Title of the new programme – including any year abroad/ in industry variants

Note: Bold letters refer to module diet columns to the right of the summative assessment maps below.

A: BEng Electronic Engineering with Foundation Year (H604)
B: BEng Music Technology Systems with Foundation Year (H662)
C: BEng Electronic Engineering (H610), BEng Electronic Engineering with a year in industry (H611)
D: BEng Electronic and Computer Engineering (H634), BEng Electronic and Computer Engineering with a year in industry (H635)
E: BEng Electronic Engineering with Nanotechnology (H6F3), BEng Electronic Engineering with Nanotechnology with a year in industry (H6F4)
F: BEng Music Technology Systems (H663), BEng Music Technology Systems with a year in industry (H664), BEng Electronic Engineering with Music Technology Systems (H667), BEng Electronic Engineering with Music Technology Systems with a year in industry (H661)
G: BEng Electronic and Communication Engineering (H621), BEng Electronic and Communication Engineering with a year in industry (H622)
H: BEng Electronic Engineering with Business Management (H6N2), BEng Electronic Engineering with Business Management with a year in industry (H6N3)

Level of qualification

Please select:	Level 6

Please indicate if the programme is offered with any year abroad / in industry variants	**Year in Industry** Please select Y/N	Yes
	Year Abroad Please select Y/N	No

Department(s):
Where more than one department is involved, indicate the lead department

Lead Department	Electronic Engineering
Other contributing Departments:	

Programme Leader

Dr. Andrew Pomfret

Purpose and learning outcomes of the programme

Statement of purpose for applicants to the programme

The Appendices contain the individual Educational Aims statements for each of our programmes. These are intended to be applicant-facing, and to summarise the specialist field and how our programme fits into that field. As an example, here is our statement for BEng Electronic Engineering:

The electronics industry has revolutionised life in the last few decades, and continues to push the boundaries of the physical world to produce faster, more powerful and more cost-effective technologies that enable products such as personal computers, mobile phones and the Internet. This programme provides a solid core of knowledge in the discipline, allowing students to choose specialist options for deeper study later in the degree, providing considerable flexibility for you to develop your subject-specific knowledge according to your own developing interests.
Electronics is an exciting and fascinating world of large-scale projects with ever-increasing demands for solutions and innovation. To succeed in such an environment, graduates need to be knowledgeable, highly-skilled, professional and adept at communication and project management. Drawing on the expertise of the teaching and research staff at York, and including individual and group projects at every stage of the degree to develop practical, organisational, management and business skills, this programme will provide you with precisely the abilities and approaches you will need to operate with confidence – as a designer, operator or manager - in the challenging world of Electronics.
As with all our undergraduate degrees, the BEng Electronic Engineering is fully accredited by the Institute of Engineering and Technology.

Programme Learning Outcomes

Please provide six to eight statements of what a graduate of the programme can be expected to do.
Taken together, these outcomes should capture the distinctive features of the programme. They should also be outcomes for which progressive achievement through the course of the programme can be articulated, and which will therefore be reflected in the design of the whole programme.

PLO	On successful completion of the programme, graduates will be able to:
1	Assess electronic engineering designs by applying detailed knowledge of algorithms, devices and systems and by consulting relevant documentation and research.
2	Evaluate system & component performance through a variety of analytical techniques including computational methods and modelling.
3	Create designs to address real-world problems by synthesising ideas into engineering specifications.
4	Solve technical problems through employing skills in programming, CAD, construction and measurement and by using safe laboratory techniques.
5	Clearly communicate and explain electronic engineering issues and practice in a technically accurate manner to a variety of audiences, verbally, in writing and using multimedia.
6	Coordinate and execute complex projects (with effective time management, team working, and ethical decision-making) in preparation for technical careers in electronics, computing and related disciplines.
	*Please note that the above are **indicative** PLOs, taken from our BEng Electronic Engineering (H604). The PLOs for each programme are given at the top of each programme's map, and in the Appendices*.

Programme Learning Outcome for year in industry (where applicable)

For programmes which lead to the title 'with a Year in Industry' – typically involving an additional year – please provide either a) amended versions of some (at least one, but not necessarily all) of the standard PLOs listed above, showing how these are changed and enhanced by the additional year in industry b) an additional PLO, if and only if it is not possible to capture a key ability developed by the year in industry by alteration of the standard PLOs.

We are choosing the latter option, and introducing an extra PLO for the industrial year. That way, we can leave the rest of the degree unaffected in its mapping, which makes sense, so that the learning ladders of PLOs 1-6 flow consistently for the industry and non-industry variants. PLO7 will only appear in programmes that include an industrial year.

PLO7: Explain and reflect on the role of the engineer in society and in company structure, and on the nature of their own learning style, based on personal experience in a commercial company or academic research institution.

Programme Learning Outcome for year abroad programmes (where applicable)

For programmes which lead to the title 'with a Year Abroad' – typically involving an additional year – please provide either a) amended versions of some (at least one, but not necessarily all) of the standard PLOs listed above, showing how these are changed and enhanced by the additional year abroad or b) an additional PLO, if and only if it is not possible to capture a key ability developed by the year abroad by alteration of the standard PLOs.

N/A

Explanation of the choice of Programme Learning Outcomes
Please explain your rationale for choosing these PLOs in a statement that can be used for students (such as in a student handbook). Please include brief reference to:

i) Why the PLOs are considered ambitious or stretching?

The PLOs are intended to form the top rung of a learning ladder which helps the student progress from school-based A-level (or equivalent) knowledge to being employment-ready in the engineering sector. They give structure to gaining and using IET-accredited subject knowledge, applying this through professional practical skills, and being able to communicate clearly and accurately.

ii) The ways in which these outcomes are distinctive or particularly advantageous to the student:

Our PLOs are all based on a core set of competencies which align well with the AHEP3 (Accreditation of Higher Education Programmes) learning outcomes which are at the core of our industry body – the IET's accreditation policy. However, our different programmes give the students a range of application areas (e.g. music technology, nanotechnology etc.), each with their own inflections of the PLOs.

The main advantage to the student is that the core degree is professionally accredited, but that there are a range of subject-specialisms which are reflected in the programme title, content and PLOs.

iii) How the programme learning outcomes develop students' digital literacy and will make appropriate use of technology-enhanced learning (such as lecture recordings, online resources, simulations, online assessment, 'flipped classrooms' etc)?

In all our programmes students are fully immersed in digital literacy, not just from a user's point of view, but in actively understanding and being able to contribute to the design and development of the next generation of computing hardware and software.

We have built in a wide range of assessment styles throughout the degree. Core knowledge is assessed in closed and open book examinations, as well as formatively in workshops, tutorials and on-line exercises. Many assignments are designed to give real-world scenarios, allowing students to create solutions and technically document them (by computer code, creating a video demo, public presentation, keeping a blog, and a variety of documentation formats to mimic the real-world expectations).

The Department's own internal website is the main repository of student-facing reading materials, giving access to lecture and support material for each module. We are using the VLE almost exclusively to handle assessment submission and feedback to students, and some modules include much interactive learning material.

The programmes help students gain a wide variety of practical experience and teamwork (working in pairs in labs, and in year-long group projects in Stages 1 and 2) and culminating in a major solo project entirely managed by the student with support throughout from a project supervisor.

iv) How the PLOs support and enhance the students' employability (for example, opportunities for students to apply their learning in a real world setting)?
The programme's employablity objectives should be informed by the University's Employability Strategy:

http://www.york.ac.uk/about/departments/support-and-admin/careers/staff/

Each of our programmes comes with an industrial variant, where students will take a one year placement in a related company or academic research institution. In this year students gain a thorough grounding in how the company operates, and get to work in a variety of job-roles in the company before finalising on a major research and production project.

As mentioned above we provide a variety of assessment scenarios and formats which are based on realistic situations that the students might encounter after graduation.

All students benefit from a thread of self-management and project-management opportunities in the group projects in stages 1 and 2, which build to give realistic experience of research, design, construction, testing and marketing of novel products.

vi) How will students who need additional support for academic and transferable skills be identified and supported by the Department?

The Department has a strong academic and pastoral supervision system, which allows students to get to know other members of a 6-student team during their first year. They meet in the group and individually with a supervisor (academic member of staff) to discuss their work, progress and general wellbeing. It is usually at this point that problems are picked up, especially as various group activities in the first year are based around the supervision group.

Lecturers are happy to give extra support related to their subject material, but those struggling with specific aspects of work will discuss this with their supervisor and can be referred (such as to the University's Maths Skills Centre, which we helped to establish).

If it appears that a student may have an undiagnosed disability we have a Disability Support Officer who can provide initial confidential discussion before referring to University Disability Services.

The Department also runs a successful mentoring scheme where 3rd and 4th years and postgraduates can provide one-to-one support, advice and encouragement for struggling students.

Students with significant personal difficulties or seen as underperforming academically may be directed to see the Chair of the Board of Studies, who may be more experienced than the supervisor in certain cases and may be better positioned to advise on students' options, involving contacts with the Open Door Team, Student Support Office, taking a Leave of Absence, or, in some extreme cases, voluntary withdrawal from studies.

vii) How is teaching informed and led by research in the department/ centre/ University?

All our students must demonstrate an understanding of the state of the art in tools and technologies, assessed via a literature review as part of the final-year project.

All academic (ART) staff members are expected to carry out research, and T&S staff are expected to keep up to date with their discipline. Research is organised in research groups and all staff are linked to one or more groups. These research groups align well with our teaching specialist streams. Staff are expected to keep up with their fields of research interest through conferences and literature, to supervise PhD and MSc by Research students, to write grant applications and to supervise PDRAs. New lecturers are given lighter teaching loads in their first year or two to enable them to have additional time to develop their research.

One of the most commonly cited reasons for coming to York Electronics Department is the choice of undergraduate specialisms. York was the first University in the UK to produce courses in 'MusTech', firstly at Masters Level and then at Undergraduate. Its ongoing success means that we have a thriving community of students who are just at home with creativity and production as they are at engineering analysis and design. Employers have noticed what successful all-round creative engineers they are and constantly return for new employees.

York's growing Nanotechnology infrastructure has enabled the development of the UK's first IET accredited degree programme in this area. The Nanotechnology Research Centre (http://www.york.ac.uk/nanocentre/) is linked closely to our taught provision in this area.

Stage-level progression

Please complete the table below, to summarise students' progressive development towards the achievement of PLOs, in terms of the characteristics that you expect students to demonstrate at the end of each year. This summary may be particularly helpful to students and the programme team where there is a high proportion of option modules.

Note: it is not expected that a position statement is written for each PLO, but this can be done if preferred (please add information in the 'individual statement' boxes). For a statement that applies across all PLOs in the stage fill in the 'Global statement' box.

Stage 0 (if your programme has a Foundation year, use the toggles to the left to show the hidden rows)

Stage 1

On progression from the first year (Stage 1), students will be able to:	Understand and appreciate the fundamentals of electronic engineering - principles, components and devices

PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6		
Understand fundamental algorithms and devices, and appreciate their limitations.	Use laboratory and programming tools to execute well-defined experiments and engineering solutions.			Work with others and communicate effectively, verbally and in writing.	Engage with team working, ethics, project management, Intellectual Property, and applied numeracy.		

Stage 2

On progression from the second year (Stage 2), students will be able to:				Have a theoretical and practical awareness of larger-scale electronic systems - how components work together to form operational units			
PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6		
Understand systems and select appropriate solutions.	Design, execute and test hardware and software components and systems to meet defined specifications.			Summarise and show understanding of engineering issues and practice.	Organise and manage a project team to produce a business plan and marketing strategy for a product.		

Programme Structure

Module Structure and Summative Assessment Map

Please complete the summary table below which shows the module structure and the pattern of summative assessment through the programme.

'Option module' can be used in place of a specific named option. If the programme requires students to select option modules from specific lists these lists should be provided in the next section.

From the drop-down select 'S' to indicate the start of the module, 'A' to indicate the timing of each distinct summative assessment point (eg. essay submission/ exam), and 'E' to indicate the end of the module (if the end of the module coincides with the summative assessment select 'EA') . It is not expected that each summative task will be listed where an overall module might be assessed cumulatively (for example weekly problem sheets).

If summative assessment by exams will be scheduled in the summer Common Assessment period (weeks 5-7) a single 'A' can be used within the shaded cells as it is understood that you will not know in which week of the CAP the examination will take place.

Stage 0

Credits	Module		Autumn Term										Spring Term										Summer Term									
	Code	Title	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
15	ELE00001F	Maths I	S									EA																				
15	ELE00002F	Physics & Electronics I	S									EA																				
10	ELE00003F	Fundamentals of Electronic Measurement	S																							E						
40	ELE00004F	Maths II											S									A				E				A		
40	ELE00005F	Physics & Electronics II											S									A				E				A		

Stage 1

Credits	Module		Autumn Term										Spring Term										Summer Term									
	Code	Title	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
30	ELE00023C	Analogue Electronics & Physics	S																							E			A			
10	ELE00024C	Audio Technology	S									E		A																		
15	ELE00025C	Digital Circuits	S																							E			A			
20	ELE00026C	Digital Systems											S													E	A		A			
10	ELE00027C	Engineering Design	S																							E		A				
20	ELE00028C	Intro to Nanoscience & Nanotechnology											S													EA						

15	ELE00029C	Introduction to Programming	S																						E	A					
30	ELE00030C	Mathematics	S										A												E			A			
10	ELE00031C	Recording Studio Techniques											S												E						
Stage 2																															
Credits	**Module**		**Autumn Term**										**Spring Term**										**Summer Term**									
	Code	**Title**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
20	ELE00031I	Engineering Mathematics, Systems & Signals	S										A													E			A			
20	ELE00034I	Noise, Waves & Fields	S																							E			A			
10	ELE00030I	Digital Design with HDL	S									E	A																			
15	ELE00040I	Java Programming											S													E	A	A				
15	ELE00041I	Design, Construction & Test											S													E		A				
20	ELE00035I	Semiconductor Devices & Circuits	S																							E			A			
20	ELE00028I	Algorithms & Numerical Methods	S																							E	A		A			
20	ELE00027I	Acoustics & Psychoacoustics	S																							E		A				
20	ELE00033I	Nanofabrication & Nanoanalysis											S									EA										
15	ELE00042I	Design, Construction & Test for Audio											S													E		A				
Stage 3																															
Credits	**Module**		**Autumn Term**										**Spring Term**										**Summer Term**									
	Code	**Title**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
40	ELE00004H	BEng Individual Project	S																							E		A				
10	ELE00049H	Control	S									E	A																			
10	ELE00048H	Communication Systems	S									E	A																			
10	ELE00055H	Principles of DSP											S													E			A			
20	ELE00046H	Applications of EM	S									E	A																			
20	ELE00051H	iOS Audio Programming	S									E		A																		
20	ELE00054H	Multimedia Sound Design											S													E	A					
10	ELE00008H	Management & Marketing of Technology	S									E	A																			
10	ELE00009H	Law for Engineering Management	S									E		A																		
10	ELE00045H	Analogue Engineering											S													E			A			
10	ELE00057H	State Space & Digital Control											S													E			A			
10	ELE00050H	Digital Communication Systems											S													E			A			
10	ELE00052H	LAN & Internet Protocols											S									E							A			
10	ELE00012H	Mobile Communication Systems											S									E							A			
10	ELE00047H	Cloud & Distributed Computer Systems											S													E	A					
10	ELE00011H	Digital Engineering											S									E	A									
10	ELE00015H	Accounting & Finance											S									E							A			
10	ELE00023H	Nanoelectronics											S									E							A			

10	ELE00025H	Photonics & Nanophotonics										S									E							A			

Programme Information & PLOs - MEng Programmes

Title of the new programme – including any year abroad/ in industry variants

Note: Bold letters refer to module diet columns to the right of the summative assessment maps below.

I: MEng Electronic Engineering (H609), MEng Electronic Engineering with a year in industry (H608)
J: MEng Electronic and Computer Engineering (H639), MEng Electronic and Computer Engineering with a year in industry (H638)
K: MEng Electronic Engineering with Nanotechnology (H6FH), MEng Electronic Engineering with Nanotechnology with a year in industry (H6FG)
L: MEng Music Technology Systems (H666), MEng Music Technology Systems with a year in industry (H668), MEng Electronic Engineering with Music Technology Systems (H669), MEng Electronic Engineering with Music Technology Systems with a year in industry (H668)
M: MEng Electronic and Communication Engineering (H629), MEng Electronic and Communication Engineering with a year in industry (H628)
N: MEng Electronic Engineering with Business Management (H6NG), MEng Electronic Engineering with Business Management with a year in industry (H6NF)

Level of qualification

Please select:	Level 7

Please indicate if the programme is offered with any year abroad / in industry variants	**Year in Industry** Please select Y/N	Yes
	Year Abroad Please select Y/N	No

Department(s):
Where more than one department is involved, indicate the lead department

Lead Department	Electronic Engineering
Other contributing Departments:	

Programme Leader

Dr. Andrew Pomfret

Purpose and learning outcomes of the programme

Statement of purpose for applicants to the programme
Please express succinctly the overall aims of the programme as an applicant facing statement for a prospectus or website. This should clarify to a prospective student why they should choose this programme, what it will provide to them and what benefits they will gain from completing it.

The Appendices contain the individual Educational Aims statements for each of our programmes. These are intended to be applicant-facing, and to summarise the specialist field and how our programme fits into that field. As an example, here is our statement for MEng Electronic Engineering:

The electronics industry has revolutionised life in the last few decades, and continues to push the boundaries of the physical world to produce faster, more powerful and more cost-effective technologies that enable products such as personal computers, mobile phones and the Internet. This programme provides a solid core of knowledge in the discipline, allowing students to choose specialist options for deeper study later in the degree, providing considerable flexibility for you to develop your subject-specific knowledge according to your own developing interests.
Electronics is an exciting and fascinating world of large-scale projects with ever-increasing demands for solutions and innovation. To succeed in such an environment, graduates need to be knowledgeable, highly-skilled, professional and adept at communication and project management. Drawing on the expertise of the teaching and research staff at York, and including individual and group projects at every stage of the degree to develop practical, organisational, management and business skills, this programme will provide you with precisely the abilities and approaches you will need to operate with confidence – as a researcher, expert designer or technical manager - in the challenging world of Electronics.
The final year of this Masters-level programme extends the Bachelors (BEng) programme by providing an opportunity for further engagement with research staff, technology and literature. Students will manage a large-scale individual project, and extend their knowledge and experience in a variety of core and optional topic areas; together these opportunities allow you to develop the knowledge and skills required to take a leadership role in pushing forward this specialist subject area.
As with all our undergraduate degrees, the MEng Electronic Engineering is fully accredited by the Institute of Engineering and Technology, and satisfies the educational requirements for becoming a Chartered Engineer.

Programme Learning Outcomes
Please provide six to eight statements of what a graduate of the programme can be expected to do.
Taken together, these outcomes should capture the distinctive features of the programme. They should also be outcomes for which progressive achievement through the course of the programme can be articulated, and which will therefore be reflected in the design of the whole programme.

PLO	On successful completion of the programme, graduates will be able to:
1	Conduct research in applied electronic engineering and computing to advance the state of knowledge in algorithms, devices and systems.
2	Extract and critically evaluate data from complex systems through a variety of analytical techniques including computational methods and modelling.
3	Create innovative and optimised designs to address real-world problems by synthesising ideas into engineering specifications.
4	Apply professional skills of programming, CAD, construction and measurement, combined with an understanding of engineering systems and components, to solve technically challenging problems.
5	Debate, defend and contextualise information in a succinct and technically accurate manner for audiences of engineers and members of the public, and to write and interpret technical documentation.
6	Proficiently manage themselves, teams and complex projects in preparation for technical careers as leaders in electronics, computing and related disciplines.
	*Please note that the above are **indicative** PLOs, taken from our MEng Electronic Engineering (H609). The PLOs for each programme are given at the top of each programme's map, and in the Appendices.*

Programme Learning Outcome for year in industry (where applicable)
For programmes which lead to the title 'with a Year in Industry' – typically involving an additional year – please provide either a) amended versions of some (at least one, but not necessarily all) of the standard PLOs listed above, showing how these are changed and enhanced by the additional year in industry b) an additional PLO, if and only if it is not possible to capture a key ability developed by the year in industry by alteration of the standard PLOs.

We are choosing the latter option, and introducing an extra PLO for the industrial year. That way, we can leave the rest of the degree unaffected in its mapping, which makes sense, so that the learning ladders of PLOs 1-6 flow consistently for the industry and non-industry variants. PLO7 will only appear in programmes that include an industrial year.

PLO7: Explain and reflect on the role of the engineer in society and in company structure, and on the nature of their own learning style, based on personal experience in a commercial company or academic research institution.

Programme Learning Outcome for year abroad programmes (where applicable)
For programmes which lead to the title 'with a Year Abroad' – typically involving an additional year – please provide either a) amended versions of some (at least one, but not necessarily all) of the standard PLOs listed above, showing how these are changed and enhanced by the additional year abroad or b) an additional PLO, if and only if it is not possible to capture a key ability developed by the year abroad by alteration of the standard PLOs.

N/A

Explanation of the choice of Programme Learning Outcomes
Please explain your rationale for choosing these PLOs in a statement that can be used for students (such as in a student handbook). Please include brief reference to:

i) Why the PLOs are considered ambitious or stretching?

The PLOs are intended to form the top rung of a learning ladder which helps the student progress from school-based A-level (or equivalent) knowledge to being employment-ready in the engineering sector. The MEng PLOs are based on those for the BEng programmes, and give structure to gaining and using IET-accredited subject knowledge, applying this through professional practical skills, and being able to communicate clearly and accurately. They stretch the students further by emphasising engagement with cutting-edge research, critical evaluation, debate and contextualisation, and the management of complex projects.

ii) The ways in which these outcomes are distinctive or particularly advantageous to the student:

Our PLOs are all based on a core set of competencies which align well with the AHEP3 (Accreditation of Higher Education Programmes) learning outcomes which are at the core of our industry body – the IET's accreditation policy. However, our different programmes give the students a range of application areas (e.g. music technology, nanotechnology etc.), each with their own inflections of the PLOs.

The main advantage to the student is that the core degree is professionally accredited, but that there are a range of subject-specialisms which are reflected in the programme title, content and PLOs.

iii) How the programme learning outcomes develop students' digital literacy and will make appropriate use of technology-enhanced learning (such as lecture recordings, online resources, simulations, online assessment, 'flipped classrooms' etc)?

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As mentioned above we provide a variety of assessment scenarios and formats which are based on realistic situations that the students might encounter after graduation.

MEng students benefit from a thread of self-management and project-management opportunities in the group projects in stages 1 to 3, which build to give realistic experience of research, design, construction, testing and marketing of novel products. In Stage 3, this consists of a major Software Engineering project in which groups of 8 or 9 students form companies and engage in the entire process of tendering ideas, producing marketing plans, designing, coding and testing software, and operating throughout as a company with official documentation and Quality Assurance.

vi) How will students who need additional support for academic and transferable skills be identified and supported by the Department?

The Department has a strong academic and pastoral supervision system, which allows students to get to know other members of a 6-student team during their first year. They meet in the group and individually with a supervisor (academic member of staff) to discuss their work, progress and general wellbeing. It is usually at this point that problems are picked up, especially as various group activities in the first year are based around the supervision group.

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vii) How is teaching informed and led by research in the department/ centre/ University?

All our students must demonstrate an understanding of the state of the art in tools and technologies, assessed via a literature review as part of the final-year project.

As students progress through an MEng degree they move from learning about the fundamental principles and techniques through to engaging with the latest research in the area.

All academic (ART) staff members are expected to carry out research, and T&S staff are expected to keep up to date with their discipline. Research is organised in research groups and all staff are linked to one or more groups. These research groups align well with our teaching specialist streams. Staff are expected to keep up with their fields of research interest through conferences and literature, to supervise PhD and MSc by Research students, to write grant applications and to supervise PDRAs. New lecturers are given lighter teaching loads in their first year or two to enable them to have additional time to develop their research.

One of the most commonly cited reasons for coming to York Electronics Department is the choice of undergraduate specialisms. York was the first University in the UK to produce courses in 'MusTech', firstly at Masters Level and then at Undergraduate. Its ongoing success means that we have a thriving community of students who are just at home with creativity and production as they are at engineering analysis and design. Employers have noticed what successful all-round creative engineers they are and constantly return for new employees.

York's growing Nanotechnology infrastructure has enabled the development of the UK's first IET accredited degree programme in this area. The Nanotechnology Research Centre (http://www.york.ac.uk/nanocentre/) is linked closely to our taught provision in this area.

Stage-level progression

Please complete the table below, to summarise students' progressive development towards the achievement of PLOs, in terms of the characteristics that you expect students to demonstrate at the end of each year. This summary may be particularly helpful to students and the programme team where there is a high proportion of option modules.

Note: it is not expected that a position statement is written for each PLO, but this can be done if preferred (please add information in the 'individual statement' boxes). For a statement that applies across all PLOs in the stage fill in the 'Global statement' box.

Stage 0 (if your programme has a Foundation year, use the toggles to the left to show the hidden rows)							
Stage 1							
On progression from the first year (Stage 1), students will be able to:			Understand and appreciate the fundamentals of electronic engineering - principles, components and devices				
PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6		
Understand fundamental algorithms and devices, and appreciate their limitations.	Use laboratory and programming tools to execute well-defined experiments and engineering solutions.			Work with others and communicate effectively, verbally and in writing.	Engage with team working, ethics, project management, Intellectual Property, and applied numeracy.		
Stage 2							
On progression from the second year (Stage 2), students will be able to:			Have a theoretical and practical awareness of larger-scale electronic systems - how components work together to form operational units				
PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6		
Understand systems and select appropriate solutions.	Design, execute and test hardware and software components and systems to meet defined specifications.			Summarise and show understanding of engineering issues and practice.	Organise and manage a project team to produce a business plan and marketing strategy for a product.		
Stage 3							
(For Integrated Masters) On progression from the third year (Stage 3), students will be able to:			Have a professional understanding of applications - how components and systems are used in real life				
PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6		

Critically evaluate and acquire knowledge to create optimised designs.	Develop specifications for electronic systems and design and demonstrate an optimised solution to meet customer requirements.	Communicate and explain engineering issues and practice, to a variety of audiences.	Coordinate complex technical tasks with critical thinking and effective time management.		

Programme Structure

Module Structure and Summative Assessment Map

Please complete the summary table below which shows the module structure and the pattern of summative assessment through the programme.

'Option module' can be used in place of a specific named option. If the programme requires students to select option modules from specific lists these lists should be provided in the next section.

From the drop-down select 'S' to indicate the start of the module, 'A' to indicate the timing of each distinct summative assessment point (eg. essay submission/ exam), and 'E' to indicate the end of the module (if the end of the module coincides with the summative assessment select 'EA') . It is not expected that each summative task will be listed where an overall module might be assessed cumulatively (for example weekly problem sheets).

If summative assessment by exams will be scheduled in the summer Common Assessment period (weeks 5-7) a single 'A' can be used within the shaded cells as it is understood that you will not know in which week of the CAP the examination will take place.

Please note that the diets below are indicative only. Several programmes require (or prohibit) certain selections of optional modules, and this information is not captured here. See the Appendices for detailed programme diet information.

Stage 0

Stage 1

Credits	Module		Autumn Term										Spring Term										Summer Term										Programme Diets (C: core, o: option)					
	Code	Title	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	I	J	K	L	M	N
30	ELE00023C	Analogue Electronics & Physics	S																							E			A				C	C	C	C	C	C
10	ELE00024C	Audio Technology	S									E		A																							C		
15	ELE00025C	Digital Circuits	S																							E			A				C	C	C	C	C	C
20	ELE00026C	Digital Systems											S													E	A		A				C	C			C	C
10	ELE00027C	Engineering Design	S																							E		A					C	C	C	C	C	C
20	ELE00028C	Intro to Nanoscience & Nanotechnc											S													EA										C			
15	ELE00029C	Introduction to Programming	S																							E	A						C	C	C	C	C	C
30	ELE00030C	Mathematics	S										A													E			A				C	C	C	C	C	C
10	ELE00031C	Recording Studio Techniques											S													E										C		

Stage 2

Credits	Module		Autumn Term										Spring Term										Summer Term										Programme Diets (C: core, o: option)					
	Code	Title	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	I	J	K	L	M	N
20	ELE00031I	Engineering Mathematics, Systems	S										A													E			A				C	C	C	C	C	C
20	ELE00034I	Noise, Waves & Fields	S																							E			A				C	C	C	C	C	C
10	ELE00030I	Digital Design with HDL	S									E	A																				C	C	C	C	C	C
15	ELE00040I	Java Programming											S													E	A	A					C	C	C	C	C	C
15	ELE00041I	Design, Construction & Test											S													E		A					C	C	C		C	C
20	ELE00035I	Semiconductor Devices & Circuits	S																							E			A				C	C	C		C	C
20	ELE00028I	Algorithms & Numerical Methods	S																							E	A		A				C	C		C	C	C
20	ELE00027I	Acoustics & Psychoacoustics	S																							E		A								C		
20	ELE00033I	Nanofabrication & Nanoanalysis											S									EA														C			

Stage 3

Credits	Module		Autumn Term										Spring Term										Summer Term										Programme Diets (C: core, o: option)					
	Code	Title	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	I	J	K	L	M	N
10	ELE00049H	Control	S									E	A																				C	C	C	C	C	C

10	ELE00048H	Communication Systems	S									E	A																			C	C	C	C	C	C
10	ELE00055H	Principles of DSP											S													E				A				C	C	C	C	C	C
20	ELE00046H	Applications of EM	S									E	A																					C	C	C		C	
10	ELE00008H	Management & Marketing of Techn	S									E	A																											C
10	ELE00009H	Law for Engineering Management	S									E		A																										C
10	ELE00045H	Analogue Engineering											S													E				A				o	o	o		o	o
10	ELE00057H	State Space & Digital Control											S													E				A				o	o	o	o	o	o
10	ELE00050H	Digital Communication Systems											S													E				A				o	o	o	o	o	
10	ELE00052H	LAN & Internet Protocols											S								E									A				o	o	o	o	o	o
10	ELE00012H	Mobile Communication Systems											S								E									A				o	o	o	o	o	o
10	ELE00047H	Cloud & Distributed Computer Syst											S													E	A							o	o		o	o	o
10	ELE00011H	Digital Engineering											S								E	A												o	o			o	o
10	ELE00015H	Accounting & Finance											S								E									A				o	o	o	o	o	C
10	ELE00023H	Nanoelectronics											S								E									A				o	o	C	o	o	o
10	ELE00025H	Photonics & Nanophotonics											S								E									A				o		C		o	o
40	ELE00056H	Software Engineering Project	S																							E					A			C	C	C	C	C	C

Stage 4																																		Programme Diets					
Credits	**Module**		**Autumn Term**										**Spring Term**										**Summer Term**										(C: core, o: option)					
	Code	**Title**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**I**	**J**	**K**	**L**	**M**	**N**
80	ELE00101M	MEng Individual Project											S													E				A			C	C	C	C	C	C
10	ELE00097M	Advanced Control	S									E	A																				o	o		o	o	o
10	ELE00007M	Electronics for Medicine	S									EA																					o	o	o	o	o	o
10	ELE00099M	High Frequency Electronics	S									E	A																				o	o			o	
10	ELE00103M	Robotics	S									E	A																				o	o	o	o		o
10	ELE00059M	Sensors & Instrumentation	S									E	A																				o		o	o		o
10	ELE00005M	Information Theory & Error Control	S									E	A																				o		o	o	C	o
10	ELE00105M	Wired, Wireless & Optical Transmis	S									E	A																				o	o	o	o	C	o
10	ELE00017M	Bio-Inspired Computation	S							A		EA																					o	C	o	o	o	
10	ELE00062M	Systems Programming for ARM	S									E	A																				o	C	o	o		o
10	ELE00039M	Ideation	S							A		EA	A																				o	o		o	o	o
10	ELE00022M	Strategic Management	S								A	EA																					o	o	o	o		o
10	ELE00104M	Skills for Business Leadership	S									E				A																	o			o	o	o
10	ELE00102M	Physical Modelling Synthesis	S									E	A																				o	o	o	o	o	o
10	ELE00074M	Voice:Acoustics & Applications	S									E	A																								o		
10	ELE00100M	Information Storage & Spintronics	S									E				A																	o		C	o	o	o
10	ELE00065M	Music Performance Analysis Syste	S									E	A																								o		
10	ELE00098M	Emerging Nanotechnologies	S								A	EA																							C				
10	ELE00127M	Integrated Circuit Design & Simulat	S									EA																					o	o	o	o	o	o

Management and Admissions Information

This document applies to students who commenced the programme(s) in:	2017/18

Interim awards available Interim awards available on undergraduate programmes (subject to programme regulations) will normally be: Certificate of Higher Education (Level 4/Certificate), Diploma of Higher Education (Level 5/Intermediate), Ordinary Degree and in the case of Integrated Masters the Bachelors with honours. Please specify any proposed exceptions to this norm.

Certificate of Higher Education (Level 4/Certificate) generic
Diploma of Higher Education (Level 5/Certificate) generic

Admissions Criteria

TYPICAL OFFERS
A levels
BEng: ABB
MEng: AAA
IB Diploma Programme
BEng: 34 points
MEng: 36 points
BTEC Extended Diploma
BEng: DDM
MEng: DDD

Length and status of the programme(s) and mode(s) of study

Programme	**Length (years)**	**Status (full-time/part-time)** Please select	**Start dates/months** (if applicable – for programmes that have multiple intakes or start dates that differ from the usual academic year)	**Mode**		
				Face-to-face, campus-based	**Distance learning**	**Other**

BEng Electronic Engineering BEng Electronic Engineering BEng Electronic and Commu BEng Electronic and Compu BEng Music Technology Sys BEng Electronic Engineering BEng Digital Media Systems BEng Electronic Engineering BEng Electronic Engineering BEng Electronic Engineering BSc in Music Technology (S	3/4	Full-time			Yes		No	
MEng Electronic Engineering MEng Electronic and Commu MEng Electronic and Compu MEng Avionics (last intake 1 MEng Music Technology Sys MEng Electronic Engineering MEng Electronic Engineering MEng Digital Media Systems MEng Electronic Engineering MEng Electronics Engineerin	4/5	Full-time			Yes		No	

Language(s) of study

English.

Language(s) of assessment

English.

Programme accreditation by Professional, Statutory or Regulatory Bodies (PSRB)

Is the programme recognised or accredited by a PSRB

Please Select Y/N:	Yes	if No move to next Section if Yes complete the following questions

Name of PSRB

Institution of Engineering and Technology

Are there any conditions on the approval/ accreditation of the programme(s)/ graduates (for example accreditation only for the full award and not any interim award)

Accreditation only for the full award. Limit on compensation per stage that is more stringent than the University's rule.

Additional Professional or Vocational Standards

Are there any additional requirements of accrediting bodies or PSRB or pre-requisite professional experience needed to study this programme?

Please Select Y/N:	No	if Yes, provide details

(max 200 words)

University award regulations

The University's award and assessment regulations apply to all programmes: any exceptions that relate to this programme are approved by University Teaching Committee and are recorded at the end of this document.

Are students on the programme permitted to take elective modules?

(See: https://www.york.ac.uk/media/staffhome/learningandteaching/documents/policies/Framework%20for%20Programme%20Design%20-%20UG.pdf)

Please Select Y/N:	No	

Careers & Placements - 'With Placement Year' programmes

Students on all undergraduate and integrated masters programmes may apply to spend their third year on a work-based placement facilitated by Careers & Placements. Such students would return to their studies at Stage 3 in the following year, thus lengthening their programme by a year. Successful completion of the placement year and associated assessment allows this to be recognised in programme title, which is amended to include 'with Placement Year' (e.g. BA in XYZ with Placement Year'). The Placement Year also adds a Programme Learning Outcome, concerning employability. (See Careers & Placements for details).

In exceptional circumstances, UTC may approve an exemption from the 'Placement Year' initiative. This is usually granted only for compelling reasons concerning accreditation; if the Department already has a Year in Industry with criteria sufficiently generic so as to allow the same range of placements; or if the programme is less than three years in length.

Programme excluded from Placement Year?	No	If yes, what are the reasons for this exemption:

Study Abroad (including Year Abroad as an additional year and replacement year)

Students on all programmes may apply to spend Stage 2 on the University-wide North America/ Asia/ Australia student exchange programme. Acceptance onto the programme is on a competitive basis. Marks from modules taken on replacement years count toward progression and classification. Does the programme include the opportunity to undertake other formally agreed study abroad activities? All such programmes must comply with the Policy on Study Abroad https://www.york.ac.uk/staff/teaching/procedure/programmes/design/		
Please Select Y/N:	No	
Additional information		
Transfers out of or into the programme		
ii) Transfers into the programme will be possible? (please select Y/N)	Yes	
Additional details:		
a) Transfer between BEng and MEng Students registered on BEng programmes can transfer to equivalent MEng programmes at the end of Stage 1 provided they satisfy the appropriate Part 1 examination progression rules. The continued registration on MEng programmes beyond Stage 2 is dependent on students satisfying the Part 2a progression rule. Details of all progression rules can be found in the Statement of Assessment document. Transfer from MEng to BEng can occur up to the end of Stage 2. b) Transfers between 'with' and 'without' Year in Industry Students transferring from 'without' to 'with' need to do so in sufficient time for them to be able to secure and organise an industrial placement. The reverse transfer should occur in sufficient time for the student to be able to select optional modules and a project. c) Transfers across streamed programmes Transfer across streamed programmes is dependent upon the student satisfying the necessary prerequisites. These are summarised in the Transfer Matrix, which can be viewed on the Departmental website and in the student handbook.		
ii) Transfers out of the programme will be possible? (please select Y/N)	Yes	
Additional details:		
a) Transfer between BEng and MEng Students registered on BEng programmes can transfer to equivalent MEng programmes at the end of Stage 1 provided they satisfy the appropriate Part 1 examination progression rules. The continued registration on MEng programmes beyond Stage 2 is dependent on students satisfying the Part 2a progression rule. Details of all progression rules can be found in the Statement of Assessment document. Transfer from MEng to BEng can occur up to the end of Stage 2. b) Transfers between 'with' and 'without' Year in Industry Students transferring from 'without' to 'with' need to do so in sufficient time for them to be able to secure and organise an industrial placement. The reverse transfer should occur in sufficient time for the student to be able to select optional modules and a project. c) Transfers across streamed programmes Transfer across streamed programmes is dependent upon the student satisfying the necessary prerequisites. These are summarised in the Transfer Matrix, which can be viewed on the Departmental website and in the student handbook.		
Exceptions to University Award Regulations approved by University Teaching Committee		

Exception Please detail any exceptions to University Award Regulations approved by UTC	**Date approved**

Date on which this programme information was updated:

04/09/2018

Please note:

The information above provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if they take full advantage of the learning opportunities that are provided.

Detailed information on the learning outcomes, content, delivery and assessment of modules can be found in the module descriptions.

The University reserves the right to modify this overview in unforeseen circumstances, or where the process of academic development, based on feedback from staff, students, external examiners or professional bodies, requires a change to be made. Students will be notified of any substantive changes at the first available opportunity.

Programme Map

Please note: the programme map below is in interim format pending the development of a University Programme Catalogue.

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Electronics BEng		Programmes:	BEng Electronic Engineering (H610) BEng Electronic Engineering with a year in industry (H611)

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Assess electronic engineering designs by applying detailed knowledge of algorithms, devices and systems and by consulting relevant documentation and research.	**Evaluate system & component performance through a variety of analytical techniques including computational methods and modelling.**	**Create designs to address real-world problems by synthesising ideas into engineering specifications.**	**Solve technical problems through employing skills in programming, CAD, construction and measurement and by using safe laboratory techniques.**	**Clearly communicate and explain electronic engineering issues and practice in a technically accurate manner to a variety of audiences, verbally, in writing and using multimedia.**	**Coordinate and execute complex projects (with effective time management, team working, and ethical decision-making) in preparation for technical careers in electronics, computing and related disciplines.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00026C	Progress towards PLO	You will learn about the operation of microprocessors and microcontrollers, and the techniques of assembly-language and low-level programming.			You will learn to write programs in machine code and assembly language, and to write programs for interfacing using higher-level languages.	You will learn to explain technical concepts concisely and accurately.	You will be able to manage your own progress in implementing software solutions.
	Digital Systems	By working on (and if applicable, assessed through)	The lectures will give you all the information that you need, and laboratory sessions will give you practice. A technical report (assessed) will test your knowledge.			A series of lab-based assignments will teach you to develop microcontroller-based solutions. (Assessed by report and submitting code)	You will write a report (assessed) that clearly describes the operation of low-level code and its interaction with target hardware.	A large-scale summative design exercise at the end of the module helps you to manage work leading to a technical report with accompanying code (both assessed).

Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of appropriate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.

	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		
	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)
Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.

	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstrati on)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).
Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.

	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	
	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 3	ELE00004H	Progress towards PLO	You will learn more about the important engineering approaches to solving problems, and will advance your knowledge considerably in the subject area of your project.	You will gain experience in analysing the scientific literature in a specialised area, and making an informed selection of tools and techniques to apply.	Specify, design, construct and verify a project in an advanced and/or specialised area of engineering	Independently evaluate and assess alternative approaches to specific engineering problems	You will present and defend your own work through a written initial report, final report and oral presentation.	You will be able to confidently define specifications and propose suitable timescales, work independently and also interact with colleagues, plan your own time, and consider and evaluate the risks in your project.

	BEng Individual Project	By working on (and if applicable, assessed through)	Your individual project, which will run over two terms, will involve significant independent reading and research, guided by regular supervision meetings. Assessed via written initial report, final report and oral presentation.	With the guidance of your supervisor, you will be expected to gather and critically analyse information from reliable sources, and use this information to guide your project work. Assessed via written initial report, final report and oral presentation.	Assessed during project displays, reports and viva	Experience of an independent project from specifications, analysis, simulation and design, to report writing	You'll be able to construct detailed and accurate technical reports for a specified audience (initial and final reports assessed) and defend your project work in a viva setting (assessed).	Throughout the project time you will be developing your skills in project management, including the management of time, risk and resources. These are assessed from evidence provided in your report and viva.
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		
	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				

	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		
	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		

Stage 3	ELE00046H	Progress towards PLO	You will learn about the propagation mechanisms of electromagnetic waves within materials, and how to classify materials according to the nature of a wave propagating through them. You will also learn about the principles of waveguiding, the importance of antennas in all types of radio communication systems, the problems of interference and fading, and channel models.	You will learn to determine the interactions of electromagnetic waves at boundaries between materials, and to describe and calculate the loss and dispersion limits of propagation distance in fibre optical links. You will also learn to to specify the performance of a radio system in terms of antenna characteristics, and to estimate the channel losses for guided, ground, sky and freespace waves, including the effects of diffraction and reflections, and know what applications use these propagation modes.	You will know how to use the Smith Chart for transmission line calculations; will be able to design single stub and quarterwave matching networks; and to appreciate the main considerations in design of freespace and guided optical links.	You will learn how to use an RF network analyser, and how to use Smith charts to analyse distributed circuits, as well as how to prototype and construct high-frequency circuits.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Applications of EM	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will provide you with the knowledge you need. Laboratory tasks and workshop exercises will help you reinforce your knowledge. (Assessed by closed-book exam.)	Lectures will provide you with the information that you need, and workshop exercises will help reinforce it. Laboratory tasks using a bespoke software simulator to model and characterise a transmission line will put your knowledge into a practical context. (Assessed by closed-book exam.)	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	Laboratory tasks with peers allow you to discuss the issues with each other and with lab leader/lab instructors/technicians.	

Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	
	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	

Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		
	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			

	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	
Stage 3	ELE00011H	Progress towards PLO	You will develop the ability to design complex digital circuits that take into account performance and testability, and to exploit IP components in the design of digital circuits. You will gain experience in interfacing custom circuits with external components.	You will become familiar with the tools required to analyse circuits from the point of view of performance and testability, and with the use of advanced testing and test-bench design techniques to verify digital circuits.		You will further your design skills using a hardware description language to build a omplex system including IP components.	You will develop your skills in the documentation of digital circuits, including timing- and test-related information.	You will hone your skills in team working and time management.

	Digital Engineering	By working on (and if applicable, assessed through)	Lectures will provide you with knowledge, and a set of lab exercises will give you practice. You will also read and understanding IP component documentation. You will complete a final project involving the design of high-performance, testable circuits that use IP components. Assessed through lab and final project reports.	A set of lab exercises, involving the use of simulation tools to implement and verify digital circuits that meet performance and/or testability constraints, will give you this familiarity. Assessed through lab and final project reports.		A set of lab exercises will lead you through the process of including IP components in a design of a high-performance, testable digital system, and implementing it in a Field Programmable Gate Array (FPGA). (Assessed by lab and final project reports.)	The laboratory and project reports (assessed) require professional presentation and annotation of VHDL code (including timing and testing considerations), testbenches, and simulations.	You will work on a sequence of laboratory-based group tasks and a final group project (assessed)that require independent work outside of supervised lab hours.
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.
	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.

Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportunity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00025H	Progress towards PLO	You will learn to combine the principles and laws of optics, semiconductor physics and technology, and quantum mechanics in the context of photonics and nanophotonics.	You will learn to apply the apparatus of ordinary and partial differential equations, eigenvalue problems, Fourier analysis etc. to analysis of light propagation in photonic and nanophotonic devices, their modal structure, and ultimately their performance.	You will learn how the use of photonic and nanophotonic technology, devices, and subsystems are used in long-distance communications, storage and retrieval (e.g. DVD/Blu-Ray) and data acquisition (photonic sensors), and the requirements of photonic components for each of these applications		You will be able to explain the principle and performance of photonics and nanophotonics on both qualitative level (verbal explanations) and quantiative level (phenomenological and if required microscopic analysis) and show the logical progression from fundamental principles to peformance issues.	
	Photonics & Nanophotonics	By working on (and if applicable, assessed through)	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Engagement in lectures, workshops and reading supporting material. (Assessed by a closed-book exam.)		You will be expected to synthesis the knowledge and experience from lectures, workshop questions, and supporting material explaining the principles of photonics. Assessed by examination.	

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Computer Engineering BEng	Programmes:	BEng Electronic and Computer Engineering (H634) BEng Electronic and Computer Engineering with a year in industry (H635)	

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Assess computer and electronic engineering designs by applying detailed knowledge of algorithms, devices and systems and by consulting relevant documentation and research.	**Evaluate system & component performance through a variety of analytical techniques including computational methods and modelling.**	**Create designs to address real-world problems in computer software and hardware (analogue & digital) by synthesising ideas into engineering specifications.**	**Solve technical problems through employing skills in programming, CAD, construction and measurement and by using safe laboratory techniques.**	**Clearly communicate and explain computer and electronic engineering issues and practice in a technically accurate manner to a variety of audiences, verbally, in writing and using multimedia.**	**Coordinate and execute complex projects (with effective time management, team working, and ethical decision-making) in preparation for technical careers in applied computer and electronic engineering.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00026C	Progress towards PLO	You will learn about the operation of microprocessors and microcontrollers, and the techniques of assembly-language and low-level programming.			You will learn to write programs in machine code and assembly language, and to write programs for interfacing using higher-level languages.	You will learn to explain technical concepts concisely and accurately.	You will be able to manage your own progress in implementing software solutions.
	Digital Systems	By working on (and if applicable, assessed through)	The lectures will give you all the information that you need, and laboratory sessions will give you practice. A technical report (assessed) will test your knowledge.			A series of lab-based assignments will teach you to develop microcontroller-based solutions. (Assessed by report and submitting code)	You will write a report (assessed) that clearly describes the operation of low-level code and its interaction with target hardware.	A large-scale summative design exercise at the end of the module helps you to manage work leading to a technical report with accompanying code (both assessed).

Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of appropriate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.

	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		
	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)
Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.

	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstrati on)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).
Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.

	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	
	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 3	ELE00004H	Progress towards PLO	You will learn more about the important engineering approaches to solving problems, and will advance your knowledge considerably in the subject area of your project.	You will gain experience in analysing the scientific literature in a specialised area, and making an informed selection of tools and techniques to apply.	Specify, design, construct and verify a project in an advanced and/or specialised area of engineering	Independently evaluate and assess alternative approaches to specific engineering problems	You will present and defend your own work through a written initial report, final report and oral presentation.	You will be able to confidently define specifications and propose suitable timescales, work independently and also interact with colleagues, plan your own time, and consider and evaluate the risks in your project.

	BEng Individual Project	By working on (and if applicable, assessed through)	Your individual project, which will run over two terms, will involve significant independent reading and research, guided by regular supervision meetings. Assessed via written initial report, final report and oral presentation.	With the guidance of your supervisor, you will be expected to gather and critically analyse information from reliable sources, and use this information to guide your project work. Assessed via written initial report, final report and oral presentation.	Assessed during project displays, reports and viva	Experience of an independent project from specifications, analysis, simulation and design, to report writing	You'll be able to construct detailed and accurate technical reports for a specified audience (initial and final reports assessed) and defend your project work in a viva setting (assessed).	Throughout the project time you will be developing your skills in project management, including the management of time, risk and resources. These are assessed from evidence provided in your report and viva.
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		
	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				

	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		
	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		

Stage 3	ELE00046H	Progress towards PLO	You will learn about the propagation mechanisms of electromagnetic waves within materials, and how to classify materials according to the nature of a wave propagating through them. You will also learn about the principles of waveguiding, the importance of antennas in all types of radio communication systems, the problems of interference and fading, and channel models.	You will learn to determine the interactions of electromagnetic waves at boundaries between materials, and to describe and calculate the loss and dispersion limits of propagation distance in fibre optical links. You will also learn to to specify the performance of a radio system in terms of antenna characteristics, and to estimate the channel losses for guided, ground, sky and freespace waves, including the effects of diffraction and reflections, and know what applications use these propagation modes.	You will know how to use the Smith Chart for transmission line calculations; will be able to design single stub and quarterwave matching networks; and to appreciate the main considerations in design of freespace and guided optical links.	You will learn how to use an RF network analyser, and how to use Smith charts to analyse distributed circuits, as well as how to prototype and construct high-frequency circuits.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Applications of EM	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will provide you with the knowledge you need. Laboratory tasks and workshop exercises will help you reinforce your knowledge. (Assessed by closed-book exam.)	Lectures will provide you with the information that you need, and workshop exercises will help reinforce it. Laboratory tasks using a bespoke software simulator to model and characterise a transmission line will put your knowledge into a practical context. (Assessed by closed-book exam.)	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	Laboratory tasks with peers allow you to discuss the issues with each other and with lab leader/lab instructors/technicians.	

Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	
	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	

Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		
	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			

	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	
Stage 3	ELE00011H	Progress towards PLO	You will develop the ability to design complex digital circuits that take into account performance and testability, and to exploit IP components in the design of digital circuits. You will gain experience in interfacing custom circuits with external components.	You will become familiar with the tools required to analyse circuits from the point of view of performance and testability, and with the use of advanced testing and test-bench design techniques to verify digital circuits.		You will further your design skills using a hardware description language to build a omplex system including IP components.	You will develop your skills in the documentation of digital circuits, including timing- and test-related information.	You will hone your skills in team working and time management.

	Digital Engineering	By working on (and if applicable, assessed through)	Lectures will provide you with knowledge, and a set of lab exercises will give you practice. You will also read and understanding IP component documentation. You will complete a final project involving the design of high-performance, testable circuits that use IP components. Assessed through lab and final project reports.	A set of lab exercises, involving the use of simulation tools to implement and verify digital circuits that meet performance and/or testability constraints, will give you this familiarity. Assessed through lab and final project reports.		A set of lab exercises will lead you through the process of including IP components in a design of a high-performance, testable digital system, and implementing it in a Field Programmable Gate Array (FPGA). (Assessed by lab and final project reports.)	The laboratory and project reports (assessed) require professional presentation and annotation of VHDL code (including timing and testing considerations), testbenches, and simulations.	You will work on a sequence of laboratory-based group tasks and a final group project (assessed)that require independent work outside of supervised lab hours.
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.
	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.

Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportunity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Communication Engineering BEng	Programmes:	BEng Electronic and Communication Engineering (H621) BEng Electronic and Communication Engineering with a year in industry (H622)

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Assess electronic and communications engineering designs by applying detailed knowledge of algorithms, devices and systems and by consulting relevant documentation and research.	**Evaluate system & component performance through a variety of analytical techniques including computational methods and modelling.**	**Create designs to address real-world problems involving communications hardware and software by synthesising ideas into engineering specifications.**	**Solve technical problems through employing skills in programming, CAD, construction and measurement and by using safe laboratory techniques.**	**Clearly communicate and explain communications and electronic engineering issues and practice in a technically accurate manner to a variety of audiences, verbally, in writing and using multimedia.**	**Coordinate and execute complex projects (with effective time management, team working, and ethical decision-making) in preparation for technical careers in applied electronic engineering and wired and wireless communications systems.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00026C	Progress towards PLO	You will learn about the operation of microprocessors and microcontrollers, and the techniques of assembly-language and low-level programming.			You will learn to write programs in machine code and assembly language, and to write programs for interfacing using higher-level languages.	You will learn to explain technical concepts concisely and accurately.	You will be able to manage your own progress in implementing software solutions.
	Digital Systems	By working on (and if applicable, assessed through)	The lectures will give you all the information that you need, and laboratory sessions will give you practice. A technical report (assessed) will test your knowledge.			A series of lab-based assignments will teach you to develop microcontroller-based solutions. (Assessed by report and submitting code)	You will write a report (assessed) that clearly describes the operation of low-level code and its interaction with target hardware.	A large-scale summative design exercise at the end of the module helps you to manage work leading to a technical report with accompanying code (both assessed).

Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of appropriate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.

	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		
	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)
Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.

	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstrati on)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).
Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.

	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	
	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 3	ELE00004H	Progress towards PLO	You will learn more about the important engineering approaches to solving problems, and will advance your knowledge considerably in the subject area of your project.	You will gain experience in analysing the scientific literature in a specialised area, and making an informed selection of tools and techniques to apply.	Specify, design, construct and verify a project in an advanced and/or specialised area of engineering	Independently evaluate and assess alternative approaches to specific engineering problems	You will present and defend your own work through a written initial report, final report and oral presentation.	You will be able to confidently define specifications and propose suitable timescales, work independently and also interact with colleagues, plan your own time, and consider and evaluate the risks in your project.

	BEng Individual Project	By working on (and if applicable, assessed through)	Your individual project, which will run over two terms, will involve significant independent reading and research, guided by regular supervision meetings. Assessed via written initial report, final report and oral presentation.	With the guidance of your supervisor, you will be expected to gather and critically analyse information from reliable sources, and use this information to guide your project work. Assessed via written initial report, final report and oral presentation.	Assessed during project displays, reports and viva	Experience of an independent project from specifications, analysis, simulation and design, to report writing	You'll be able to construct detailed and accurate technical reports for a specified audience (initial and final reports assessed) and defend your project work in a viva setting (assessed).	Throughout the project time you will be developing your skills in project management, including the management of time, risk and resources. These are assessed from evidence provided in your report and viva.
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		
	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				

	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		
	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		

Stage 3	ELE00046H	Progress towards PLO	You will learn about the propagation mechanisms of electromagnetic waves within materials, and how to classify materials according to the nature of a wave propagating through them. You will also learn about the principles of waveguiding, the importance of antennas in all types of radio communication systems, the problems of interference and fading, and channel models.	You will learn to determine the interactions of electromagnetic waves at boundaries between materials, and to describe and calculate the loss and dispersion limits of propagation distance in fibre optical links. You will also learn to to specify the performance of a radio system in terms of antenna characteristics, and to estimate the channel losses for guided, ground, sky and freespace waves, including the effects of diffraction and reflections, and know what applications use these propagation modes.	You will know how to use the Smith Chart for transmission line calculations; will be able to design single stub and quarterwave matching networks; and to appreciate the main considerations in design of freespace and guided optical links.	You will learn how to use an RF network analyser, and how to use Smith charts to analyse distributed circuits, as well as how to prototype and construct high-frequency circuits.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Applications of EM	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will provide you with the knowledge you need. Laboratory tasks and workshop exercises will help you reinforce your knowledge. (Assessed by closed-book exam.)	Lectures will provide you with the information that you need, and workshop exercises will help reinforce it. Laboratory tasks using a bespoke software simulator to model and characterise a transmission line will put your knowledge into a practical context. (Assessed by closed-book exam.)	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	Laboratory tasks with peers allow you to discuss the issues with each other and with lab leader/lab instructors/technicians.	

Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	
	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	

Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		
	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			

	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	
Stage 3	ELE00011H	Progress towards PLO	You will develop the ability to design complex digital circuits that take into account performance and testability, and to exploit IP components in the design of digital circuits. You will gain experience in interfacing custom circuits with external components.	You will become familiar with the tools required to analyse circuits from the point of view of performance and testability, and with the use of advanced testing and test-bench design techniques to verify digital circuits.		You will further your design skills using a hardware description language to build a omplex system including IP components.	You will develop your skills in the documentation of digital circuits, including timing- and test-related information.	You will hone your skills in team working and time management.

	Digital Engineering	By working on (and if applicable, assessed through)	Lectures will provide you with knowledge, and a set of lab exercises will give you practice. You will also read and understanding IP component documentation. You will complete a final project involving the design of high-performance, testable circuits that use IP components. Assessed through lab and final project reports.	A set of lab exercises, involving the use of simulation tools to implement and verify digital circuits that meet performance and/or testability constraints, will give you this familiarity. Assessed through lab and final project reports.		A set of lab exercises will lead you through the process of including IP components in a design of a high-performance, testable digital system, and implementing it in a Field Programmable Gate Array (FPGA). (Assessed by lab and final project reports.)	The laboratory and project reports (assessed) require professional presentation and annotation of VHDL code (including timing and testing considerations), testbenches, and simulations.	You will work on a sequence of laboratory-based group tasks and a final group project (assessed)that require independent work outside of supervised lab hours.
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.
	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.

Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportunity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00025H	Progress towards PLO	You will learn to combine the principles and laws of optics, semiconductor physics and technology, and quantum mechanics in the context of photonics and nanophotonics.	You will learn to apply the apparatus of ordinary and partial differential equations, eigenvalue problems, Fourier analysis etc. to analysis of light propagation in photonic and nanophotonic devices, their modal structure, and ultimately their performance.	You will learn how the use of photonic and nanophotonic technology, devices, and subsystems are used in long-distance communications, storage and retrieval (e.g. DVD/Blu-Ray) and data acquisition (photonic sensors), and the requirements of photonic components for each of these applications		You will be able to explain the principle and performance of photonics and nanophotonics on both qualitative level (verbal explanations) and quantiative level (phenomenological and if required microscopic analysis) and show the logical progression from fundamental principles to peformance issues.	
	Photonics & Nanophotonics	By working on (and if applicable, assessed through)	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Engagement in lectures, workshops and reading supporting material. (Assessed by a closed-book exam.)		You will be expected to synthesis the knowledge and experience from lectures, workshop questions, and supporting material explaining the principles of photonics. Assessed by examination.	

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Nanotechnology BEng	Programmes:	BEng Electronic Engineering with Nanotechnology (H6F3) BEng Electronic Engineering with Nanotechnology with a year in industry (H6F4)	

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Assess electronic engineering and nanotechnology designs by applying detailed knowledge of algorithms, devices (miniaturisation, behaviour and fabrication) and systems and by consulting relevant documentation and research.	**Evaluate system & component performance through a variety of analytical techniques including computational methods and modelling.**	**Create designs to address real-world problems involving nanotechnology and electronic systems by synthesising ideas into engineering specifications.**	**Solve technical problems through employing skills in fabrication, programming, CAD, construction and measurement and by using safe laboratory techniques.**	**Clearly communicate and explain nanotechnology and electronic engineering issues and practice in a technically accurate manner to a variety of audiences, verbally, in writing and using multimedia.**	**Coordinate and execute complex projects (with effective time management, team working, and ethical decision-making) in preparation for technical careers in nanofabrication and integration methodologies and electronic engineering.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of approprirate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.

	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00028C	Progress towards PLO	You will learn about physical phenomena emergent at the nanoscale, drawing upon concepts from chemistry, physics, biology and electronics. By the end of the module, you will understand the basic principles of solid-state theory and their application to electronic and nanoelectronic devices.	You will use simple mathematical models to describe physical phenomena emergent at the nanoscale, and use appropriate data analytical methods to critically analyse experimental data.	You will apply physical and theoretical models to the design of electronic materials and devices.	You will plan and execute experiments or investigations across the nanoscience discipline and critically evaluate the results.	You will develop your written communication skills by constructing basic technical reports and identifying reliable sources of information, recognising issues of plagiarism and collusion. You will learn to present complex nanoscience principles in clear and precise manner.	You will develop skills in analysis, problem solving and critical evaluation, and work effectively in a cross-disciplinary environment, drawing upon concepts from chemistry, physics, biology and electronics.
	Intro to Nanoscience & Nanotechnology	By working on (and if applicable, assessed through)	Lectures and reading material will develop your understanding of electronic devices from atomic models through to the solid-state. You will demonstrate your understanding through class examples and laboratory exercises, and in the final technical report (assessed).	Laboratory exercises will help you to develop a fluency in data analysis and to show an understanding of this in the final technical report (assessed).	Class examples and laboratory exercises will develop your design skills, summarised in the final technical report (assessed).	The laboratory exercises are designed to introduce a wide range of experimental methods across the nanosciences.	A concise technical report (assessed) will test your written communication skills.	By carefully planning the final technical report (assessed), you will develop your skills in literature analysis and time management. Laboratory sessions will give you experience in working across disciplines.

Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.
	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		

	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)

Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.
	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstration)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).

Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.
	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00033I	Progress towards PLO	You will learn about the approaches used for the fabrication and analysis of nanostructured materials, with an emphasis on micro/nano electronic materials and devices. You will also learn about the basic principles of fabrication at the nanoscale, including conventional and nonconventional lithography, and about measurement techniques for analyzing the structural, physical and chemical properties of nanomaterials and nanoelectronic devices.	You will learn to analyse the properties and performance of micro/nano devices, and to analyse experimental data critically.		You will gain experience in the fabrication and measurement of nanotechnology devices using safe laboratory practices.	You will be able to explain clearly various nanofabrication and nano-measurement techniques, from the basic physics principles to instrument operations, and will have developed skills in critical analysis, problem solving and report writing.	You will be able to plan and execute a specific experiment related to microelectronics and nanotechnology.

	Nanofabrication & Nanoanalysis	By working on (and if applicable, assessed through)	Lectures and additional reading material will develop an understanding of various nanofabrication and nano-measurement techniques. Class examples and laboratory exercises will help reinforce your learning, and you will show an understanding of this in the final technical report (assessed).	Lectures and additional reading material will develop an understanding of various nanofabrication and nano-measurement techniques, backed up by laboratory exercises. (Assessed in the final technical report.)		You will work through a series of laboratory exercises designed to introduce a wide range of nanofabrication and nanomeasurement techniques.. (Assessed in the final writen report.)	You are required to engage with a wide range of reading material that develops a further understanding of various nanofabrication and nano-measurement techniques, and you write a concise technical report (assessed) to consolidate your written communication.	You will synthesise your knowledge from lectures and experience from laboratories in an assessed design report.
Stage 3	ELE00004H	Progress towards PLO	You will learn more about the important engineering approaches to solving problems, and will advance your knowledge considerably in the subject area of your project.	You will gain experience in analysing the scientific literature in a specialised area, and making an informed selection of tools and techniques to apply.	Specify, design, construct and verify a project in an advanced and/or specialised area of engineering	Independently evaluate and assess alternative approaches to specific engineering problems	You will present and defend your own work through a written initial report, final report and oral presentation.	You will be able to confidently define specifications and propose suitable timescales, work independently and also interact with colleagues, plan your own time, and consider and evaluate the risks in your project.
	BEng Individual Project	By working on (and if applicable, assessed through)	Your individual project, which will run over two terms, will involve significant independent reading and research, guided by regular supervision meetings. Assessed via written initial report, final report and oral presentation.	With the guidance of your supervisor, you will be expected to gather and critically analyse information from reliable sources, and use this information to guide your project work. Assessed via written initial report, final report and oral presentation.	Assessed during project displays, reports and viva	Experience of an independent project from specifications, analysis, simulation and design, to report writing	You'll be able to construct detailed and accurate technical reports for a specified audience (initial and final reports assessed) and defend your project work in a viva setting (assessed).	Throughout the project time you will be developing your skills in project management, including the management of time, risk and resources. These are assessed from evidence provided in your report and viva.
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		

	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				
	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		

	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		
Stage 3	ELE00046H	Progress towards PLO	You will learn about the propagation mechanisms of electromagnetic waves within materials, and how to classify materials according to the nature of a wave propagating through them. You will also learn about the principles of waveguiding, the importance of antennas in all types of radio communication systems, the problems of interference and fading, and channel models.	You will learn to determine the interactions of electromagnetic waves at boundaries between materials, and to describe and calculate the loss and dispersion limits of propagation distance in fibre optical links. You will also learn to to specify the performance of a radio system in terms of antenna characteristics, and to estimate the channel losses for guided, ground, sky and freespace waves, including the effects of diffraction and reflections, and know what applications use these propagation modes.	You will know how to use the Smith Chart for transmission line calculations; will be able to design single stub and quarterwave matching networks; and to appreciate the main considerations in design of freespace and guided optical links.	You will learn how to use an RF network analyser, and how to use Smith charts to analyse distributed circuits, as well as how to prototype and construct high-frequency circuits.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	

	Applications of EM	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will provide you with the knowledge you need. Laboratory tasks and workshop exercises will help you reinforce your knowledge. (Assessed by closed-book exam.)	Lectures will provide you with the information that you need, and workshop exercises will help reinforce it. Laboratory tasks using a bespoke software simulator to model and characterise a transmission line will put your knowledge into a practical context. (Assessed by closed-book exam.)	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	Laboratory tasks with peers allow you to discuss the issues with each other and with lab leader/lab instructors/technicians.	
Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	

	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	
Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		

	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			
	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.

	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.
Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportinity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00025H	Progress towards PLO	You will learn to combine the principles and laws of optics, semiconductor physics and technology, and quantum mechanics in the context of photonics and nanophotonics.	You will learn to apply the apparatus of ordinary and partial differential equations, eigenvalue problems, Fourier analysis etc. to analysis of light propagation in photonic and nanophotonic devices, their modal structure, and ultimately their performance.	You will learn how the use of photonic and nanophotonic technology, devices, and subsystems are used in long-distance communications, storage and retrieval (e.g. DVD/Blu-Ray) and data acquisition (photonic sensors), and the requirements of photonic components for each of these applications		You will be able to explain the principle and performance of photonics and nanophotonics on both qualitative level (verbal explanations) and quantiative level (phenomenological and if required microscopic analysis) and show the logical progression from fundamental principles to peformance issues.	

	Photonics & Nanophotonics	By working on (and if applicable, assessed through)	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Engagement in lectures, workshops and reading supporting material. (Assessed by a closed-book exam.)		You will be expected to synthesis the knowledge and experience from lectures, workshop questions, and supporting material explaining the principles of photonics. Assessed by examination.	

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Music Technology BEng	Programmes:	BEng Music Technology Systems (H663) BEng Music Technology Systems with a year in industry (H664) BEng Electronic Engineering with Music Technology Systems (H667) BEng Electronic Engineering with Music Technology Systems with a year in industry (H661)

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Assess electronic engineering and audio technology designs by applying detailed knowledge of algorithms, devices and systems and by consulting relevant documentation and research.	**Evaluate system & component performance through a variety of analytical techniques including computational methods and modelling.**	**Create designs to address real-world problems involving audio hardware and software by synthesising ideas into engineering specifications.**	**Solve technical problems through employing skills in programming, CAD, construction and measurement and by using safe laboratory techniques.**	**Clearly communicate and explain audio and electronic engineering issues and practice in a technically accurate manner to a variety of audiences, verbally, in writing and using multimedia.**	**Coordinate and execute complex projects (with effective time management, team working, and ethical decision-making) in preparation for technical careers in audio and electronic engineering.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00024C	Progress towards PLO	You will learn about the historical context of synthesis techniques and their application in contemporary music, and understand the theory behind sampling and synthesis systems.	You will learn to manipulate and analyse digital audio signals against target specifications.	You will take an idea for a synthesiser, and translate this into an specification for implementation in the PureData audio programming environment.	You will take your specification, and implement this in PureData to produce a working synthesiser.	You will construct basic technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	You will develop skills in analysis, problem solving, critical evaluation, innovation and creativity.
	Audio Technology	By working on (and if applicable, assessed through)	Lectures, and reading & multimedia material, will show the development of audio technology from the early 1900s up to the present day. In-class examples will help you develop your understanding of synthesisers, and you will show an understanding of this in the final technical report (assessed).	Laboratory exercises will introduce and develop fluency in the Pure Data multimedia programming environment.	A series of structured laboratory exercises will lead you through the stages required to design a synthesiser. (Assessed by a report about the design project.)	The laboratory exercises will guide you in the implementation of your synthesiser design. (Assessed by a report about the design project.)	You will work on a concise technical report (assessed) to document a synthesis exercise.	Your work in the computer laboratory on structured examples (with formative feedback) lead to the management of a synthesis design & development project (assessed).
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.

	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of approprirate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).

Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.
	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 1	ELE00031C	Progress towards PLO	You will learn the recording studio environment, multitrack recording formats and the associated signals and systems involved.			You will learn how to operate a software based Digital Audio Workstation environment together with a range of mixing and processing options for recording, editing and production work; how to select and use microphones appropriate for recording live and studio based scenarios; and how to mix component audio tracks into a stereo master track.	You will be able to produce technical documentation to support your creative output.	You will be able to demonstrate your ability to work individually to complete a range of creative and technical studio based tasks, and to self-reflect on that work.
	Recording Studio Techniques	By working on (and if applicable, assessed through)	Lectures and reading materials will help you learn the information you need, which you will then put to use in studio practical sessions. You will submit a technical studio report (assessed) in which you will demonstrate your knowledge.			A series of studio-based practical sessions will demonstrate the techniques used by recording engineering, techniques which are then practiced and refined in individual studio-time. (Assessed by a creative recording portfolio).	By writing a technical studio report (assessed) you will develop the skills to document the studio work process.	The above skills are developed through a creative recording portfolio (assessed), requiring the planning of time and resources effectively throghout the process. The process is documented in a reflective report (assessed) to accompany the recording portfolio.
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		
	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)
Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.

	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00042I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies. Gain and apply knowledge of music technology systems and synthesis techniques.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies. Analyse a system requirement for a sound generation process.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test for Audio	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration)	Group designed products with tangible and audio outputs.	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstrati on)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	

	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 2	ELE00027I	Progress towards PLO	You will learn about the principles of acoustic energy transmission; about pitch, loudness and timbre perception; about auditory streaming with special reference to hearing music; and about interaural time delay (ITD) and interaural intensity delays (IID).	You will learn to appreciate and analyse the acoustic properties of different classes of acoustic instruments and the human voice.	You will learn how to characterise the acoustic properties of real spaces.	Yoi will learn to select and apply a range of mathematical techniques to solve problems in sound transmission.	You will be able to explain commonly -encountered technical concepts concisely and accurately, and to summarise and show understanding in technical reports based on information selected from a variety of reliable sources, to a specified audience.	
	Acoustics & Psychoacoustics	By working on (and if applicable, assessed through)	Lectures, labs and reading about acoustics and psychoacoustics in the context of audio and music production and listening, informed by recent developments in the field, will help you to develop this knowledge. (Assessed by multiple choice exam.)	You will develop critical analysis skills in the context of practical work in sound presentation.	You will work through an exercise characterising and modifying a room's acoustic characteristics. (Assessed by a report.)	You will use mathematical techniques to analyse measurements to derive and interpret frequency and impulse response of physical spaces. (Assessed by multiple-choice exam and a report.)	Your technical communication is developed by keeping a laboratory logbook and by writing a technical report for the room acoustics design exercise (assessed).	
Stage 3	ELE00004H	Progress towards PLO	You will learn more about the important engineering approaches to solving problems, and will advance your knowledge considerably in the subject area of your project.	You will gain experience in analysing the scientific literature in a specialised area, and making an informed selection of tools and techniques to apply.	Specify, design, construct and verify a project in an advanced and/or specialised area of engineering	Independently evaluate and assess alternative approaches to specific engineering problems	You will present and defend your own work through a written initial report, final report and oral presentation.	You will be able to confidently define specifications and propose suitable timescales, work independently and also interact with colleagues, plan your own time, and consider and evaluate the risks in your project.

	BEng Individual Project	By working on (and if applicable, assessed through)	Your individual project, which will run over two terms, will involve significant independent reading and research, guided by regular supervision meetings. Assessed via written initial report, final report and oral presentation.	With the guidance of your supervisor, you will be expected to gather and critically analyse information from reliable sources, and use this information to guide your project work. Assessed via written initial report, final report and oral presentation.	Assessed during project displays, reports and viva	Experience of an independent project from specifications, analysis, simulation and design, to report writing	You'll be able to construct detailed and accurate technical reports for a specified audience (initial and final reports assessed) and defend your project work in a viva setting (assessed).	Throughout the project time you will be developing your skills in project management, including the management of time, risk and resources. These are assessed from evidence provided in your report and viva.
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		
	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				

	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		
	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		
Stage 3	ELE00051H	Progress towards PLO	You will gain knowledge of, and experience in using, a commonly--used programming language. You will also learn about the principles of good user-interface design for audio applications.	You will learn to critically assess your own work against external standards.	You will learn to develop a specification for a creative piece of user-friendly software to address a real-world problem, industry standards.	You will gain experience of applying and developing your programming skills within the development environment for iOS.	You will develop your ability to document software to professional standards.	You will hone your skills in personal time and workflow management while learning new languages and libraries, coordinating information from lectures, labs and external sources, and delivering a finished app to a deadline.

	iOS Audio Programming	By working on (and if applicable, assessed through)	Your learning will come from lectures and computer labs using Apple's Swift language and external library AudioKit to make musical/audio-processing software for iOS devices (assessed by software submission).	The laboratory exercises will help you with this, and you will review your own work against company criteria provided by Apple.	Lectures and provided reading will develop an appreciation of user - interface design considerations. (Assessed by a submitting a software app.)	Working though a graded series of computer laboratories will introduce key programming features and audio programming skills. (Assessed by submitting a software app.)	You will produce a piece of software (iOS app, assessed) while following Apple's guidelines and app-store submission requirements. You will also create engaging documentation for software, both within the software itself and via an external web-page (both assessed).	You will manage the process of producing a creative piece of user--friendly software to industry standards (assessed).
Stage 3	ELE00054H	Progress towards PLO	You will learn to understand and appreciate the relationship between picture and sound.		You will learn about the process of developing a soundtrack for professionally produced media.	You will develop a working knowledge of the tools required for audio postproduction, including a Digital Audio Workstation based recording environment, and the associated handling and management of audio and video based assets.	You will be able to support creative output with comprehensive and reasoned technical documentation.	You will develop your ability to work both individually and in teams to complete creative and technical audio/video postproduction based tasks.
	Multimedia Sound Design	By working on (and if applicable, assessed through)	Lectures, and associated reading and multimedia material, will introduce you to the art and science of creating music and sound effects for visual media such as television, film and computer games (assessed by creative technical group project and individual report).		You will develop a script for the soundtrack for a piece of provided video (assessed by report).	Formative laboratory sessions will explain and provided experience in using the Digital Audio Workstation tools, then a group-based multimedia exercise will allow you to practice and develop these skills. (Assessed by a submitted soundtrack.)	An individual report (assessed) allows you to detail and reflect upon the technical and creative work done by the group and your own contribution to it.	A complex multimedia project (assessed), allows you to gain experience working in teams, similar to industry--based production companies.
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	

	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	
Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		

	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			
	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	

Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.
	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.
Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	

	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportinity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Business Management BEng	Programmes:	BEng Electronic Engineering with Business Management (H6N2) BEng Electronic Engineering with Business Management with a year in industry (H6N3)	

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Assess and evaluate management, leadership and electronic engineering designs by applying detailed knowledge of algorithms, devices and systems and by consulting relevant documentation and research.	**Evaluate organisational, system & component performance through a variety of analytical techniques including computational methods and modelling.**	**Create designs to address real-world problems by synthesising ideas into engineering specifications.**	**Solve technical problems through employing skills in programming, CAD, construction and measurement and by using safe laboratory techniques.**	**Clearly communicate and explain business management and electronic engineering issues and practice in a technically accurate manner to a variety of audiences, verbally, in writing and using multimedia.**	**Coordinate and execute complex projects (with effective time management, team working, and ethical decision-making) in preparation for technical careers in engineering management.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00026C	Progress towards PLO	You will learn about the operation of microprocessors and microcontrollers, and the techniques of assembly-language and low-level programming.			You will learn to write programs in machine code and assembly language, and to write programs for interfacing using higher-level languages.	You will learn to explain technical concepts concisely and accurately.	You will be able to manage your own progress in implementing software solutions.
	Digital Systems	By working on (and if applicable, assessed through)	The lectures will give you all the information that you need, and laboratory sessions will give you practice. A technical report (assessed) will test your knowledge.			A series of lab-based assignments will teach you to develop microcontroller-based solutions. (Assessed by report and submitting code)	You will write a report (assessed) that clearly describes the operation of low-level code and its interaction with target hardware.	A large-scale summative design exercise at the end of the module helps you to manage work leading to a technical report with accompanying code (both assessed).

Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of appropriate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.

	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		
	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)
Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.

	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstrati on)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).
Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.

	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	
	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 3	ELE00004H	Progress towards PLO	You will learn more about the important engineering approaches to solving problems, and will advance your knowledge considerably in the subject area of your project.	You will gain experience in analysing the scientific literature in a specialised area, and making an informed selection of tools and techniques to apply.	Specify, design, construct and verify a project in an advanced and/or specialised area of engineering	Independently evaluate and assess alternative approaches to specific engineering problems	You will present and defend your own work through a written initial report, final report and oral presentation.	You will be able to confidently define specifications and propose suitable timescales, work independently and also interact with colleagues, plan your own time, and consider and evaluate the risks in your project.

	BEng Individual Project	By working on (and if applicable, assessed through)	Your individual project, which will run over two terms, will involve significant independent reading and research, guided by regular supervision meetings. Assessed via written initial report, final report and oral presentation.	With the guidance of your supervisor, you will be expected to gather and critically analyse information from reliable sources, and use this information to guide your project work. Assessed via written initial report, final report and oral presentation.	Assessed during project displays, reports and viva	Experience of an independent project from specifications, analysis, simulation and design, to report writing	You'll be able to construct detailed and accurate technical reports for a specified audience (initial and final reports assessed) and defend your project work in a viva setting (assessed).	Throughout the project time you will be developing your skills in project management, including the management of time, risk and resources. These are assessed from evidence provided in your report and viva.
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		
	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				

	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		
	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		
Stage 3	ELE00008H	Progress towards PLO	You will learn about the place of technology management and marketing in the modern world, and about the change implications of technological innovation on an organisation.	You will learn to analyse and critique technological innovations.	You will learn to produce a marketing plan for a new technology based product or service.		You will develop you report writing skills for a professional business audience.	You will develop your understanding of the role of marketing and technology management in the modern world.
	Management & Marketing of Technology	By working on (and if applicable, assessed through)	Lectures and wider reading will provide you with the knowledge you need (assessed by report).	By attending lectures and engaging in in-class group activities, you will analyse and critique a past technological innovation (assessed by report).	By engaging with lecture materail and undertaking private study you will develop a marketing plan (assessed by report).		The development of a full marketing plan (assessed) will help you to communicate concisely and effectively with business audiences.	A variety of group and individual activities help you to explore the marketing of technology.

Stage 3	ELE00009H	Progress towards PLO	You will learn about the implications of legal instruments on the engineering business, and the implications of non-compliance.				You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience	You will explore the laws applicable to engineering business in international trading, and will be able to evaluate the difference in legal implications in business formation in the UK compared to another country.
	Law for Engineering Management	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the UK legal system and to the laws relating to the Professional Engineer, contracts, Intellectual Property, International trading and dealing with disputes (assessed by report).				You will research and construct a comparative study (assessed) of legal implications between the UK and a chosen country.	You will research and construct a comparative study (assessed) of legal implications between the UK and a chosen country.
Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	

Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	
	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		
	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			

	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	
Stage 3	ELE00011H	Progress towards PLO	You will develop the ability to design complex digital circuits that take into account performance and testability, and to exploit IP components in the design of digital circuits. You will gain experience in interfacing custom circuits with external components.	You will become familiar with the tools required to analyse circuits from the point of view of performance and testability, and with the use of advanced testing and test-bench design techniques to verify digital circuits.		You will further your design skills using a hardware description language to build a omplex system including IP components.	You will develop your skills in the documentation of digital circuits, including timing- and test-related information.	You will hone your skills in team working and time management.

	Digital Engineering	By working on (and if applicable, assessed through)	Lectures will provide you with knowledge, and a set of lab exercises will give you practice. You will also read and understanding IP component documentation. You will complete a final project involving the design of high-performance, testable circuits that use IP components. Assessed through lab and final project reports.	A set of lab exercises, involving the use of simulation tools to implement and verify digital circuits that meet performance and/or testability constraints, will give you this familiarity. Assessed through lab and final project reports.		A set of lab exercises will lead you through the process of including IP components in a design of a high-performance, testable digital system, and implementing it in a Field Programmable Gate Array (FPGA). (Assessed by lab and final project reports.)	The laboratory and project reports (assessed) require professional presentation and annotation of VHDL code (including timing and testing considerations), testbenches, and simulations.	You will work on a sequence of laboratory-based group tasks and a final group project (assessed)that require independent work outside of supervised lab hours.
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.
	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.

Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportunity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00025H	Progress towards PLO	You will learn to combine the principles and laws of optics, semiconductor physics and technology, and quantum mechanics in the context of photonics and nanophotonics.	You will learn to apply the apparatus of ordinary and partial differential equations, eigenvalue problems, Fourier analysis etc. to analysis of light propagation in photonic and nanophotonic devices, their modal structure, and ultimately their performance.	You will learn how the use of photonic and nanophotonic technology, devices, and subsystems are used in long-distance communications, storage and retrieval (e.g. DVD/Blu-Ray) and data acquisition (photonic sensors), and the requirements of photonic components for each of these applications		You will be able to explain the principle and performance of photonics and nanophotonics on both qualitative level (verbal explanations) and quantiative level (phenomenological and if required microscopic analysis) and show the logical progression from fundamental principles to peformance issues.	
	Photonics & Nanophotonics	By working on (and if applicable, assessed through)	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Engagement in lectures, workshops and reading supporting material. (Assessed by a closed-book exam.)		You will be expected to synthesis the knowledge and experience from lectures, workshop questions, and supporting material explaining the principles of photonics. Assessed by examination.	

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Electronics MEng		Programmes:	MEng Electronic Engineering (H609) MEng Electronic Engineering with a year in industry (H608)					

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Conduct research in applied electronic engineering and computing to advance the state of knowledge in algorithms, devices and systems.	**Extract and critically evaluate data from complex systems through a variety of analytical techniques including computational methods and modelling.**	**Create innovative and optimised designs to address real-world problems by synthesising ideas into engineering specifications.**	**Apply professional skills of programming, CAD, construction and measurement, combined with an understanding of engineering systems and components, to solve technically challenging problems.**	**Debate, defend and contextualise information in a succinct and technically accurate manner for audiences of engineers and members of the public, and to write and interpret technical documentation.**	**Proficiently manage themselves, teams and complex projects in preparation for technical careers as leaders in electronics, computing and related disciplines.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00026C	Progress towards PLO	You will learn about the operation of microprocessors and microcontrollers, and the techniques of assembly-language and low-level programming.			You will learn to write programs in machine code and assembly language, and to write programs for interfacing using higher-level languages.	You will learn to explain technical concepts concisely and accurately.	You will be able to manage your own progress in implementing software solutions.
	Digital Systems	By working on (and if applicable, assessed through)	The lectures will give you all the information that you need, and laboratory sessions will give you practice. A technical report (assessed) will test your knowledge.			A series of lab-based assignments will teach you to develop microcontroller-based solutions. (Assessed by report and submitting code)	You will write a report (assessed) that clearly describes the operation of low-level code and its interaction with target hardware.	A large-scale summative design exercise at the end of the module helps you to manage work leading to a technical report with accompanying code (both assessed).

Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of appropriate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.

	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		
	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)
Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.

	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstrati on)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).
Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.

	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	
	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		

	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				
	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		

	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		
Stage 3	ELE00046H	Progress towards PLO	You will learn about the propagation mechanisms of electromagnetic waves within materials, and how to classify materials according to the nature of a wave propagating through them. You will also learn about the principles of waveguiding, the importance of antennas in all types of radio communication systems, the problems of interference and fading, and channel models.	You will learn to determine the interactions of electromagnetic waves at boundaries between materials, and to describe and calculate the loss and dispersion limits of propagation distance in fibre optical links. You will also learn to to specify the performance of a radio system in terms of antenna characteristics, and to estimate the channel losses for guided, ground, sky and freespace waves, including the effects of diffraction and reflections, and know what applications use these propagation modes.	You will know how to use the Smith Chart for transmission line calculations; will be able to design single stub and quarterwave matching networks; and to appreciate the main considerations in design of freespace and guided optical links.	You will learn how to use an RF network analyser, and how to use Smith charts to analyse distributed circuits, as well as how to prototype and construct high-frequency circuits.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	

	Applications of EM	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will provide you with the knowledge you need. Laboratory tasks and workshop exercises will help you reinforce your knowledge. (Assessed by closed-book exam.)	Lectures will provide you with the information that you need, and workshop exercises will help reinforce it. Laboratory tasks using a bespoke software simulator to model and characterise a transmission line will put your knowledge into a practical context. (Assessed by closed-book exam.)	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	Laboratory tasks with peers allow you to discuss the issues with each other and with lab leader/lab instructors/technicians.	
Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	

	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	
Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		

	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			
	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	

Stage 3	ELE00011H	Progress towards PLO	You will develop the ability to design complex digital circuits that take into account performance and testability, and to exploit IP components in the design of digital circuits. You will gain experience in interfacing custom circuits with external components.	You will become familiar with the tools required to analyse circuits from the point of view of performance and testability, and with the use of advanced testing and test-bench design techniques to verify digital circuits.		You will further your design skills using a hardware description language to build a omplex system including IP components.	You will develop your skills in the documentation of digital circuits, including timing- and test-related information.	You will hone your skills in team working and time management.
	Digital Engineering	By working on (and if applicable, assessed through)	Lectures will provide you with knowledge, and a set of lab exercises will give you practice. You will also read and understanding IP component documentation. You will complete a final project involving the design of high-performance, testable circuits that use IP components. Assessed through lab and final project reports.	A set of lab exercises, involving the use of simulation tools to implement and verify digital circuits that meet performance and/or testability constraints, will give you this familiarity. Assessed through lab and final project reports.		A set of lab exercises will lead you through the process of including IP components in a design of a high-performance, testable digital system, and implementing it in a Field Programmable Gate Array (FPGA). (Assessed by lab and final project reports.)	The laboratory and project reports (assessed) require professional presentation and annotation of VHDL code (including timing and testing considerations), testbenches, and simulations.	You will work on a sequence of laboratory-based group tasks and a final group project (assessed)that require independent work outside of supervised lab hours.
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.

	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.
Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportinity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00025H	Progress towards PLO	You will learn to combine the principles and laws of optics, semiconductor physics and technology, and quantum mechanics in the context of photonics and nanophotonics.	You will learn to apply the apparatus of ordinary and partial differential equations, eigenvalue problems, Fourier analysis etc. to analysis of light propagation in photonic and nanophotonic devices, their modal structure, and ultimately their performance.	You will learn how the use of photonic and nanophotonic technology, devices, and subsystems are used in long-distance communications, storage and retrieval (e.g. DVD/Blu-Ray) and data acquisition (photonic sensors), and the requirements of photonic components for each of these applications		You will be able to explain the principle and performance of photonics and nanophotonics on both qualitative level (verbal explanations) and quantiative level (phenomenological and if required microscopic analysis) and show the logical progression from fundamental principles to peformance issues.	

	Photonics & Nanophotonics	By working on (and if applicable, assessed through)	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Engagement in lectures, workshops and reading supporting material. (Assessed by a closed-book exam.)		You will be expected to synthesis the knowledge and experience from lectures, workshop questions, and supporting material explaining the principles of photonics. Assessed by examination.	
Stage 3	ELE00056H	Progress towards PLO	You will understand specification, design, prototyping, implementation and testing methods in the context of formal software engineering methods.		You will learn to effectively use tools to conceptualise, specify and support the creation of products within a software engineering process	You will learn to apply your programming skills in a multi-programmer small business environment, including the use of source control.	You will develop the ability to communicate effectively within a team and to explain complex technical issues to external customers.	You will be able to understand the role of project management in a practical, team based and time pressured context. This includes the basic operational aspects of a small business.
	Software Engineering Project	By working on (and if applicable, assessed through)	A major team-based scenario involves you in the creation of a new, software based, product.		Working in a group, you will create a product idea to address a real-world issue. (Assessed by report.)	In your group, you will work through the development of a software product. (Assessed by report.)	A number of meetings are held with team members, customers and suppliers to ensure that all aspects are covered and that all stakeholders are kept fully informed at all times. Final technical reports are assessed.	A clear definition of tasks, timescales and responsibilities within the team ensures that clear lines of communication are established.
Stage 4	ELE00101M	Progress towards PLO	You will know how to research, design, construct and verify a substantial project in a complex and/or highly specialised area of engineering.	You will be able to critically evaluate appropriate scientific literature and synthesise new information.	In the final-year project, you will engage with an advanced current research or development issue, and learn to create a testable, practical specification for your solution.	You will learn to evaluate and assess alternative approaches to implementing your chosen solution from an agreed specification.	You will master the art of writing concise technical reports and defending presentations on advanced topics.	You will finely hone your skills in project management, including the management of time, risk and resources.
	MEng Individual Project	By working on (and if applicable, assessed through)	An individual project over 2 full terms gives you an intensive period of time to run a project, with a variety of assessments throughout.	Your developing skills in gathering and critically analysing information from reliable sources is assessed in an initial Literature Report.	Supported by feedback during supervisions, you will develop your ideas into a workable specification. (Assessed by project report.)	Guided by regular supervision meetings, you will work independently towards developing a working solution. (Assess by project report.)	Your technical communication will be assessed by constructing technical reports for a specified audience and defending your project in a viva setting.	You will work individually on a major project which develops your capacity to think independently and creatively about a specific area of electronic engineering and develop your problem solving in this area (assessed by report and viva).

Stage 4	ELE00097M	Progress towards PLO	You will be introduced to advanced cost--function based control design techniques, including optimal control (LQR) and model- predictive control (MPC).	You will deepen your insights into the theory and practice of optimal control via real-world examples.		You will learn to use CAD tools for the development of LQR and MPC controllers.		
	Advanced Control	By working on (and if applicable, assessed through)	Lectures, workshops and illustrative examples cover LQR, and provide a mathematical framework for the receding -horizon terminal constraints of MPC (assessed by exam).	You will use software tools on examples and case studies, in practical computer workshops and self -study, based upon the MATLAB environment.		Laboratory sessions will give you practical experience of control system design using CAD tools.		
Stage 4	ELE00007M	Progress towards PLO	You will understand how electrical signals are generated within the human body, and describe and apply techniques to model these signals.	You will become familiar with a range of computational and analytical methods appropriate to medical research and clinical practice	You will learn how medical diagnosis, therapy, risk assessment and dosimetry lead to engineering specifications on the use of EM fields and waves.	You will learn how to use image processing techniques to interpret the results of medical imaging scans.	You will develop your skills in critically evaluating and synthesising new information based on researched information and writing concise technical reports appropriate for the target audience. You will also able to design, deliver and defend persuasive technical presentations based on selected reliable evidence to the target audiences.	You will develop the skills necessary to undertake a small group research project in a topic related to electronics for medicine.
	Electronics for Medicine	By working on (and if applicable, assessed through)	Lectures introduce you to a range of methods appropriate to medical research and clinical practice (assessed by report and presentation).	Image processing laboratories provide a link between knowledge and practical experience.	Engaging with lecture material and directed reading will lead to an understanding of the role of EM waves in medicine. (Assessed through an individual report and presentation slides.)	A series of practical exercises in labs will illustrate how image processing can help with diagnosis.	An individual report (max 3000 words, assessed) and a presentation (slides assessed) allow you to develop the above technical communication skills.	The results of the group work are summarised and reflected upon in an individual report (assessed) and presented orally in a group (assessed).

Stage 4	ELE00099M	Progress towards PLO	You will understand the complete design process of RF and Microwave circuits including analytical design skills, computer aided testing and optimisation and construction.	You will be able to select, adapt and apply a range of mathematical techniques to solve advanced problems and explain the implications of the answer; to specify high frequency systems (amplifiers, oscillators, mixers, resonators and filters and printed circuit boards) including RF and Microwave systems.	You will learn how to specify RF circuits for use in modern communication systems including mobile phones, TVs, tablets and PCs, including Bluetooth and Wi-Fi.	You will gain experience in using common RF and Microwave measurement instruments including spectrum and network analysers to test circuits you have designed and built, and learn how to use modern CAD tools for RF design.		
	High Frequency Electronics	By working on (and if applicable, assessed through)	Knowledge is gained by guided reading through lecture material and recommended texts, supplemented by formative workshop exercises, and is assessed by an exam.	Workshop exercises help you apply your new knowledge to solving problems (assessed summatively by module exam).	Engaging in lectures and studying directed reading will explain the most important parameters relating real-life systems to specifications.	In laboratory exercises you will use simulation tools such as Advance Design Systems to verify a design and test components.		
Stage 4	ELE00103M	Progress towards PLO	You will learn the basic concepts involved in measuring and controlling position and motion for both mobile and fixed - arm robotic systems, examining the use of different forms of sensors and their use for the purposes of orientation control and navigation.	You will develop fluency in the analysis of robotic systems, and the use of mathematical descriptions of position, orientation, and forces involved in robot control.	You will explore the challenges and solutions involved in using robots in both the manufacturing and service industries, and for field applications.	You will develop insights into the practicalities of robotic control using specialist simulation tools.		
	Robotics	By working on (and if applicable, assessed through)	Information is delivered via lectures, workshops, worked examples and self study (assessed by closed-book examination).	MATLAB computer laboratory sessions and self study give you practical experience (assessed by closed-book examination).	By engaging with lecture content, worked examples and directed reading.	A series of laboratory sessions will provide experience in developing and testing robotic control systems.		

Stage 4	ELE00059M	Progress towards PLO	You will be able to understand the requirements for monitoring the environment; the nature and effects of the various forms of air and water pollution; the operation of sensors and instrumentation, particularly for environmental and industrial monitoring; and the limitations of sensors.		You will learn to specify appropriate sensors for a range of engineering and environmental problems, and appreciate the effects these have on system performance.		You will hone your ability to construct concise technical reports that critically evaluate and synthesise new information based on research, appropriate for the target audience.	
	Sensors & Instrumentation	By working on (and if applicable, assessed through)	Knowledge is gained by guided reading through lecture material and recommended scientific journal and conference papers (assessed by a techincal reseaarch report on a relevant topic).		Engaging with lecture material and through directed reading you will learn about real-world applications of sensors. (Assessed by closed-book exam.)		An individual technical reseach report (assessed) selected from the topics covered in the module allows you to communicate information about sensors and instrumentation.	
Stage 4	ELE00005M	Progress towards PLO	You will develop an understanding of information theory and its application to coding schemes used in wireless communication systems.	You will develop skills in the application of mathematical techniques and understand the implications of the answer.	You will learn to specify appropriate error control schemes for wireless systems, and evaluate their effects on system performance.	You will use simulation tools to evaluate and compare the performance of different types of error control codes.	You will develop your ability to explain and evaluate advanced techincal concepts concisely and accurately.	
	Information Theory & Error Control Coding	By working on (and if applicable, assessed through)	Knowledge comes through engaging with lectures and background studies on information and coding theory, focusing on error control coding as applied to wireless communication systems (assessed through formative tutorial questions and summative examination).	In labs and example exercises you will learn how to quantify information and compute entropy, mutual information and channel capacity, and how to encode & decode linear block codes and convolutional codes, and calculate decoded bit error rates (assessed through formative tutorial questions and summative examination).	By engaging with lecture material, working through example problems and directed reading you will learn the most common techniques of error control coding. (Assessed through a closed-book exam.)	A series of practical exercises will lead you through how to implement and evaluate error-control schemes.	A lab book kept during practical work allows you to demonstrate concepts of encoding and decoding procedures .	

Stage 4	ELE00105M	Progress towards PLO	You will gain knowledge of channel characteristics and physical layer techniques used for wired, optical and wireless digital communication systems.	You will be able to apply a range of mathematical tools and models to common transmission problems.	You will learn to specify realistic and achievable performance levels for real-world communication links.	You will learn to evaluate performance of transmission schemes using computer simulation,	You will be able to explain and evaluate advanced techincal concepts concisely and accurately.	
	Wired, Wireless & Optical Transmission	By working on (and if applicable, assessed through)	Lectures and wider reading to introduce the students to communication channel characteristics and technologies designed to exploit them and/or overcome constraints, as used in current systems and standards such as DSL, Ethernet, WiFi, 4G and DVB (assessed through formative tutorial questions and summative examination).	A series of lab exercises and example sheets helps develop your ability to calculate power budgets in wired, wireless and optical links, and to determine suitable channel models to analyse performance of wired, wireless and optical systems (assessed through formative tutorial questions and summative examination).	By engaging with examples presented in lectures and working though example sheets, you will learn how to specify real-world transmission systems. (Assessed by closed-book exam.)	By working through a series of laboratory simulation exercises using MATLAB you will evaluate and compare the performance of common modulation schemes.	You will be able to describe, explain and justify techniques used in current communication systems, in response to tutorial questions and in (assessed) examination papers.	
Stage 4	ELE00017M	Progress towards PLO	You will be able to understand the principles and techniques of bioinspired computing to the extent of being able to solve meaningful computational tasks and research and create evolutionary computing solutions to real world problems.	You will be able to compare and critically evaluate the differences between the approaches of conventional design and evolutionary design; and be aware of, and make informed decisions about, state-of-the-art biologically-inspired computation methods.	You will learn how bio-inspired algorithms can be applied to solve real-world computing problems, and to select appropriate algorithms.	You will learn to select, design and apply evolutionary algorithms to find solutions to search problems.	You will develop advanced skills in designing, delivering and defending engaging presentations on advanced topics, and in critically evaluating and synthesising new information based on research. You will also learn to produce comprehensive software/hardware documentation.	

	Bio-Inspired Computation	By working on (and if applicable, assessed through)	You will work through a set of class problems and lab exercises (assessed through an individual research paper & presentation on a small project.	You will work through a set of class problems and lab exercises (assessed through an individual research paper & presentation on a small project.	Engaging with lectures and lab scripts will develop insight into the range and applicability of bio-inspired algorithms.	A set of lab exercises involving the creation of bio-inspired algorithms, lead to an individual project requiring research to develop an evolutionary computing solution to a real-world problem. (Assessed by an individual research paper and presentation.)	You will conduct research from a list of projects, and create an evolutionary computing solution to a real-world problem, writing up and presenting the results (both assessed) in a succinct and informative manner.	
Stage 4	ELE00062M	Progress towards PLO	You will learn how systems programming is different from applications programming. You will develop your skills in C progamming to an advanced level, and become familiar with low-level programming concepts such as processor modes, direct interaction with the stack, and writing interrupt and exception handlers.	You will start to learn the delicate art of systems-level debugging, analysing stack traces and memory dumps to find bugs.		You will develop skills in designing task scheduling and synchronisation algorithms suitable for embedded systems. You will learn to exploit the mechanisms available for the implementation atomic operations on an ARM Cortex M device, and to write substantial parts of a small operating system kernel for an ARM Cortex M device, in C and assembly language.	You will develop your report-writing skills, and also learn to produce code that is self-documenting and well commented.	
	Systems Programming for ARM	By working on (and if applicable, assessed through)	The lectures will introduce several new keywords and C language features, and you will get practice using these in the laboratory sessions. You will undertake a programming task, and submit your code and a technical report (assessed) to demonstrate your knowledge.	The laboratory sessions will give you plenty of opportunities for low-level debugging. Your submitted report and code (assessed) will show that you have engaged with this process.		In the laboratory sessions you will design a low-level systems in the context of an ARM-based embedded platform. (Assessed though a technical report and code submission.	During the laboratory sessions you will be encouraged to write readable, documented code. Your technical report and code submission (assessed) will provide evidence of your skills in this area.	
Stage 4	ELE00039M	Progress towards PLO	You will understand the various concepts of idea generation techniques and applications that can be used within an organization.	You will develop your capacity for analysis and synthesis of ideas.	You will develop your creativity and understanding of innovation.	You will develop your ability to generate ideas in a new area .	You will be able to generate, develop and communicate ideas to relevant stakeholders.	

	Ideation	By working on (and if applicable, assessed through)	BY: participating in lectures on creativity, intrapreneurship, idea refinement and commercial exploitation (assessed by individual report).	BY: working on an assignment on idea generation and selection (assessed by presentation and report).	BY: designing a selection approach for a new application area to allow the better ideas generated to be identified	BY: participating in lectures on creativity, intrapreneurship, idea refinement and commercial exploitation (assessed by individual report).	BY: communicating an idea through an 'elevator pitch', then more deeply through a written proposal (all assessed).	
Stage 4	ELE00022M	Progress towards PLO	You will be able to understand and explain the meaning of common strategic management terminology and strategic management issues.	You will be able to strategically analyse an organisation or business unit's position, compare strategic opportunities, and recommend a way forward.	You will learn to plan an organisation's structure and systems to achieve an agreed strategy.		You will enhance your ability to discuss and debate technical and commercial issues.	Your team working abilities and experience will be enhanced in a business context.
	Strategic Management	By working on (and if applicable, assessed through)	Lectures and wider reading material introduce students to the terminology and issues of strategic management (assessed by group and personal reflective reports).	You will analyse the strategic position and direction of a case study organisation in class exercises.	Working in class in a Company Board Room simulated setting will develop skills in analysing the strategic position and direction of a case study organisation.		You will work in a simulated Company Board Room setting to experience board level activities. You will construct concise technical reports (assessed) that critically evaluate and synthesise new information based on research, and design, deliver and defend a persuasive technical presentation (assessed) based on selected reliable evidence.	By working in a Company Board Room simulated setting you will learn how to analyse the strategic position and direction of a case study organisation (assessed by group report and personal reflective report).
Stage 4	ELE00104M	Progress towards PLO	You will be able to understand leadership from a theoretical perspective, the different types of leadership, leadership styles and leadership tools and techniques.	You will be able to analyse a business situation and to propose and justify appropriate leadership styles.			You will gain confidence in discussion, debating, and public speaking.	You will develop your team working abilities and enhance your personal development planning.

	Skills for Business Leadership	By working on (and if applicable, assessed through)	Information is delivered via lectures and wider reading on the theory and fundamentals of leadership.	Business analysis experience is obtained by working in groups on case studies.			Throughout the module there are opportunities to take part in class discussions and debates on appropriate leadership skills, and give a presentation of group findings to the class.	You will prepare a personal leadership development plan (assessed) which is informed by in-class debate and discussion.
Stage 4	ELE00102M	Progress towards PLO	You will understand the mathematical underpinning and uses of physical and spectral modelling synthesis techniques.	You will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.		Working with specialist software, you will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.	You will learn to communicate and present theoretical and practical examples of physical modelling methods to a non--expert audience through an online publication.	
	Physical Modelling Synthesis	By working on (and if applicable, assessed through)	Lectures and laboratories allow you to develop skills in critically evaluating and synthesising new information based on recent research in this area (assessed through technical web-page).	Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)		Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)	An online report (assessed) allows you to take technical information developed in the laboratories and summarise and explain it for a non-expert audience on a multimedia web-page.	
Stage 4	ELE00100M	Progress towards PLO	You will be able to describe the advancement of information storage techniques, and to understand the basic principles of semiconductor storage and memories. You'll also be able to explain the principle of magnetic recording, to identify the limitations and gaps in the current memory and storage techniques, and to describe the next-generation of memories and storage.	You will be able to measure the length scale of current storage technologies.			You will develop your ability to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	

	Information Storage & Spintronics	By working on (and if applicable, assessed through)	Information is delivered by lectures and directed reading material explaining information storage techniques, supplemented by class examples and laboratory work on the fundamental concepts of information storage techniques (assessed).	Lectures and reading material explaining quantum mechanics lead to class examples and laboratories (assessed).			You will write an individual report (assessed) to describe the fundamental principles and operation of information storage techniques .	
Stage 4	ELE00127M	Progress towards PLO	You will gain knowledge of semiconductor devices, how they operate and how they are manufactured, and appreciate the challenges of fabrication, implications of technology nodes/sizes and consequences on device performance and behaviour.	You will appreciate the difference between abstract device/circuit behaviour, device models and physical implementation in hardware.	You will understand microelectronic design techniques.	You will be able to apply theoretical and practical knowledge and understanding of microelectronics in order to specify, design, simulate and test significant elements and building blocks of transistor-level electronic circuits.	You will develop the skills to communicate effectively with peers, and form learning/working groups.	You will gain problem solving and task identification skills, and work with peers on technical examples.
	Integrated Circuit Design & Simulation	By working on (and if applicable, assessed through)	BY: attending lectures and seminars on the concepts of microelectronic design techniques and systems (assessed by closed-book examination).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: a series of practical laboratories (including formative feedback) within the framework of industry standard design tools (e.g. Cadence, Mentor).	BY: participation in seminars, peer work in labs, and by clear technical analysis and communication (assessed by closed-book examination).	BY: participation in seminars, peer work in labs.

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Computer Engineering MEng	Programmes:	MEng Electronic and Computer Engineering (H639) MEng Electronic and Computer Engineering with a year in industry (H638)	

Stage	Module		Programme Learning Outcomes					
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
			Conduct research in applied electronic engineering and computing technology to advance the state of knowledge in algorithms, devices and systems.	**Extract and critically evaluate data from complex systems through a variety of analytical techniques including computational methods and modelling.**	**Create innovative and optimised designs to address real-world problems involving computer hardware and software systems by synthesising ideas into engineering specifications.**	**Apply professional skills of programming, CAD, construction and measurement, combined with an understanding of engineering systems and components, to solve technically challenging problems.**	**Debate, defend and contextualise information in a succinct and technically accurate manner for audiences of engineers and members of the public, and to write and interpret technical documentation.**	**Proficiently manage themselves, teams and complex projects in preparation for technical careers as leaders in applied computer and electronic engineering.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00026C	Progress towards PLO	You will learn about the operation of microprocessors and microcontrollers, and the techniques of assembly-language and low-level programming.			You will learn to write programs in machine code and assembly language, and to write programs for interfacing using higher-level languages.	You will learn to explain technical concepts concisely and accurately.	You will be able to manage your own progress in implementing software solutions.
	Digital Systems	By working on (and if applicable, assessed through)	The lectures will give you all the information that you need, and laboratory sessions will give you practice. A technical report (assessed) will test your knowledge.			A series of lab-based assignments will teach you to develop microcontroller-based solutions. (Assessed by report and submitting code)	You will write a report (assessed) that clearly describes the operation of low-level code and its interaction with target hardware.	A large-scale summative design exercise at the end of the module helps you to manage work leading to a technical report with accompanying code (both assessed).

Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of appropriate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.

	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		
	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)
Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.

	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstrati on)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).
Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.

	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	
	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		

	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				
	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		

	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		
Stage 3	ELE00046H	Progress towards PLO	You will learn about the propagation mechanisms of electromagnetic waves within materials, and how to classify materials according to the nature of a wave propagating through them. You will also learn about the principles of waveguiding, the importance of antennas in all types of radio communication systems, the problems of interference and fading, and channel models.	You will learn to determine the interactions of electromagnetic waves at boundaries between materials, and to describe and calculate the loss and dispersion limits of propagation distance in fibre optical links. You will also learn to to specify the performance of a radio system in terms of antenna characteristics, and to estimate the channel losses for guided, ground, sky and freespace waves, including the effects of diffraction and reflections, and know what applications use these propagation modes.	You will know how to use the Smith Chart for transmission line calculations; will be able to design single stub and quarterwave matching networks; and to appreciate the main considerations in design of freespace and guided optical links.	You will learn how to use an RF network analyser, and how to use Smith charts to analyse distributed circuits, as well as how to prototype and construct high-frequency circuits.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	

	Applications of EM	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will provide you with the knowledge you need. Laboratory tasks and workshop exercises will help you reinforce your knowledge. (Assessed by closed-book exam.)	Lectures will provide you with the information that you need, and workshop exercises will help reinforce it. Laboratory tasks using a bespoke software simulator to model and characterise a transmission line will put your knowledge into a practical context. (Assessed by closed-book exam.)	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	Laboratory tasks with peers allow you to discuss the issues with each other and with lab leader/lab instructors/technicians.	
Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	

	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	
Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		

	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			
	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	

Stage 3	ELE00011H	Progress towards PLO	You will develop the ability to design complex digital circuits that take into account performance and testability, and to exploit IP components in the design of digital circuits. You will gain experience in interfacing custom circuits with external components.	You will become familiar with the tools required to analyse circuits from the point of view of performance and testability, and with the use of advanced testing and test-bench design techniques to verify digital circuits.		You will further your design skills using a hardware description language to build a omplex system including IP components.	You will develop your skills in the documentation of digital circuits, including timing- and test-related information.	You will hone your skills in team working and time management.
	Digital Engineering	By working on (and if applicable, assessed through)	Lectures will provide you with knowledge, and a set of lab exercises will give you practice. You will also read and understanding IP component documentation. You will complete a final project involving the design of high-performance, testable circuits that use IP components. Assessed through lab and final project reports.	A set of lab exercises, involving the use of simulation tools to implement and verify digital circuits that meet performance and/or testability constraints, will give you this familiarity. Assessed through lab and final project reports.		A set of lab exercises will lead you through the process of including IP components in a design of a high-performance, testable digital system, and implementing it in a Field Programmable Gate Array (FPGA). (Assessed by lab and final project reports.)	The laboratory and project reports (assessed) require professional presentation and annotation of VHDL code (including timing and testing considerations), testbenches, and simulations.	You will work on a sequence of laboratory-based group tasks and a final group project (assessed)that require independent work outside of supervised lab hours.
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.

	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.
Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportinity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00056H	Progress towards PLO	You will understand specification, design, prototyping, implementation and testing methods in the context of formal software engineering methods.		You will learn to effectively use tools to conceptualise, specify and support the creation of products within a software engineering process	You will learn to apply your programming skills in a multi-programmer small business environment, including the use of source control.	You will develop the ability to communicate effectively within a team and to explain complex technical issues to external customers.	You will be able to understand the role of project management in a practical, team based and time pressured context. This includes the basic operational aspects of a small business.

	Software Engineering Project	By working on (and if applicable, assessed through)	A major team-based scenario involves you in the creation of a new, software based, product.		Working in a group, you will create a product idea to address a real-world issue. (Assessed by report.)	In your group, you will work through the development of a software product. (Assessed by report.)	A number of meetings are held with team members, customers and suppliers to ensure that all aspects are covered and that all stakeholders are kept fully informed at all times. Final technical reports are assessed.	A clear definition of tasks, timescales and responsibilities within the team ensures that clear lines of communication are established.
Stage 4	ELE00101M	Progress towards PLO	You will know how to research, design, construct and verify a substantial project in a complex and/or highly specialised area of engineering.	You will be able to critically evaluate appropriate scientific literature and synthesise new information.	In the final-year project, you will engage with an advanced current research or development issue, and learn to create a testable, practical specification for your solution.	You will learn to evaluate and assess alternative approaches to implementing your chosen solution from an agreed specification.	You will master the art of writing concise technical reports and defending presentations on advanced topics.	You will finely hone your skills in project management, including the management of time, risk and resources.
	MEng Individual Project	By working on (and if applicable, assessed through)	An individual project over 2 full terms gives you an intensive period of time to run a project, with a variety of assessments throughout.	Your developing skills in gathering and critically analysing information from reliable sources is assessed in an initial Literature Report.	Supported by feedback during supervisions, you will develop your ideas into a workable specification. (Assessed by project report.)	Guided by regular supervision meetings, you will work independently towards developing a working solution. (Assess by project report.)	Your technical communication will be assessed by constructing technical reports for a specified audience and defending your project in a viva setting.	You will work individually on a major project which develops your capacity to think independently and creatively about a specific area of electronic engineering and develop your problem solving in this area (assessed by report and viva).
Stage 4	ELE00097M	Progress towards PLO	You will be introduced to advanced cost--function based control design techniques, including optimal control (LQR) and model- predictive control (MPC).	You will deepen your insights into the theory and practice of optimal control via real-world examples.		You will learn to use CAD tools for the development of LQR and MPC controllers.		
	Advanced Control	By working on (and if applicable, assessed through)	Lectures, workshops and illustrative examples cover LQR, and provide a mathematical framework for the receding -horizon terminal constraints of MPC (assessed by exam).	You will use software tools on examples and case studies, in practical computer workshops and self -study, based upon the MATLAB environment.		Laboratory sessions will give you practical experience of control system design using CAD tools.		

Stage 4	ELE00007M	Progress towards PLO	You will understand how electrical signals are generated within the human body, and describe and apply techniques to model these signals.	You will become familiar with a range of computational and analytical methods appropriate to medical research and clinical practice	You will learn how medical diagnosis, therapy, risk assessment and dosimetry lead to engineering specifications on the use of EM fields and waves.	You will learn how to use image processing techniques to interpret the results of medical imaging scans.	You will develop your skills in critically evaluating and synthesising new information based on researched information and writing concise technical reports appropriate for the target audience. You will also able to design, deliver and defend persuasive technical presentations based on selected reliable evidence to the target audiences.	You will develop the skills necessary to undertake a small group research project in a topic related to electronics for medicine.
	Electronics for Medicine	By working on (and if applicable, assessed through)	Lectures introduce you to a range of methods appropriate to medical research and clinical practice (assessed by report and presentation).	Image processing laboratories provide a link between knowledge and practical experience.	Engaging with lecture material and directed reading will lead to an understanding of the role of EM waves in medicine. (Assessed through an individual report and presentation slides.)	A series of practical exercises in labs will illustrate how image processing can help with diagnosis.	An individual report (max 3000 words, assessed) and a presentation (slides assessed) allow you to develop the above technical communication skills.	The results of the group work are summarised and reflected upon in an individual report (assessed) and presented orally in a group (assessed).
Stage 4	ELE00099M	Progress towards PLO	You will understand the complete design process of RF and Microwave circuits including analytical design skills, computer aided testing and optimisation and construction.	You will be able to select, adapt and apply a range of mathematical techniques to solve advanced problems and explain the implications of the answer; to specify high frequency systems (amplifiers, oscillators, mixers, resonators and filters and printed circuit boards) including RF and Microwave systems.	You will learn how to specify RF circuits for use in modern communication systems including mobile phones, TVs, tablets and PCs, including Bluetooth and Wi-Fi.	You will gain experience in using common RF and Microwave measurement instruments including spectrum and network analysers to test circuits you have designed and built, and learn how to use modern CAD tools for RF design.		

	High Frequency Electronics	By working on (and if applicable, assessed through)	Knowledge is gained by guided reading through lecture material and recommended texts, supplemented by formative workshop exercises, and is assessed by an exam.	Workshop exercises help you apply your new knowledge to solving problems (assessed summatively by module exam).	Engaging in lectures and studying directed reading will explain the most important parameters relating real-life systems to specifications.	In laboratory exercises you will use simulation tools such as Advance Design Systems to verify a design and test components.		
Stage 4	ELE00103M	Progress towards PLO	You will learn the basic concepts involved in measuring and controlling position and motion for both mobile and fixed - arm robotic systems, examining the use of different forms of sensors and their use for the purposes of orientation control and navigation.	You will develop fluency in the analysis of robotic systems, and the use of mathematical descriptions of position, orientation, and forces involved in robot control.	You will explore the challenges and solutions involved in using robots in both the manufacturing and service industries, and for field applications.	You will develop insights into the practicalities of robotic control using specialist simulation tools.		
	Robotics	By working on (and if applicable, assessed through)	Information is delivered via lectures, workshops, worked examples and self study (assessed by closed-book examination).	MATLAB computer laboratory sessions and self study give you practical experience (assessed by closed-book examination).	By engaging with lecture content, worked examples and directed reading.	A series of laboratory sessions will provide experience in developing and testing robotic control systems.		
Stage 4	ELE00105M	Progress towards PLO	You will gain knowledge of channel characteristics and physical layer techniques used for wired, optical and wireless digital communication systems.	You will be able to apply a range of mathematical tools and models to common transmission problems.	You will learn to specify realistic and achievable performance levels for real-world communication links.	You will learn to evaluate performance of transmission schemes using computer simulation,	You will be able to explain and evaluate advanced techincal concepts concisely and accurately.	

	Wired, Wireless & Optical Transmission	By working on (and if applicable, assessed through)	Lectures and wider reading to introduce the students to communication channel characteristics and technologies designed to exploit them and/or overcome constraints, as used in current systems and standards such as DSL, Ethernet, WiFi, 4G and DVB (assessed through formative tutorial questions and summative examination).	A series of lab exercises and example sheets helps develop your ability to calculate power budgets in wired, wireless and optical links, and to determine suitable channel models to analyse performance of wired, wireless and optical systems (assessed through formative tutorial questions and summative examination).	By engaging with examples presented in lectures and working though example sheets, you will learn how to specify real-world transmission systems. (Assessed by closed-book exam.)	By working through a series of laboratory simulation exercises using MATLAB you will evaluate and compare the performance of common modulation schemes.	You will be able to describe, explain and justify techniques used in current communication systems, in response to tutorial questions and in (assessed) examination papers.	
Stage 4	ELE00017M	Progress towards PLO	You will be able to understand the principles and techniques of bioinspired computing to the extent of being able to solve meaningful computational tasks and research and create evolutionary computing solutions to real world problems.	You will be able to compare and critically evaluate the differences between the approaches of conventional design and evolutionary design; and be aware of, and make informed decisions about, state-of-the-art biologically-inspired computation methods.	You will learn how bio-inspired algorithms can be applied to solve real-world computing problems, and to select appropriate algorithms.	You will learn to select, design and apply evolutionary algorithms to find solutions to search problems.	You will develop advanced skills in designing, delivering and defending engaging presentations on advanced topics, and in critically evaluating and synthesising new information based on research. You will also learn to produce comprehensive software/hardware documentation.	
	Bio-Inspired Computation	By working on (and if applicable, assessed through)	You will work through a set of class problems and lab exercises (assessed through an individual research paper & presentation on a small project.	You will work through a set of class problems and lab exercises (assessed through an individual research paper & presentation on a small project.	Engaging with lectures and lab scripts will develop insight into the range and applicability of bio-inspired algorithms.	A set of lab exercises involving the creation of bio-inspired algorithms, lead to an individual project requiring research to develop an evolutionary computing solution to a real-world problem. (Assessed by an individual research paper and presentation.)	You will conduct research from a list of projects, and create an evolutionary computing solution to a real-world problem, writing up and presenting the results (both assessed) in a succinct and informative manner.	

Stage 4	ELE00062M	Progress towards PLO	You will learn how systems programming is different from applications programming. You will develop your skills in C progamming to an advanced level, and become familiar with low-level programming concepts such as processor modes, direct interaction with the stack, and writing interrupt and exception handlers.	You will start to learn the delicate art of systems-level debugging, analysing stack traces and memory dumps to find bugs.		You will develop skills in designing task scheduling and synchronisation algorithms suitable for embedded systems. You will learn to exploit the mechanisms available for the implementation atomic operations on an ARM Cortex M device, and to write substantial parts of a small operating system kernel for an ARM Cortex M device, in C and assembly language.	You will develop your report-writing skills, and also learn to produce code that is self-documenting and well commented.	
	Systems Programming for ARM	By working on (and if applicable, assessed through)	The lectures will introduce several new keywords and C language features, and you will get practice using these in the laboratory sessions. You will undertake a programming task, and submit your code and a technical report (assessed) to demonstrate your knowledge.	The laboratory sessions will give you plenty of opportunities for low-level debugging. Your submitted report and code (assessed) will show that you have engaged with this process.		In the laboratory sessions you will design a low-level systems in the context of an ARM-based embedded platform. (Assessed though a technical report and code submission.	During the laboratory sessions you will be encouraged to write readable, documented code. Your technical report and code submission (assessed) will provide evidence of your skills in this area.	
Stage 4	ELE00039M	Progress towards PLO	You will understand the various concepts of idea generation techniques and applications that can be used within an organization.	You will develop your capacity for analysis and synthesis of ideas.	You will develop your creativity and understanding of innovation.	You will develop your ability to generate ideas in a new area .	You will be able to generate, develop and communicate ideas to relevant stakeholders.	
	Ideation	By working on (and if applicable, assessed through)	BY: participating in lectures on creativity, intrapreneurship, idea refinement and commercial exploitation (assessed by individual report).	BY: working on an assignment on idea generation and selection (assessed by presentation and report).	BY: designing a selection approach for a new application area to allow the better ideas generated to be identified	BY: participating in lectures on creativity, intrapreneurship, idea refinement and commercial exploitation (assessed by individual report).	BY: communicating an idea through an ‘elevator pitch’, then more deeply through a written proposal (all assessed).	

Stage 4	ELE00022M	Progress towards PLO	You will be able to understand and explain the meaning of common strategic management terminology and strategic management issues.	You will be able to strategically analyse an organisation or business unit's position, compare strategic opportunities, and recommend a way forward.	You will learn to plan an organisation's structure and systems to achieve an agreed strategy.		You will enhance your ability to discuss and debate technical and commercial issues.	Your team working abilities and experience will be enhanced in a business context.
	Strategic Management	By working on (and if applicable, assessed through)	Lectures and wider reading material introduce students to the terminology and issues of strategic management (assessed by group and personal reflective reports).	You will analyse the strategic position and direction of a case study organisation in class exercises.	Working in class in a Company Board Room simulated setting will develop skills in analysing the strategic position and direction of a case study organisation.		You will work in a simulated Company Board Room setting to experience board level activities. You will construct concise technical reports (assessed) that critically evaluate and synthesise new information based on research, and design, deliver and defend a persuasive technical presentation (assessed) based on selected reliable evidence.	By working in a Company Board Room simulated setting you will learn how to analyse the strategic position and direction of a case study organisation (assessed by group report and personal reflective report).
Stage 4	ELE00102M	Progress towards PLO	You will understand the mathematical underpinning and uses of physical and spectral modelling synthesis techniques.	You will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.		Working with specialist software, you will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.	You will learn to communicate and present theoretical and practical examples of physical modelling methods to a non--expert audience through an online publication.	
	Physical Modelling Synthesis	By working on (and if applicable, assessed through)	Lectures and laboratories allow you to develop skills in critically evaluating and synthesising new information based on recent research in this area (assessed through technical web-page).	Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)		Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)	An online report (assessed) allows you to take technical information developed in the laboratories and summarise and explain it for a non-expert audience on a multimedia web-page.	

Stage 4	ELE00127M	Progress towards PLO	You will gain knowledge of semiconductor devices, how they operate and how they are manufactured, and appreciate the challenges of fabrication, implications of technology nodes/sizes and consequences on device performance and behaviour.	You will appreciate the difference between abstract device/circuit behaviour, device models and physical implementation in hardware.	You will understand microelectronic design techniques.	You will be able to apply theoretical and practical knowledge and understanding of microelectronics in order to specify, design, simulate and test significant elements and building blocks of transistor-level electronic circuits.	You will develop the skills to communicate effectively with peers, and form learning/working groups.	You will gain problem solving and task identification skills, and work with peers on technical examples.
	Integrated Circuit Design & Simulation	By working on (and if applicable, assessed through)	BY: attending lectures and seminars on the concepts of microelectronic design techniques and systems (assessed by closed-book examination).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: a series of practical laboratories (including formative feedback) within the framework of industry standard design tools (e.g. Cadence, Mentor).	BY: participation in seminars, peer work in labs, and by clear technical analysis and communication (assessed by closed-book examination).	BY: participation in seminars, peer work in labs.

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Nanotechnology MEng	Programmes:	MEng Electronic Engineering with Nanotechnology (H6FH) MEng Electronic Engineering with Nanotechnology with a year in industry (H6FG)	

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Conduct research in nanotechnology and applied electronic engineering advance the state of knowledge in algorithms, devices (miniaturisation, behaviour and fabrication) and systems.	**Extract and critically evaluate data from complex systems through a variety of analytical techniques including computational methods and modelling.**	**Create innovative and optimised designs to address real-world problems involving nano-fabrication, nanostructures and analogue & digital electronics by synthesising ideas into engineering specifications.**	**Apply professional skills of fabrication, programming, CAD, construction and measurement, combined with an understanding of engineering systems and components, to solve technically challenging problems.**	**Debate, defend and contextualise information in a succinct and technically accurate manner for audiences of engineers and members of the public, and to write and interpret technical documentation.**	**Proficiently manage themselves, teams and complex projects in preparation for technical careers as leaders in nanofabrication and integration methodologies and electronic engineering.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of approprirate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.

	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00028C	Progress towards PLO	You will learn about physical phenomena emergent at the nanoscale, drawing upon concepts from chemistry, physics, biology and electronics. By the end of the module, you will understand the basic principles of solid-state theory and their application to electronic and nanoelectronic devices.	You will use simple mathematical models to describe physical phenomena emergent at the nanoscale, and use appropriate data analytical methods to critically analyse experimental data.	You will apply physical and theoretical models to the design of electronic materials and devices.	You will plan and execute experiments or investigations across the nanoscience discipline and critically evaluate the results.	You will develop your written communication skills by constructing basic technical reports and identifying reliable sources of information, recognising issues of plagiarism and collusion. You will learn to present complex nanoscience principles in clear and precise manner.	You will develop skills in analysis, problem solving and critical evaluation, and work effectively in a cross-disciplinary environment, drawing upon concepts from chemistry, physics, biology and electronics.
	Intro to Nanoscience & Nanotechnology	By working on (and if applicable, assessed through)	Lectures and reading material will develop your understanding of electronic devices from atomic models through to the solid-state. You will demonstrate your understanding through class examples and laboratory exercises, and in the final technical report (assessed).	Laboratory exercises will help you to develop a fluency in data analysis and to show an understanding of this in the final technical report (assessed).	Class examples and laboratory exercises will develop your design skills, summarised in the final technical report (assessed).	The laboratory exercises are designed to introduce a wide range of experimental methods across the nanosciences.	A concise technical report (assessed) will test your written communication skills.	By carefully planning the final technical report (assessed), you will develop your skills in literature analysis and time management. Laboratory sessions will give you experience in working across disciplines.

Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.
	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		

	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)

Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.
	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstration)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).

Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.
	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00033I	Progress towards PLO	You will learn about the approaches used for the fabrication and analysis of nanostructured materials, with an emphasis on micro/nano electronic materials and devices. You will also learn about the basic principles of fabrication at the nanoscale, including conventional and nonconventional lithography, and about measurement techniques for analyzing the structural, physical and chemical properties of nanomaterials and nanoelectronic devices.	You will learn to analyse the properties and performance of micro/nano devices, and to analyse experimental data critically.		You will gain experience in the fabrication and measurement of nanotechnology devices using safe laboratory practices.	You will be able to explain clearly various nanofabrication and nano-measurement techniques, from the basic physics principles to instrument operations, and will have developed skills in critical analysis, problem solving and report writing.	You will be able to plan and execute a specific experiment related to microelectronics and nanotechnology.

	Nanofabrication & Nanoanalysis	By working on (and if applicable, assessed through)	Lectures and additional reading material will develop an understanding of various nanofabrication and nano-measurement techniques. Class examples and laboratory exercises will help reinforce your learning, and you will show an understanding of this in the final technical report (assessed).	Lectures and additional reading material will develop an understanding of various nanofabrication and nano-measurement techniques, backed up by laboratory exercises. (Assessed in the final technical report.)		You will work through a series of laboratory exercises designed to introduce a wide range of nanofabrication and nanomeasurement techniques.. (Assessed in the final writen report.)	You are required to engage with a wide range of reading material that develops a further understanding of various nanofabrication and nano-measurement techniques, and you write a concise technical report (assessed) to consolidate your written communication.	You will synthesise your knowledge from lectures and experience from laboratories in an assessed design report.
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		
	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				

	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		
	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		

Stage 3	ELE00046H	Progress towards PLO	You will learn about the propagation mechanisms of electromagnetic waves within materials, and how to classify materials according to the nature of a wave propagating through them. You will also learn about the principles of waveguiding, the importance of antennas in all types of radio communication systems, the problems of interference and fading, and channel models.	You will learn to determine the interactions of electromagnetic waves at boundaries between materials, and to describe and calculate the loss and dispersion limits of propagation distance in fibre optical links. You will also learn to to specify the performance of a radio system in terms of antenna characteristics, and to estimate the channel losses for guided, ground, sky and freespace waves, including the effects of diffraction and reflections, and know what applications use these propagation modes.	You will know how to use the Smith Chart for transmission line calculations; will be able to design single stub and quarterwave matching networks; and to appreciate the main considerations in design of freespace and guided optical links.	You will learn how to use an RF network analyser, and how to use Smith charts to analyse distributed circuits, as well as how to prototype and construct high-frequency circuits.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Applications of EM	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will provide you with the knowledge you need. Laboratory tasks and workshop exercises will help you reinforce your knowledge. (Assessed by closed-book exam.)	Lectures will provide you with the information that you need, and workshop exercises will help reinforce it. Laboratory tasks using a bespoke software simulator to model and characterise a transmission line will put your knowledge into a practical context. (Assessed by closed-book exam.)	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	Laboratory tasks with peers allow you to discuss the issues with each other and with lab leader/lab instructors/technicians.	

Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	
	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	

Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		
	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			

	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.
	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.

Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportunity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00025H	Progress towards PLO	You will learn to combine the principles and laws of optics, semiconductor physics and technology, and quantum mechanics in the context of photonics and nanophotonics.	You will learn to apply the apparatus of ordinary and partial differential equations, eigenvalue problems, Fourier analysis etc. to analysis of light propagation in photonic and nanophotonic devices, their modal structure, and ultimately their performance.	You will learn how the use of photonic and nanophotonic technology, devices, and subsystems are used in long-distance communications, storage and retrieval (e.g. DVD/Blu-Ray) and data acquisition (photonic sensors), and the requirements of photonic components for each of these applications		You will be able to explain the principle and performance of photonics and nanophotonics on both qualitative level (verbal explanations) and quantiative level (phenomenological and if required microscopic analysis) and show the logical progression from fundamental principles to peformance issues.	
	Photonics & Nanophotonics	By working on (and if applicable, assessed through)	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Engagement in lectures, workshops and reading supporting material. (Assessed by a closed-book exam.)		You will be expected to synthesis the knowledge and experience from lectures, workshop questions, and supporting material explaining the principles of photonics. Assessed by examination.	

Stage 3	ELE00056H	Progress towards PLO	You will understand specification, design, prototyping, implementation and testing methods in the context of formal software engineering methods.		You will learn to effectively use tools to conceptualise, specify and support the creation of products within a software engineering process	You will learn to apply your programming skills in a multi-programmer small business environment, including the use of source control.	You will develop the ability to communicate effectively within a team and to explain complex technical issues to external customers.	You will be able to understand the role of project management in a practical, team based and time pressured context. This includes the basic operational aspects of a small business.
	Software Engineering Project	By working on (and if applicable, assessed through)	A major team-based scenario involves you in the creation of a new, software based, product.		Working in a group, you will create a product idea to address a real-world issue. (Assessed by report.)	In your group, you will work through the development of a software product. (Assessed by report.)	A number of meetings are held with team members, customers and suppliers to ensure that all aspects are covered and that all stakeholders are kept fully informed at all times. Final technical reports are assessed.	A clear definition of tasks, timescales and responsibilities within the team ensures that clear lines of communication are established.
Stage 4	ELE00101M	Progress towards PLO	You will know how to research, design, construct and verify a substantial project in a complex and/or highly specialised area of engineering.	You will be able to critically evaluate appropriate scientific literature and synthesise new information.	In the final-year project, you will engage with an advanced current research or development issue, and learn to create a testable, practical specification for your solution.	You will learn to evaluate and assess alternative approaches to implementing your chosen solution from an agreed specification.	You will master the art of writing concise technical reports and defending presentations on advanced topics.	You will finely hone your skills in project management, including the management of time, risk and resources.
	MEng Individual Project	By working on (and if applicable, assessed through)	An individual project over 2 full terms gives you an intensive period of time to run a project, with a variety of assessments throughout.	Your developing skills in gathering and critically analysing information from reliable sources is assessed in an initial Literature Report.	Supported by feedback during supervisions, you will develop your ideas into a workable specification. (Assessed by project report.)	Guided by regular supervision meetings, you will work independently towards developing a working solution. (Assess by project report.)	Your technical communication will be assessed by constructing technical reports for a specified audience and defending your project in a viva setting.	You will work individually on a major project which develops your capacity to think independently and creatively about a specific area of electronic engineering and develop your problem solving in this area (assessed by report and viva).

Stage 4	ELE00007M	Progress towards PLO	You will understand how electrical signals are generated within the human body, and describe and apply techniques to model these signals.	You will become familiar with a range of computational and analytical methods appropriate to medical research and clinical practice	You will learn how medical diagnosis, therapy, risk assessment and dosimetry lead to engineering specifications on the use of EM fields and waves.	You will learn how to use image processing techniques to interpret the results of medical imaging scans.	You will develop your skills in critically evaluating and synthesising new information based on researched information and writing concise technical reports appropriate for the target audience. You will also able to design, deliver and defend persuasive technical presentations based on selected reliable evidence to the target audiences.	You will develop the skills necessary to undertake a small group research project in a topic related to electronics for medicine.
	Electronics for Medicine	By working on (and if applicable, assessed through)	Lectures introduce you to a range of methods appropriate to medical research and clinical practice (assessed by report and presentation).	Image processing laboratories provide a link between knowledge and practical experience.	Engaging with lecture material and directed reading will lead to an understanding of the role of EM waves in medicine. (Assessed through an individual report and presentation slides.)	A series of practical exercises in labs will illustrate how image processing can help with diagnosis.	An individual report (max 3000 words, assessed) and a presentation (slides assessed) allow you to develop the above technical communication skills.	The results of the group work are summarised and reflected upon in an individual report (assessed) and presented orally in a group (assessed).
Stage 4	ELE00103M	Progress towards PLO	You will learn the basic concepts involved in measuring and controlling position and motion for both mobile and fixed - arm robotic systems, examining the use of different forms of sensors and their use for the purposes of orientation control and navigation.	You will develop fluency in the analysis of robotic systems, and the use of mathematical descriptions of position, orientation, and forces involved in robot control.	You will explore the challenges and solutions involved in using robots in both the manufacturing and service industries, and for field applications.	You will develop insights into the practicalities of robotic control using specialist simulation tools.		
	Robotics	By working on (and if applicable, assessed through)	Information is delivered via lectures, workshops, worked examples and self study (assessed by closed-book examination).	MATLAB computer laboratory sessions and self study give you practical experience (assessed by closed-book examination).	By engaging with lecture content, worked examples and directed reading.	A series of laboratory sessions will provide experience in developing and testing robotic control systems.		

Stage 4	ELE00059M	Progress towards PLO	You will be able to understand the requirements for monitoring the environment; the nature and effects of the various forms of air and water pollution; the operation of sensors and instrumentation, particularly for environmental and industrial monitoring; and the limitations of sensors.		You will learn to specify appropriate sensors for a range of engineering and environmental problems, and appreciate the effects these have on system performance.		You will hone your ability to construct concise technical reports that critically evaluate and synthesise new information based on research, appropriate for the target audience.	
	Sensors & Instrumentation	By working on (and if applicable, assessed through)	Knowledge is gained by guided reading through lecture material and recommended scientific journal and conference papers (assessed by a techincal reseaarch report on a relevant topic).		Engaging with lecture material and through directed reading you will learn about real-world applications of sensors. (Assessed by closed-book exam.)		An individual technical reseach report (assessed) selected from the topics covered in the module allows you to communicate information about sensors and instrumentation.	
Stage 4	ELE00005M	Progress towards PLO	You will develop an understanding of information theory and its application to coding schemes used in wireless communication systems.	You will develop skills in the application of mathematical techniques and understand the implications of the answer.	You will learn to specify appropriate error control schemes for wireless systems, and evaluate their effects on system performance.	You will use simulation tools to evaluate and compare the performance of different types of error control codes.	You will develop your ability to explain and evaluate advanced techincal concepts concisely and accurately.	
	Information Theory & Error Control Coding	By working on (and if applicable, assessed through)	Knowledge comes through engaging with lectures and background studies on information and coding theory, focusing on error control coding as applied to wireless communication systems (assessed through formative tutorial questions and summative examination).	In labs and example exercises you will learn how to quantify information and compute entropy, mutual information and channel capacity, and how to encode & decode linear block codes and convolutional codes, and calculate decoded bit error rates (assessed through formative tutorial questions and summative examination).	By engaging with lecture material, working through example problems and directed reading you will learn the most common techniques of error control coding. (Assessed through a closed-book exam.)	A series of practical exercises will lead you through how to implement and evaluate error-control schemes.	A lab book kept during practical work allows you to demonstrate concepts of encoding and decoding procedures .	

Stage 4	ELE00105M	Progress towards PLO	You will gain knowledge of channel characteristics and physical layer techniques used for wired, optical and wireless digital communication systems.	You will be able to apply a range of mathematical tools and models to common transmission problems.	You will learn to specify realistic and achievable performance levels for real-world communication links.	You will learn to evaluate performance of transmission schemes using computer simulation,	You will be able to explain and evaluate advanced techincal concepts concisely and accurately.	
	Wired, Wireless & Optical Transmission	By working on (and if applicable, assessed through)	Lectures and wider reading to introduce the students to communication channel characteristics and technologies designed to exploit them and/or overcome constraints, as used in current systems and standards such as DSL, Ethernet, WiFi, 4G and DVB (assessed through formative tutorial questions and summative examination).	A series of lab exercises and example sheets helps develop your ability to calculate power budgets in wired, wireless and optical links, and to determine suitable channel models to analyse performance of wired, wireless and optical systems (assessed through formative tutorial questions and summative examination).	By engaging with examples presented in lectures and working though example sheets, you will learn how to specify real-world transmission systems. (Assessed by closed-book exam.)	By working through a series of laboratory simulation exercises using MATLAB you will evaluate and compare the performance of common modulation schemes.	You will be able to describe, explain and justify techniques used in current communication systems, in response to tutorial questions and in (assessed) examination papers.	
Stage 4	ELE00017M	Progress towards PLO	You will be able to understand the principles and techniques of bioinspired computing to the extent of being able to solve meaningful computational tasks and research and create evolutionary computing solutions to real world problems.	You will be able to compare and critically evaluate the differences between the approaches of conventional design and evolutionary design; and be aware of, and make informed decisions about, state-of-the-art biologically-inspired computation methods.	You will learn how bio-inspired algorithms can be applied to solve real-world computing problems, and to select appropriate algorithms.	You will learn to select, design and apply evolutionary algorithms to find solutions to search problems.	You will develop advanced skills in designing, delivering and defending engaging presentations on advanced topics, and in critically evaluating and synthesising new information based on research. You will also learn to produce comprehensive software/hardware documentation.	

	Bio-Inspired Computation	By working on (and if applicable, assessed through)	You will work through a set of class problems and lab exercises (assessed through an individual research paper & presentation on a small project.	You will work through a set of class problems and lab exercises (assessed through an individual research paper & presentation on a small project.	Engaging with lectures and lab scripts will develop insight into the range and applicability of bio-inspired algorithms.	A set of lab exercises involving the creation of bio-inspired algorithms, lead to an individual project requiring research to develop an evolutionary computing solution to a real-world problem. (Assessed by an individual research paper and presentation.)	You will conduct research from a list of projects, and create an evolutionary computing solution to a real-world problem, writing up and presenting the results (both assessed) in a succinct and informative manner.	
Stage 4	ELE00062M	Progress towards PLO	You will learn how systems programming is different from applications programming. You will develop your skills in C progamming to an advanced level, and become familiar with low-level programming concepts such as processor modes, direct interaction with the stack, and writing interrupt and exception handlers.	You will start to learn the delicate art of systems-level debugging, analysing stack traces and memory dumps to find bugs.		You will develop skills in designing task scheduling and synchronisation algorithms suitable for embedded systems. You will learn to exploit the mechanisms available for the implementation atomic operations on an ARM Cortex M device, and to write substantial parts of a small operating system kernel for an ARM Cortex M device, in C and assembly language.	You will develop your report-writing skills, and also learn to produce code that is self-documenting and well commented.	
	Systems Programming for ARM	By working on (and if applicable, assessed through)	The lectures will introduce several new keywords and C language features, and you will get practice using these in the laboratory sessions. You will undertake a programming task, and submit your code and a technical report (assessed) to demonstrate your knowledge.	The laboratory sessions will give you plenty of opportunities for low-level debugging. Your submitted report and code (assessed) will show that you have engaged with this process.		In the laboratory sessions you will design a low-level systems in the context of an ARM-based embedded platform. (Assessed though a technical report and code submission.	During the laboratory sessions you will be encouraged to write readable, documented code. Your technical report and code submission (assessed) will provide evidence of your skills in this area.	

Stage 4	ELE00022M	Progress towards PLO	You will be able to understand and explain the meaning of common strategic management terminology and strategic management issues.	You will be able to strategically analyse an organisation or business unit's position, compare strategic opportunities, and recommend a way forward.	You will learn to plan an organisation's structure and systems to achieve an agreed strategy.		You will enhance your ability to discuss and debate technical and commercial issues.	Your team working abilities and experience will be enhanced in a business context.
	Strategic Management	By working on (and if applicable, assessed through)	Lectures and wider reading material introduce students to the terminology and issues of strategic management (assessed by group and personal reflective reports).	You will analyse the strategic position and direction of a case study organisation in class exercises.	Working in class in a Company Board Room simulated setting will develop skills in analysing the strategic position and direction of a case study organisation.		You will work in a simulated Company Board Room setting to experience board level activities. You will construct concise technical reports (assessed) that critically evaluate and synthesise new information based on research, and design, deliver and defend a persuasive technical presentation (assessed) based on selected reliable evidence.	By working in a Company Board Room simulated setting you will learn how to analyse the strategic position and direction of a case study organisation (assessed by group report and personal reflective report).
Stage 4	ELE00102M	Progress towards PLO	You will understand the mathematical underpinning and uses of physical and spectral modelling synthesis techniques.	You will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.		Working with specialist software, you will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.	You will learn to communicate and present theoretical and practical examples of physical modelling methods to a non--expert audience through an online publication.	
	Physical Modelling Synthesis	By working on (and if applicable, assessed through)	Lectures and laboratories allow you to develop skills in critically evaluating and synthesising new information based on recent research in this area (assessed through technical web-page).	Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)		Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)	An online report (assessed) allows you to take technical information developed in the laboratories and summarise and explain it for a non-expert audience on a multimedia web-page.	

Stage 4	ELE00100M	Progress towards PLO	You will be able to describe the advancement of information storage techniques, and to understand the basic principles of semiconductor storage and memories. You'll also be able to explain the principle of magnetic recording, to identify the limitations and gaps in the current memory and storage techniques, and to describe the next-generation of memories and storage.	You will be able to measure the length scale of current storage technologies.			You will develop your ability to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Information Storage & Spintronics	By working on (and if applicable, assessed through)	Information is delivered by lectures and directed reading material explaining information storage techniques, supplemented by class examples and laboratory work on the fundamental concepts of information storage techniques (assessed).	Lectures and reading material explaining quantum mechanics lead to class examples and laboratories (assessed).			You will write an individual report (assessed) to describe the fundamental principles and operation of information storage techniques .	
Stage 4	ELE00127M	Progress towards PLO	You will gain knowledge of semiconductor devices, how they operate and how they are manufactured, and appreciate the challenges of fabrication, implications of technology nodes/sizes and consequences on device performance and behaviour.	You will appreciate the difference between abstract device/circuit behaviour, device models and physical implementation in hardware.	You will understand microelectronic design techniques.	You will be able to apply theoretical and practical knowledge and understanding of microelectronics in order to specify, design, simulate and test significant elements and building blocks of transistor-level electronic circuits.	You will develop the skills to communicate effectively with peers, and form learning/working groups.	You will gain problem solving and task identification skills, and work with peers on technical examples.

	Integrated Circuit Design & Simulation	By working on (and if applicable, assessed through)	BY: attending lectures and seminars on the concepts of microelectronic design techniques and systems (assessed by closed-book examination).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: a series of practical laboratories (including formative feedback) within the framework of industry standard design tools (e.g. Cadence, Mentor).	BY: participation in seminars, peer work in labs, and by clear technical analysis and communication (assessed by closed-book examination).	BY: participation in seminars, peer work in labs.
Stage 4	ELE00098M	Progress towards PLO	You will be able to describe and model physical phenomena emergent at the nanoscale drawing upon concepts from chemistry, physics, biology and electronics. You will also be able to understand advanced principles and concepts of state-of-the-art nanoscale technologies across disciplines and applications, and to critically evaluate advanced scientific concepts and technologies from reading material selected from current journal articles.	You will be able to apply simple mathematical models to describe advanced physical phenomena and concepts emergent at the nanoscale. You will also be able to use appropriate data analytical methods to critically analyse experimental data, and to apply physical and theoretical models to predict the properties of nanoscale materials and the design of functional nanoscale technologies.			You will be able to present complex nanoscience principles in a clear and precise manner, demonstrating a breadth of knowledge from across disciplines of advanced nanoscience and technology.	You will develop your skills of analysis, problem solving and critical evaluation, working effectively in a cross-disciplinary environment.
	Emerging Nanotechnologies	By working on (and if applicable, assessed through)	Lectures and reading material selected from current journal articles provide information sources, whereas class examples and cohort seminars help you develop an understanding of this for the final project presentation (assessed).	Lectures and reading material on core theoretical models from chemistry, biology and physics applied to nanotechnology provide the source information.			The above communication skills will be assessed via a personal project presentation and final technical report.	Your report and presentation (both assessed) will demonstrate how you have integrated knowledge from lectures and reading material selected from current journal articles.

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Music Technology MEng	Programmes:	MEng Music Technology Systems (H666) MEng Music Technology Systems with a year in industry (H668) MEng Electronic Engineering with Music Technology Systems (H669) MEng Electronic Engineering with Music Technology Systems with a year in industry (H668)

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Conduct research in applied electronic engineering and audio & music technology to advance the state of knowledge in algorithms, devices and systems.	**Extract and critically evaluate data from complex systems through a variety of analytical techniques including computational methods and modelling.**	**Create innovative and optimised designs to address real-world problems involving audio, computer programming, music technology, and analogue & digital electronics by synthesising ideas into engineering specifications.**	**Apply professional skills of audio analysis, programming, CAD, construction and measurement, combined with an understanding of engineering systems and components, to solve technically challenging problems.**	**Debate, defend and contextualise information in a succinct and technically accurate manner for audiences of engineers, musicians and members of the public, and to write and interpret technical documentation.**	**Proficiently manage themselves, teams and complex projects in preparation for technical careers as leaders in audio and electronic engineering.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00024C	Progress towards PLO	You will learn about the historical context of synthesis techniques and their application in contemporary music, and understand the theory behind sampling and synthesis systems.	You will learn to manipulate and analyse digital audio signals against target specifications.	You will take an idea for a synthesiser, and translate this into an specification for implementation in the PureData audio programming environment.	You will take your specification, and implement this in PureData to produce a working synthesiser.	You will construct basic technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	You will develop skills in analysis, problem solving, critical evaluation, innovation and creativity.
	Audio Technology	By working on (and if applicable, assessed through)	Lectures, and reading & multimedia material, will show the development of audio technology from the early 1900s up to the present day. In-class examples will help you develop your understanding of synthesisers, and you will show an understanding of this in the final technical report (assessed).	Laboratory exercises will introduce and develop fluency in the Pure Data multimedia programming environment.	A series of structured laboratory exercises will lead you through the stages required to design a synthesiser. (Assessed by a report about the design project.)	The laboratory exercises will guide you in the implementation of your synthesiser design. (Assessed by a report about the design project.)	You will work on a concise technical report (assessed) to document a synthesis exercise.	Your work in the computer laboratory on structured examples (with formative feedback) lead to the management of a synthesis design & development project (assessed).
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.

	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of approprirate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).

Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.
	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 1	ELE00031C	Progress towards PLO	You will learn the recording studio environment, multitrack recording formats and the associated signals and systems involved.			You will learn how to operate a software based Digital Audio Workstation environment together with a range of mixing and processing options for recording, editing and production work; how to select and use microphones appropriate for recording live and studio based scenarios; and how to mix component audio tracks into a stereo master track.	You will be able to produce technical documentation to support your creative output.	You will be able to demonstrate your ability to work individually to complete a range of creative and technical studio based tasks, and to self-reflect on that work.
	Recording Studio Techniques	By working on (and if applicable, assessed through)	Lectures and reading materials will help you learn the information you need, which you will then put to use in studio practical sessions. You will submit a technical studio report (assessed) in which you will demonstrate your knowledge.			A series of studio-based practical sessions will demonstrate the techniques used by recording engineering, techniques which are then practiced and refined in individual studio-time. (Assessed by a creative recording portfolio).	By writing a technical studio report (assessed) you will develop the skills to document the studio work process.	The above skills are developed through a creative recording portfolio (assessed), requiring the planning of time and resources effectively throghout the process. The process is documented in a reflective report (assessed) to accompany the recording portfolio.
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		
	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)
Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.

	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00042I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies. Gain and apply knowledge of music technology systems and synthesis techniques.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies. Analyse a system requirement for a sound generation process.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test for Audio	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration)	Group designed products with tangible and audio outputs.	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstrati on)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	

	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 2	ELE00027I	Progress towards PLO	You will learn about the principles of acoustic energy transmission; about pitch, loudness and timbre perception; about auditory streaming with special reference to hearing music; and about interaural time delay (ITD) and interaural intensity delays (IID).	You will learn to appreciate and analyse the acoustic properties of different classes of acoustic instruments and the human voice.	You will learn how to characterise the acoustic properties of real spaces.	Yoi will learn to select and apply a range of mathematical techniques to solve problems in sound transmission.	You will be able to explain commonly -encountered technical concepts concisely and accurately, and to summarise and show understanding in technical reports based on information selected from a variety of reliable sources, to a specified audience.	
	Acoustics & Psychoacoustics	By working on (and if applicable, assessed through)	Lectures, labs and reading about acoustics and psychoacoustics in the context of audio and music production and listening, informed by recent developments in the field, will help you to develop this knowledge. (Assessed by multiple choice exam.)	You will develop critical analysis skills in the context of practical work in sound presentation.	You will work through an exercise characterising and modifying a room's acoustic characteristics. (Assessed by a report.)	You will use mathematical techniques to analyse measurements to derive and interpret frequency and impulse response of physical spaces. (Assessed by multiple-choice exam and a report.)	Your technical communication is developed by keeping a laboratory logbook and by writing a technical report for the room acoustics design exercise (assessed).	
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		

	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				
	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		

	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		
Stage 3	ELE00051H	Progress towards PLO	You will gain knowledge of, and experience in using, a commonly--used programming language. You will also learn about the principles of good user-interface design for audio applications.	You will learn to critically assess your own work against external standards.	You will learn to develop a specification for a creative piece of user-friendly software to address a real-world problem, industry standards.	You will gain experience of applying and developing your programming skills within the development environment for iOS.	You will develop your ability to document software to professional standards.	You will hone your skills in personal time and workflow management while learning new languages and libraries, coordinating information from lectures, labs and external sources, and delivering a finished app to a deadline.
	iOS Audio Programming	By working on (and if applicable, assessed through)	Your learning will come from lectures and computer labs using Apple's Swift language and external library AudioKit to make musical/audio-processing software for iOS devices (assessed by software submission).	The laboratory exercises will help you with this, and you will review your own work against company criteria provided by Apple.	Lectures and provided reading will develop an appreciation of user - interface design considerations. (Assessed by a submitting a software app.)	Working though a graded series of computer laboratories will introduce key programming features and audio programming skills. (Assessed by submitting a software app.)	You will produce a piece of software (iOS app, assessed) while following Apple's guidelines and app-store submission requirements. You will also create engaging documentation for software, both within the software itself and via an external web-page (both assessed).	You will manage the process of producing a creative piece of user--friendly software to industry standards (assessed).
Stage 3	ELE00054H	Progress towards PLO	You will learn to understand and appreciate the relationship between picture and sound.		You will learn about the process of developing a soundtrack for professionally produced media.	You will develop a working knowledge of the tools required for audio postproduction, including a Digital Audio Workstation based recording environment, and the associated handling and management of audio and video based assets.	You will be able to support creative output with comprehensive and reasoned technical documentation.	You will develop your ability to work both individually and in teams to complete creative and technical audio/video postproduction based tasks.

	Multimedia Sound Design	By working on (and if applicable, assessed through)	Lectures, and associated reading and multimedia material, will introduce you to the art and science of creating music and sound effects for visual media such as television, film and computer games (assessed by creative technical group project and individual report).		You will develop a script for the soundtrack for a piece of provided video (assessed by report).	Formative laboratory sessions will explain and provided experience in using the Digital Audio Workstation tools, then a group-based multimedia exercise will allow you to practice and develop these skills. (Assessed by a submitted soundtrack.)	An individual report (assessed) allows you to detail and reflect upon the technical and creative work done by the group and your own contribution to it.	A complex multimedia project (assessed), allows you to gain experience working in teams, similar to industry--based production companies.
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	
	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	
Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				

	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		
	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			
	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			

Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.
	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.

Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportunity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00056H	Progress towards PLO	You will understand specification, design, prototyping, implementation and testing methods in the context of formal software engineering methods.		You will learn to effectively use tools to conceptualise, specify and support the creation of products within a software engineering process	You will learn to apply your programming skills in a multi-programmer small business environment, including the use of source control.	You will develop the ability to communicate effectively within a team and to explain complex technical issues to external customers.	You will be able to understand the role of project management in a practical, team based and time pressured context. This includes the basic operational aspects of a small business.
	Software Engineering Project	By working on (and if applicable, assessed through)	A major team-based scenario involves you in the creation of a new, software based, product.		Working in a group, you will create a product idea to address a real-world issue. (Assessed by report.)	In your group, you will work through the development of a software product. (Assessed by report.)	A number of meetings are held with team members, customers and suppliers to ensure that all aspects are covered and that all stakeholders are kept fully informed at all times. Final technical reports are assessed.	A clear definition of tasks, timescales and responsibilities within the team ensures that clear lines of communication are established.

Stage 4	ELE00101M	Progress towards PLO	You will know how to research, design, construct and verify a substantial project in a complex and/or highly specialised area of engineering.	You will be able to critically evaluate appropriate scientific literature and synthesise new information.	In the final-year project, you will engage with an advanced current research or development issue, and learn to create a testable, practical specification for your solution.	You will learn to evaluate and assess alternative approaches to implementing your chosen solution from an agreed specification.	You will master the art of writing concise technical reports and defending presentations on advanced topics.	You will finely hone your skills in project management, including the management of time, risk and resources.
	MEng Individual Project	By working on (and if applicable, assessed through)	An individual project over 2 full terms gives you an intensive period of time to run a project, with a variety of assessments throughout.	Your developing skills in gathering and critically analysing information from reliable sources is assessed in an initial Literature Report.	Supported by feedback during supervisions, you will develop your ideas into a workable specification. (Assessed by project report.)	Guided by regular supervision meetings, you will work independently towards developing a working solution. (Assess by project report.)	Your technical communication will be assessed by constructing technical reports for a specified audience and defending your project in a viva setting.	You will work individually on a major project which develops your capacity to think independently and creatively about a specific area of electronic engineering and develop your problem solving in this area (assessed by report and viva).
Stage 4	ELE00097M	Progress towards PLO	You will be introduced to advanced cost--function based control design techniques, including optimal control (LQR) and model- predictive control (MPC).	You will deepen your insights into the theory and practice of optimal control via real-world examples.		You will learn to use CAD tools for the development of LQR and MPC controllers.		
	Advanced Control	By working on (and if applicable, assessed through)	Lectures, workshops and illustrative examples cover LQR, and provide a mathematical framework for the receding -horizon terminal constraints of MPC (assessed by exam).	You will use software tools on examples and case studies, in practical computer workshops and self -study, based upon the MATLAB environment.		Laboratory sessions will give you practical experience of control system design using CAD tools.		

Stage 4	ELE00007M	Progress towards PLO	You will understand how electrical signals are generated within the human body, and describe and apply techniques to model these signals.	You will become familiar with a range of computational and analytical methods appropriate to medical research and clinical practice	You will learn how medical diagnosis, therapy, risk assessment and dosimetry lead to engineering specifications on the use of EM fields and waves.	You will learn how to use image processing techniques to interpret the results of medical imaging scans.	You will develop your skills in critically evaluating and synthesising new information based on researched information and writing concise technical reports appropriate for the target audience. You will also able to design, deliver and defend persuasive technical presentations based on selected reliable evidence to the target audiences.	You will develop the skills necessary to undertake a small group research project in a topic related to electronics for medicine.
	Electronics for Medicine	By working on (and if applicable, assessed through)	Lectures introduce you to a range of methods appropriate to medical research and clinical practice (assessed by report and presentation).	Image processing laboratories provide a link between knowledge and practical experience.	Engaging with lecture material and directed reading will lead to an understanding of the role of EM waves in medicine. (Assessed through an individual report and presentation slides.)	A series of practical exercises in labs will illustrate how image processing can help with diagnosis.	An individual report (max 3000 words, assessed) and a presentation (slides assessed) allow you to develop the above technical communication skills.	The results of the group work are summarised and reflected upon in an individual report (assessed) and presented orally in a group (assessed).
Stage 4	ELE00103M	Progress towards PLO	You will learn the basic concepts involved in measuring and controlling position and motion for both mobile and fixed - arm robotic systems, examining the use of different forms of sensors and their use for the purposes of orientation control and navigation.	You will develop fluency in the analysis of robotic systems, and the use of mathematical descriptions of position, orientation, and forces involved in robot control.	You will explore the challenges and solutions involved in using robots in both the manufacturing and service industries, and for field applications.	You will develop insights into the practicalities of robotic control using specialist simulation tools.		
	Robotics	By working on (and if applicable, assessed through)	Information is delivered via lectures, workshops, worked examples and self study (assessed by closed-book examination).	MATLAB computer laboratory sessions and self study give you practical experience (assessed by closed-book examination).	By engaging with lecture content, worked examples and directed reading.	A series of laboratory sessions will provide experience in developing and testing robotic control systems.		

Stage 4	ELE00059M	Progress towards PLO	You will be able to understand the requirements for monitoring the environment; the nature and effects of the various forms of air and water pollution; the operation of sensors and instrumentation, particularly for environmental and industrial monitoring; and the limitations of sensors.		You will learn to specify appropriate sensors for a range of engineering and environmental problems, and appreciate the effects these have on system performance.		You will hone your ability to construct concise technical reports that critically evaluate and synthesise new information based on research, appropriate for the target audience.	
	Sensors & Instrumentation	By working on (and if applicable, assessed through)	Knowledge is gained by guided reading through lecture material and recommended scientific journal and conference papers (assessed by a techincal reseaarch report on a relevant topic).		Engaging with lecture material and through directed reading you will learn about real-world applications of sensors. (Assessed by closed-book exam.)		An individual technical reseach report (assessed) selected from the topics covered in the module allows you to communicate information about sensors and instrumentation.	
Stage 4	ELE00005M	Progress towards PLO	You will develop an understanding of information theory and its application to coding schemes used in wireless communication systems.	You will develop skills in the application of mathematical techniques and understand the implications of the answer.	You will learn to specify appropriate error control schemes for wireless systems, and evaluate their effects on system performance.	You will use simulation tools to evaluate and compare the performance of different types of error control codes.	You will develop your ability to explain and evaluate advanced techincal concepts concisely and accurately.	
	Information Theory & Error Control Coding	By working on (and if applicable, assessed through)	Knowledge comes through engaging with lectures and background studies on information and coding theory, focusing on error control coding as applied to wireless communication systems (assessed through formative tutorial questions and summative examination).	In labs and example exercises you will learn how to quantify information and compute entropy, mutual information and channel capacity, and how to encode & decode linear block codes and convolutional codes, and calculate decoded bit error rates (assessed through formative tutorial questions and summative examination).	By engaging with lecture material, working through example problems and directed reading you will learn the most common techniques of error control coding. (Assessed through a closed-book exam.)	A series of practical exercises will lead you through how to implement and evaluate error-control schemes.	A lab book kept during practical work allows you to demonstrate concepts of encoding and decoding procedures .	

Stage 4	ELE00105M	Progress towards PLO	You will gain knowledge of channel characteristics and physical layer techniques used for wired, optical and wireless digital communication systems.	You will be able to apply a range of mathematical tools and models to common transmission problems.	You will learn to specify realistic and achievable performance levels for real-world communication links.	You will learn to evaluate performance of transmission schemes using computer simulation,	You will be able to explain and evaluate advanced techincal concepts concisely and accurately.	
	Wired, Wireless & Optical Transmission	By working on (and if applicable, assessed through)	Lectures and wider reading to introduce the students to communication channel characteristics and technologies designed to exploit them and/or overcome constraints, as used in current systems and standards such as DSL, Ethernet, WiFi, 4G and DVB (assessed through formative tutorial questions and summative examination).	A series of lab exercises and example sheets helps develop your ability to calculate power budgets in wired, wireless and optical links, and to determine suitable channel models to analyse performance of wired, wireless and optical systems (assessed through formative tutorial questions and summative examination).	By engaging with examples presented in lectures and working though example sheets, you will learn how to specify real-world transmission systems. (Assessed by closed-book exam.)	By working through a series of laboratory simulation exercises using MATLAB you will evaluate and compare the performance of common modulation schemes.	You will be able to describe, explain and justify techniques used in current communication systems, in response to tutorial questions and in (assessed) examination papers.	
Stage 4	ELE00017M	Progress towards PLO	You will be able to understand the principles and techniques of bioinspired computing to the extent of being able to solve meaningful computational tasks and research and create evolutionary computing solutions to real world problems.	You will be able to compare and critically evaluate the differences between the approaches of conventional design and evolutionary design; and be aware of, and make informed decisions about, state-of-the-art biologically-inspired computation methods.	You will learn how bio-inspired algorithms can be applied to solve real-world computing problems, and to select appropriate algorithms.	You will learn to select, design and apply evolutionary algorithms to find solutions to search problems.	You will develop advanced skills in designing, delivering and defending engaging presentations on advanced topics, and in critically evaluating and synthesising new information based on research. You will also learn to produce comprehensive software/hardware documentation.	

	Bio-Inspired Computation	By working on (and if applicable, assessed through)	You will work through a set of class problems and lab exercises (assessed through an individual research paper & presentation on a small project.	You will work through a set of class problems and lab exercises (assessed through an individual research paper & presentation on a small project.	Engaging with lectures and lab scripts will develop insight into the range and applicability of bio-inspired algorithms.	A set of lab exercises involving the creation of bio-inspired algorithms, lead to an individual project requiring research to develop an evolutionary computing solution to a real-world problem. (Assessed by an individual research paper and presentation.)	You will conduct research from a list of projects, and create an evolutionary computing solution to a real-world problem, writing up and presenting the results (both assessed) in a succinct and informative manner.	
Stage 4	ELE00062M	Progress towards PLO	You will learn how systems programming is different from applications programming. You will develop your skills in C progamming to an advanced level, and become familiar with low-level programming concepts such as processor modes, direct interaction with the stack, and writing interrupt and exception handlers.	You will start to learn the delicate art of systems-level debugging, analysing stack traces and memory dumps to find bugs.		You will develop skills in designing task scheduling and synchronisation algorithms suitable for embedded systems. You will learn to exploit the mechanisms available for the implementation atomic operations on an ARM Cortex M device, and to write substantial parts of a small operating system kernel for an ARM Cortex M device, in C and assembly language.	You will develop your report-writing skills, and also learn to produce code that is self-documenting and well commented.	
	Systems Programming for ARM	By working on (and if applicable, assessed through)	The lectures will introduce several new keywords and C language features, and you will get practice using these in the laboratory sessions. You will undertake a programming task, and submit your code and a technical report (assessed) to demonstrate your knowledge.	The laboratory sessions will give you plenty of opportunities for low-level debugging. Your submitted report and code (assessed) will show that you have engaged with this process.		In the laboratory sessions you will design a low-level systems in the context of an ARM-based embedded platform. (Assessed though a technical report and code submission.	During the laboratory sessions you will be encouraged to write readable, documented code. Your technical report and code submission (assessed) will provide evidence of your skills in this area.	
Stage 4	ELE00039M	Progress towards PLO	You will understand the various concepts of idea generation techniques and applications that can be used within an organization.	You will develop your capacity for analysis and synthesis of ideas.	You will develop your creativity and understanding of innovation.	You will develop your ability to generate ideas in a new area .	You will be able to generate, develop and communicate ideas to relevant stakeholders.	

	Ideation	By working on (and if applicable, assessed through)	BY: participating in lectures on creativity, intrapreneurship, idea refinement and commercial exploitation (assessed by individual report).	BY: working on an assignment on idea generation and selection (assessed by presentation and report).	BY: designing a selection approach for a new application area to allow the better ideas generated to be identified	BY: participating in lectures on creativity, intrapreneurship, idea refinement and commercial exploitation (assessed by individual report).	BY: communicating an idea through an 'elevator pitch', then more deeply through a written proposal (all assessed).	
Stage 4	ELE00022M	Progress towards PLO	You will be able to understand and explain the meaning of common strategic management terminology and strategic management issues.	You will be able to strategically analyse an organisation or business unit's position, compare strategic opportunities, and recommend a way forward.	You will learn to plan an organisation's structure and systems to achieve an agreed strategy.		You will enhance your ability to discuss and debate technical and commercial issues.	Your team working abilities and experience will be enhanced in a business context.
	Strategic Management	By working on (and if applicable, assessed through)	Lectures and wider reading material introduce students to the terminology and issues of strategic management (assessed by group and personal reflective reports).	You will analyse the strategic position and direction of a case study organisation in class exercises.	Working in class in a Company Board Room simulated setting will develop skills in analysing the strategic position and direction of a case study organisation.		You will work in a simulated Company Board Room setting to experience board level activities. You will construct concise technical reports (assessed) that critically evaluate and synthesise new information based on research, and design, deliver and defend a persuasive technical presentation (assessed) based on selected reliable evidence.	By working in a Company Board Room simulated setting you will learn how to analyse the strategic position and direction of a case study organisation (assessed by group report and personal reflective report).
Stage 4	ELE00104M	Progress towards PLO	You will be able to understand leadership from a theoretical perspective, the different types of leadership, leadership styles and leadership tools and techniques.	You will be able to analyse a business situation and to propose and justify appropriate leadership styles.			You will gain confidence in discussion, debating, and public speaking.	You will develop your team working abilities and enhance your personal development planning.

	Skills for Business Leadership	By working on (and if applicable, assessed through)	Information is delivered via lectures and wider reading on the theory and fundamentals of leadership.	Business analysis experience is obtained by working in groups on case studies.			Throughout the module there are opportunities to take part in class discussions and debates on appropriate leadership skills, and give a presentation of group findings to the class.	You will prepare a personal leadership development plan (assessed) which is informed by in-class debate and discussion.
Stage 4	ELE00102M	Progress towards PLO	You will understand the mathematical underpinning and uses of physical and spectral modelling synthesis techniques.	You will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.		Working with specialist software, you will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.	You will learn to communicate and present theoretical and practical examples of physical modelling methods to a non--expert audience through an online publication.	
	Physical Modelling Synthesis	By working on (and if applicable, assessed through)	Lectures and laboratories allow you to develop skills in critically evaluating and synthesising new information based on recent research in this area (assessed through technical web-page).	Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)		Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)	An online report (assessed) allows you to take technical information developed in the laboratories and summarise and explain it for a non-expert audience on a multimedia web-page.	
Stage 4	ELE00074M	Progress towards PLO	You will have a solid understanding of the physiology of speech production, and be able to apply articulatory phonetic descriptions to speech and singing. You will understand the principles and methods of speech synthesis and its applications, understand healthy voice use and vocal hygiene, and will have developed an understanding of research strategies including critical thinking and literature review.	You will understand the principles of current analysis techniques, including their merits, limitations and appropriate applications. You'll be able to identify vocal and speech qualities based on listening and on visual inspection of spectrograms and an Lx waveform, and have developed your analytical and numerical skills.		You will learn to use several techniques to accurately measure aspects of voice, including electrolaryngograph and audio signal recordings, and learn to transcribe voice recordings using the International Phonetics Alphabet.	You will be able to talk about a voice-related topic in front of your peers, and develop skills in report writing and presentation.	You will develop your skills of team working and independent working.

	Voice:Acoustics & Applications	By working on (and if applicable, assessed through)	Lectures and guided research reading introduce students to voice production in terms of both physiological processes and acoustic output, analysis methods and synthesis techniques. Assessed by report and presentation.	You will gain practice in analysis, leading to a fluent understanding of phonetics and phonetic descriptors to enable students to describe vocal sounds.		A series of laboratory sessions will train you in methods of voice synthesis (including using Pure Data), and in identifying limitations and potential improvements to the systems being implemented.	You will design, deliver and defend a persuasive technical presentation based on selected reliable evidence (assessed) then construct a concise technical report that critically evaluates and synthesises new information based on research (assessed).	Pair work in labs allows discussion, planning and problem-solving.
Stage 4	ELE00100M	Progress towards PLO	You will be able to describe the advancement of information storage techniques, and to understand the basic principles of semiconductor storage and memories. You'll also be able to explain the principle of magnetic recording, to identify the limitations and gaps in the current memory and storage techniques, and to describe the next-generation of memories and storage.	You will be able to measure the length scale of current storage technologies.			You will develop your ability to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Information Storage & Spintronics	By working on (and if applicable, assessed through)	Information is delivered by lectures and directed reading material explaining information storage techniques, supplemented by class examples and laboratory work on the fundamental concepts of information storage techniques (assessed).	Lectures and reading material explaining quantum mechanics lead to class examples and laboratories (assessed).			You will write an individual report (assessed) to describe the fundamental principles and operation of information storage techniques .	

Stage 4	ELE00065M	Progress towards PLO	You will be able to demonstrate an understanding of a range of musical performance analysis techniques, and to evaluate historical and recent approaches.	You will be able to assess issues relevant to music performance analysis and comparison, music information retrieval, performance analysis and perception, and to evaluate current real-time feedback systems for musical training.	By evaluating historical and recent approaches, you will formulate your own innovative solution to specify an implementable system for real-time visual (or other) feedback of music performance.	You will use a range of high and low-level software tools to implement and evaluate a new system for real-time visual (or other) feedback of music performance.	You will present work--in--progress to peers through oral presentation and demonstration, and assess peer contributions offering constructive criticism. You'll also provide reflective evaluation of your own work and that of others.	You will develop the ability to plan your own project work, setting goals and a timetable for completion within a given timescale.
	Music Performance Analysis Systems	By working on (and if applicable, assessed through)	Lectures (showing analytical views of issues of music performance analysis in their historical context) and self--directed research reading, lead to a video and technical report (both assessed).	Laboratories encourage critical evaluation of existing techniques for both off-line analysis and real--time musical performance analysis and feedback.	A series of laboratories start with developing your own design of a real--time musical performance analysis and feedback system.	A series of laboratories will support you in using a range of creating a new feedback system for musical performance. (Assessed by a project video, presentation and report.)	A short video presentation, and technical reference guide (both assessed) allow you to document and reflect on a new system for analysis and feedback.	You will plan and manage an individual project to create a new feedback system for musical performance.
Stage 4	ELE00127M	Progress towards PLO	You will gain knowledge of semiconductor devices, how they operate and how they are manufactured, and appreciate the challenges of fabrication, implications of technology nodes/sizes and consequences on device performance and behaviour.	You will appreciate the difference between abstract device/circuit behaviour, device models and physical implementation in hardware.	You will understand microelectronic design techniques.	You will be able to apply theoretical and practical knowledge and understanding of microelectronics in order to specify, design, simulate and test significant elements and building blocks of transistor-level electronic circuits.	You will develop the skills to communicate effectively with peers, and form learning/working groups.	You will gain problem solving and task identification skills, and work with peers on technical examples.
	Integrated Circuit Design & Simulation	By working on (and if applicable, assessed through)	BY: attending lectures and seminars on the concepts of microelectronic design techniques and systems (assessed by closed-book examination).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: a series of practical laboratories (including formative feedback) within the framework of industry standard design tools (e.g. Cadence, Mentor).	BY: participation in seminars, peer work in labs, and by clear technical analysis and communication (assessed by closed-book examination).	BY: participation in seminars, peer work in labs.

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Communication Engineering MEng	Programmes:	MEng Electronic and Communication Engineering (H629) MEng Electronic and Communication Engineering with a year in industry (H628)	

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Conduct research in applied electronic and communications engineering to advance the state of knowledge in algorithms, devices and systems.	**Extract and critically evaluate data from complex systems through a variety of analytical techniques including computational methods and modelling.**	**Create innovative and optimised designs to address real-world problems involving electronic and communications hardware and software by synthesising ideas into engineering specifications.**	**Apply professional skills of programming, CAD, construction and measurement, combined with an understanding of communications engineering systems and components, to solve technically challenging problems.**	**Debate, defend and contextualise information in a succinct and technically accurate manner for audiences of engineers and members of the public, and to write and interpret technical documentation.**	**Proficiently manage themselves, teams and complex projects in preparation for technical careers as leaders in applied electronic engineering and wired and wireless communications systems.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00026C	Progress towards PLO	You will learn about the operation of microprocessors and microcontrollers, and the techniques of assembly-language and low-level programming.			You will learn to write programs in machine code and assembly language, and to write programs for interfacing using higher-level languages.	You will learn to explain technical concepts concisely and accurately.	You will be able to manage your own progress in implementing software solutions.
	Digital Systems	By working on (and if applicable, assessed through)	The lectures will give you all the information that you need, and laboratory sessions will give you practice. A technical report (assessed) will test your knowledge.			A series of lab-based assignments will teach you to develop microcontroller-based solutions. (Assessed by report and submitting code)	You will write a report (assessed) that clearly describes the operation of low-level code and its interaction with target hardware.	A large-scale summative design exercise at the end of the module helps you to manage work leading to a technical report with accompanying code (both assessed).

Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of appropriate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.

	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		
	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)
Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.

	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstrati on)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).
Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.

	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	
	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		

	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				
	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		

	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		
Stage 3	ELE00046H	Progress towards PLO	You will learn about the propagation mechanisms of electromagnetic waves within materials, and how to classify materials according to the nature of a wave propagating through them. You will also learn about the principles of waveguiding, the importance of antennas in all types of radio communication systems, the problems of interference and fading, and channel models.	You will learn to determine the interactions of electromagnetic waves at boundaries between materials, and to describe and calculate the loss and dispersion limits of propagation distance in fibre optical links. You will also learn to to specify the performance of a radio system in terms of antenna characteristics, and to estimate the channel losses for guided, ground, sky and freespace waves, including the effects of diffraction and reflections, and know what applications use these propagation modes.	You will know how to use the Smith Chart for transmission line calculations; will be able to design single stub and quarterwave matching networks; and to appreciate the main considerations in design of freespace and guided optical links.	You will learn how to use an RF network analyser, and how to use Smith charts to analyse distributed circuits, as well as how to prototype and construct high-frequency circuits.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	

	Applications of EM	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will provide you with the knowledge you need. Laboratory tasks and workshop exercises will help you reinforce your knowledge. (Assessed by closed-book exam.)	Lectures will provide you with the information that you need, and workshop exercises will help reinforce it. Laboratory tasks using a bespoke software simulator to model and characterise a transmission line will put your knowledge into a practical context. (Assessed by closed-book exam.)	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	Laboratory tasks with peers allow you to discuss the issues with each other and with lab leader/lab instructors/technicians.	
Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	

	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	
Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		

	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			
	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	

Stage 3	ELE00011H	Progress towards PLO	You will develop the ability to design complex digital circuits that take into account performance and testability, and to exploit IP components in the design of digital circuits. You will gain experience in interfacing custom circuits with external components.	You will become familiar with the tools required to analyse circuits from the point of view of performance and testability, and with the use of advanced testing and test-bench design techniques to verify digital circuits.		You will further your design skills using a hardware description language to build a omplex system including IP components.	You will develop your skills in the documentation of digital circuits, including timing- and test-related information.	You will hone your skills in team working and time management.
	Digital Engineering	By working on (and if applicable, assessed through)	Lectures will provide you with knowledge, and a set of lab exercises will give you practice. You will also read and understanding IP component documentation. You will complete a final project involving the design of high-performance, testable circuits that use IP components. Assessed through lab and final project reports.	A set of lab exercises, involving the use of simulation tools to implement and verify digital circuits that meet performance and/or testability constraints, will give you this familiarity. Assessed through lab and final project reports.		A set of lab exercises will lead you through the process of including IP components in a design of a high-performance, testable digital system, and implementing it in a Field Programmable Gate Array (FPGA). (Assessed by lab and final project reports.)	The laboratory and project reports (assessed) require professional presentation and annotation of VHDL code (including timing and testing considerations), testbenches, and simulations.	You will work on a sequence of laboratory-based group tasks and a final group project (assessed)that require independent work outside of supervised lab hours.
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.

	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.
Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportinity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00025H	Progress towards PLO	You will learn to combine the principles and laws of optics, semiconductor physics and technology, and quantum mechanics in the context of photonics and nanophotonics.	You will learn to apply the apparatus of ordinary and partial differential equations, eigenvalue problems, Fourier analysis etc. to analysis of light propagation in photonic and nanophotonic devices, their modal structure, and ultimately their performance.	You will learn how the use of photonic and nanophotonic technology, devices, and subsystems are used in long-distance communications, storage and retrieval (e.g. DVD/Blu-Ray) and data acquisition (photonic sensors), and the requirements of photonic components for each of these applications		You will be able to explain the principle and performance of photonics and nanophotonics on both qualitative level (verbal explanations) and quantiative level (phenomenological and if required microscopic analysis) and show the logical progression from fundamental principles to peformance issues.	

	Photonics & Nanophotonics	By working on (and if applicable, assessed through)	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Engagement in lectures, workshops and reading supporting material. (Assessed by a closed-book exam.)		You will be expected to synthesis the knowledge and experience from lectures, workshop questions, and supporting material explaining the principles of photonics. Assessed by examination.	
Stage 3	ELE00056H	Progress towards PLO	You will understand specification, design, prototyping, implementation and testing methods in the context of formal software engineering methods.		You will learn to effectively use tools to conceptualise, specify and support the creation of products within a software engineering process	You will learn to apply your programming skills in a multi-programmer small business environment, including the use of source control.	You will develop the ability to communicate effectively within a team and to explain complex technical issues to external customers.	You will be able to understand the role of project management in a practical, team based and time pressured context. This includes the basic operational aspects of a small business.
	Software Engineering Project	By working on (and if applicable, assessed through)	A major team-based scenario involves you in the creation of a new, software based, product.		Working in a group, you will create a product idea to address a real-world issue. (Assessed by report.)	In your group, you will work through the development of a software product. (Assessed by report.)	A number of meetings are held with team members, customers and suppliers to ensure that all aspects are covered and that all stakeholders are kept fully informed at all times. Final technical reports are assessed.	A clear definition of tasks, timescales and responsibilities within the team ensures that clear lines of communication are established.
Stage 4	ELE00101M	Progress towards PLO	You will know how to research, design, construct and verify a substantial project in a complex and/or highly specialised area of engineering.	You will be able to critically evaluate appropriate scientific literature and synthesise new information.	In the final-year project, you will engage with an advanced current research or development issue, and learn to create a testable, practical specification for your solution.	You will learn to evaluate and assess alternative approaches to implementing your chosen solution from an agreed specification.	You will master the art of writing concise technical reports and defending presentations on advanced topics.	You will finely hone your skills in project management, including the management of time, risk and resources.
	MEng Individual Project	By working on (and if applicable, assessed through)	An individual project over 2 full terms gives you an intensive period of time to run a project, with a variety of assessments throughout.	Your developing skills in gathering and critically analysing information from reliable sources is assessed in an initial Literature Report.	Supported by feedback during supervisions, you will develop your ideas into a workable specification. (Assessed by project report.)	Guided by regular supervision meetings, you will work independently towards developing a working solution. (Assess by project report.)	Your technical communication will be assessed by constructing technical reports for a specified audience and defending your project in a viva setting.	You will work individually on a major project which develops your capacity to think independently and creatively about a specific area of electronic engineering and develop your problem solving in this area (assessed by report and viva).

Stage 4	ELE00097M	Progress towards PLO	You will be introduced to advanced cost--function based control design techniques, including optimal control (LQR) and model- predictive control (MPC).	You will deepen your insights into the theory and practice of optimal control via real-world examples.		You will learn to use CAD tools for the development of LQR and MPC controllers.		
	Advanced Control	By working on (and if applicable, assessed through)	Lectures, workshops and illustrative examples cover LQR, and provide a mathematical framework for the receding -horizon terminal constraints of MPC (assessed by exam).	You will use software tools on examples and case studies, in practical computer workshops and self -study, based upon the MATLAB environment.		Laboratory sessions will give you practical experience of control system design using CAD tools.		
Stage 4	ELE00007M	Progress towards PLO	You will understand how electrical signals are generated within the human body, and describe and apply techniques to model these signals.	You will become familiar with a range of computational and analytical methods appropriate to medical research and clinical practice	You will learn how medical diagnosis, therapy, risk assessment and dosimetry lead to engineering specifications on the use of EM fields and waves.	You will learn how to use image processing techniques to interpret the results of medical imaging scans.	You will develop your skills in critically evaluating and synthesising new information based on researched information and writing concise technical reports appropriate for the target audience. You will also able to design, deliver and defend persuasive technical presentations based on selected reliable evidence to the target audiences.	You will develop the skills necessary to undertake a small group research project in a topic related to electronics for medicine.
	Electronics for Medicine	By working on (and if applicable, assessed through)	Lectures introduce you to a range of methods appropriate to medical research and clinical practice (assessed by report and presentation).	Image processing laboratories provide a link between knowledge and practical experience.	Engaging with lecture material and directed reading will lead to an understanding of the role of EM waves in medicine. (Assessed through an individual report and presentation slides.)	A series of practical exercises in labs will illustrate how image processing can help with diagnosis.	An individual report (max 3000 words, assessed) and a presentation (slides assessed) allow you to develop the above technical communication skills.	The results of the group work are summarised and reflected upon in an individual report (assessed) and presented orally in a group (assessed).

Stage 4	ELE00099M	Progress towards PLO	You will understand the complete design process of RF and Microwave circuits including analytical design skills, computer aided testing and optimisation and construction.	You will be able to select, adapt and apply a range of mathematical techniques to solve advanced problems and explain the implications of the answer; to specify high frequency systems (amplifiers, oscillators, mixers, resonators and filters and printed circuit boards) including RF and Microwave systems.	You will learn how to specify RF circuits for use in modern communication systems including mobile phones, TVs, tablets and PCs, including Bluetooth and Wi-Fi.	You will gain experience in using common RF and Microwave measurement instruments including spectrum and network analysers to test circuits you have designed and built, and learn how to use modern CAD tools for RF design.		
	High Frequency Electronics	By working on (and if applicable, assessed through)	Knowledge is gained by guided reading through lecture material and recommended texts, supplemented by formative workshop exercises, and is assessed by an exam.	Workshop exercises help you apply your new knowledge to solving problems (assessed summatively by module exam).	Engaging in lectures and studying directed reading will explain the most important parameters relating real-life systems to specifications.	In laboratory exercises you will use simulation tools such as Advance Design Systems to verify a design and test components.		
Stage 4	ELE00005M	Progress towards PLO	You will develop an understanding of information theory and its application to coding schemes used in wireless communication systems.	You will develop skills in the application of mathematical techniques and understand the implications of the answer.	You will learn to specify appropriate error control schemes for wireless systems, and evaluate their effects on system performance.	You will use simulation tools to evaluate and compare the performance of different types of error control codes.	You will develop your ability to explain and evaluate advanced techincal concepts concisely and accurately.	
	Information Theory & Error Control Coding	By working on (and if applicable, assessed through)	Knowledge comes through engaging with lectures and background studies on information and coding theory, focusing on error control coding as applied to wireless communication systems (assessed through formative tutorial questions and summative examination).	In labs and example exercises you will learn how to quantify information and compute entropy, mutual information and channel capacity, and how to encode & decode linear block codes and convolutional codes, and calculate decoded bit error rates (assessed through formative tutorial questions and summative examination).	By engaging with lecture material, working through example problems and directed reading you will learn the most common techniques of error control coding. (Assessed through a closed-book exam.)	A series of practical exercises will lead you through how to implement and evaluate error-control schemes.	A lab book kept during practical work allows you to demonstrate concepts of encoding and decoding procedures .	

Stage 4	ELE00105M	Progress towards PLO	You will gain knowledge of channel characteristics and physical layer techniques used for wired, optical and wireless digital communication systems.	You will be able to apply a range of mathematical tools and models to common transmission problems.	You will learn to specify realistic and achievable performance levels for real-world communication links.	You will learn to evaluate performance of transmission schemes using computer simulation,	You will be able to explain and evaluate advanced techincal concepts concisely and accurately.	
	Wired, Wireless & Optical Transmission	By working on (and if applicable, assessed through)	Lectures and wider reading to introduce the students to communication channel characteristics and technologies designed to exploit them and/or overcome constraints, as used in current systems and standards such as DSL, Ethernet, WiFi, 4G and DVB (assessed through formative tutorial questions and summative examination).	A series of lab exercises and example sheets helps develop your ability to calculate power budgets in wired, wireless and optical links, and to determine suitable channel models to analyse performance of wired, wireless and optical systems (assessed through formative tutorial questions and summative examination).	By engaging with examples presented in lectures and working though example sheets, you will learn how to specify real-world transmission systems. (Assessed by closed-book exam.)	By working through a series of laboratory simulation exercises using MATLAB you will evaluate and compare the performance of common modulation schemes.	You will be able to describe, explain and justify techniques used in current communication systems, in response to tutorial questions and in (assessed) examination papers.	
Stage 4	ELE00017M	Progress towards PLO	You will be able to understand the principles and techniques of bioinspired computing to the extent of being able to solve meaningful computational tasks and research and create evolutionary computing solutions to real world problems.	You will be able to compare and critically evaluate the differences between the approaches of conventional design and evolutionary design; and be aware of, and make informed decisions about, state-of-the-art biologically-inspired computation methods.	You will learn how bio-inspired algorithms can be applied to solve real-world computing problems, and to select appropriate algorithms.	You will learn to select, design and apply evolutionary algorithms to find solutions to search problems.	You will develop advanced skills in designing, delivering and defending engaging presentations on advanced topics, and in critically evaluating and synthesising new information based on research. You will also learn to produce comprehensive software/hardware documentation.	

	Bio-Inspired Computation	By working on (and if applicable, assessed through)	You will work through a set of class problems and lab exercises (assessed through an individual research paper & presentation on a small project.	You will work through a set of class problems and lab exercises (assessed through an individual research paper & presentation on a small project.	Engaging with lectures and lab scripts will develop insight into the range and applicability of bio-inspired algorithms.	A set of lab exercises involving the creation of bio-inspired algorithms, lead to an individual project requiring research to develop an evolutionary computing solution to a real-world problem. (Assessed by an individual research paper and presentation.)	You will conduct research from a list of projects, and create an evolutionary computing solution to a real-world problem, writing up and presenting the results (both assessed) in a succinct and informative manner.	
Stage 4	ELE00039M	Progress towards PLO	You will understand the various concepts of idea generation techniques and applications that can be used within an organization.	You will develop your capacity for analysis and synthesis of ideas.	You will develop your creativity and understanding of innovation.	You will develop your ability to generate ideas in a new area .	You will be able to generate, develop and communicate ideas to relevant stakeholders.	
	Ideation	By working on (and if applicable, assessed through)	BY: participating in lectures on creativity, intrapreneurship, idea refinement and commercial exploitation (assessed by individual report).	BY: working on an assignment on idea generation and selection (assessed by presentation and report).	BY: designing a selection approach for a new application area to allow the better ideas generated to be identified	BY: participating in lectures on creativity, intrapreneurship, idea refinement and commercial exploitation (assessed by individual report).	BY: communicating an idea through an 'elevator pitch', then more deeply through a written proposal (all assessed).	
Stage 4	ELE00104M	Progress towards PLO	You will be able to understand leadership from a theoretical perspective, the different types of leadership, leadership styles and leadership tools and techniques.	You will be able to analyse a business situation and to propose and justify appropriate leadership styles.			You will gain confidence in discussion, debating, and public speaking.	You will develop your team working abilities and enhance your personal development planning.
	Skills for Business Leadership	By working on (and if applicable, assessed through)	Information is delivered via lectures and wider reading on the theory and fundamentals of leadership.	Business analysis experience is obtained by working in groups on case studies.			Throughout the module there are opportunities to take part in class discussions and debates on appropriate leadership skills, and give a presentation of group findings to the class.	You will prepare a personal leadership development plan (assessed) which is informed by in-class debate and discussion.

Stage 4	ELE00102M	Progress towards PLO	You will understand the mathematical underpinning and uses of physical and spectral modelling synthesis techniques.	You will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.		Working with specialist software, you will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.	You will learn to communicate and present theoretical and practical examples of physical modelling methods to a non--expert audience through an online publication.	
	Physical Modelling Synthesis	By working on (and if applicable, assessed through)	Lectures and laboratories allow you to develop skills in critically evaluating and synthesising new information based on recent research in this area (assessed through technical web-page).	Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)		Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)	An online report (assessed) allows you to take technical information developed in the laboratories and summarise and explain it for a non-expert audience on a multimedia web-page.	
Stage 4	ELE00100M	Progress towards PLO	You will be able to describe the advancement of information storage techniques, and to understand the basic principles of semiconductor storage and memories. You'll also be able to explain the principle of magnetic recording, to identify the limitations and gaps in the current memory and storage techniques, and to describe the next-generation of memories and storage.	You will be able to measure the length scale of current storage technologies.			You will develop your ability to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	

	Information Storage & Spintronics	By working on (and if applicable, assessed through)	Information is delivered by lectures and directed reading material explaining information storage techniques, supplemented by class examples and laboratory work on the fundamental concepts of information storage techniques (assessed).	Lectures and reading material explaining quantum mechanics lead to class examples and laboratories (assessed).			You will write an individual report (assessed) to describe the fundamental principles and operation of information storage techniques .	
Stage 4	ELE00127M	Progress towards PLO	You will gain knowledge of semiconductor devices, how they operate and how they are manufactured, and appreciate the challenges of fabrication, implications of technology nodes/sizes and consequences on device performance and behaviour.	You will appreciate the difference between abstract device/circuit behaviour, device models and physical implementation in hardware.	You will understand microelectronic design techniques.	You will be able to apply theoretical and practical knowledge and understanding of microelectronics in order to specify, design, simulate and test significant elements and building blocks of transistor-level electronic circuits.	You will develop the skills to communicate effectively with peers, and form learning/working groups.	You will gain problem solving and task identification skills, and work with peers on technical examples.
	Integrated Circuit Design & Simulation	By working on (and if applicable, assessed through)	BY: attending lectures and seminars on the concepts of microelectronic design techniques and systems (assessed by closed-book examination).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: a series of practical laboratories (including formative feedback) within the framework of industry standard design tools (e.g. Cadence, Mentor).	BY: participation in seminars, peer work in labs, and by clear technical analysis and communication (assessed by closed-book examination).	BY: participation in seminars, peer work in labs.

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Business Management MEng	Programmes:	MEng Electronic Engineering with Business Management (H6NG) MEng Electronic Engineering with Business Management with a year in industry (H6NF)	

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Conduct research in business management and applied electronic engineering to advance the state of knowledge in organisations, systems, algorithms, and devices.	**Extract and critically evaluate data from complex technical systems and organisational strategies through a variety of analytical techniques including computational methods and modelling.**	**Create innovative and optimised designs to address real-world problems in industrial management and technology by synthesising ideas into engineering specifications.**	**Apply professional skills of programming, CAD, construction and measurement, combined with an understanding of engineering systems and components, to solve technically challenging problems.**	**Debate, defend and contextualise information in a succinct and technically accurate manner for audiences of engineers and members of the public, and to write and interpret technical documentation.**	**Proficiently manage themselves, teams and complex projects in preparation for technical careers as leaders in engineering management.**
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.

	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00026C	Progress towards PLO	You will learn about the operation of microprocessors and microcontrollers, and the techniques of assembly-language and low-level programming.			You will learn to write programs in machine code and assembly language, and to write programs for interfacing using higher-level languages.	You will learn to explain technical concepts concisely and accurately.	You will be able to manage your own progress in implementing software solutions.
	Digital Systems	By working on (and if applicable, assessed through)	The lectures will give you all the information that you need, and laboratory sessions will give you practice. A technical report (assessed) will test your knowledge.			A series of lab-based assignments will teach you to develop microcontroller-based solutions. (Assessed by report and submitting code)	You will write a report (assessed) that clearly describes the operation of low-level code and its interaction with target hardware.	A large-scale summative design exercise at the end of the module helps you to manage work leading to a technical report with accompanying code (both assessed).

Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of approprirate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.

	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		
	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		

Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)
Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.

	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstrati on)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).
Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.

	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	
	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		

	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				
	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		

	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		
Stage 3	ELE00008H	Progress towards PLO	You will learn about the place of technology management and marketing in the modern world, and about the change implications of technological innovation on an organisation.	You will learn to analyse and critique technological innovations.	You will learn to produce a marketing plan for a new technology based product or service.		You will develop you report writing skills for a professional business audience.	You will develop your understanding of the role of marketing and technology management in the modern world.
	Management & Marketing of Technology	By working on (and if applicable, assessed through)	Lectures and wider reading will provide you with the knowledge you need (assessed by report).	By attending lectures and engaging in in-class group activities, you will analyse and critique a past technological innovation (assessed by report).	By engaging with lecture materail and undertaking private study you will develop a marketing plan (assessed by report).		The development of a full marketing plan (assessed) will help you to communicate concisely and effectively with business audiences.	A variety of group and individual activities help you to explore the marketing of technology.
Stage 3	ELE00009H	Progress towards PLO	You will learn about the implications of legal instruments on the engineering business, and the implications of non-compliance.				You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience	You will explore the laws applicable to engineering business in international trading, and will be able to evaluate the difference in legal implications in business formation in the UK compared to another country.
	Law for Engineering Management	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the UK legal system and to the laws relating to the Professional Engineer, contracts, Intellectual Property, International trading and dealing with disputes (assessed by report).				You will research and construct a comparative study (assessed) of legal implications between the UK and a chosen country.	You will research and construct a comparative study (assessed) of legal implications between the UK and a chosen country.

Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	
	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		

	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			
	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	

Stage 3	ELE00011H	Progress towards PLO	You will develop the ability to design complex digital circuits that take into account performance and testability, and to exploit IP components in the design of digital circuits. You will gain experience in interfacing custom circuits with external components.	You will become familiar with the tools required to analyse circuits from the point of view of performance and testability, and with the use of advanced testing and test-bench design techniques to verify digital circuits.		You will further your design skills using a hardware description language to build a omplex system including IP components.	You will develop your skills in the documentation of digital circuits, including timing- and test-related information.	You will hone your skills in team working and time management.
	Digital Engineering	By working on (and if applicable, assessed through)	Lectures will provide you with knowledge, and a set of lab exercises will give you practice. You will also read and understanding IP component documentation. You will complete a final project involving the design of high-performance, testable circuits that use IP components. Assessed through lab and final project reports.	A set of lab exercises, involving the use of simulation tools to implement and verify digital circuits that meet performance and/or testability constraints, will give you this familiarity. Assessed through lab and final project reports.		A set of lab exercises will lead you through the process of including IP components in a design of a high-performance, testable digital system, and implementing it in a Field Programmable Gate Array (FPGA). (Assessed by lab and final project reports.)	The laboratory and project reports (assessed) require professional presentation and annotation of VHDL code (including timing and testing considerations), testbenches, and simulations.	You will work on a sequence of laboratory-based group tasks and a final group project (assessed)that require independent work outside of supervised lab hours.
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.

	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.
Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportinity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00025H	Progress towards PLO	You will learn to combine the principles and laws of optics, semiconductor physics and technology, and quantum mechanics in the context of photonics and nanophotonics.	You will learn to apply the apparatus of ordinary and partial differential equations, eigenvalue problems, Fourier analysis etc. to analysis of light propagation in photonic and nanophotonic devices, their modal structure, and ultimately their performance.	You will learn how the use of photonic and nanophotonic technology, devices, and subsystems are used in long-distance communications, storage and retrieval (e.g. DVD/Blu-Ray) and data acquisition (photonic sensors), and the requirements of photonic components for each of these applications		You will be able to explain the principle and performance of photonics and nanophotonics on both qualitative level (verbal explanations) and quantiative level (phenomenological and if required microscopic analysis) and show the logical progression from fundamental principles to peformance issues.	

	Photonics & Nanophotonics	By working on (and if applicable, assessed through)	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Engagement in lectures, workshops and reading supporting material. (Assessed by a closed-book exam.)		You will be expected to synthesis the knowledge and experience from lectures, workshop questions, and supporting material explaining the principles of photonics. Assessed by examination.	
Stage 3	ELE00056H	Progress towards PLO	You will understand specification, design, prototyping, implementation and testing methods in the context of formal software engineering methods.		You will learn to effectively use tools to conceptualise, specify and support the creation of products within a software engineering process	You will learn to apply your programming skills in a multi-programmer small business environment, including the use of source control.	You will develop the ability to communicate effectively within a team and to explain complex technical issues to external customers.	You will be able to understand the role of project management in a practical, team based and time pressured context. This includes the basic operational aspects of a small business.
	Software Engineering Project	By working on (and if applicable, assessed through)	A major team-based scenario involves you in the creation of a new, software based, product.		Working in a group, you will create a product idea to address a real-world issue. (Assessed by report.)	In your group, you will work through the development of a software product. (Assessed by report.)	A number of meetings are held with team members, customers and suppliers to ensure that all aspects are covered and that all stakeholders are kept fully informed at all times. Final technical reports are assessed.	A clear definition of tasks, timescales and responsibilities within the team ensures that clear lines of communication are established.
Stage 4	ELE00101M	Progress towards PLO	You will know how to research, design, construct and verify a substantial project in a complex and/or highly specialised area of engineering.	You will be able to critically evaluate appropriate scientific literature and synthesise new information.	In the final-year project, you will engage with an advanced current research or development issue, and learn to create a testable, practical specification for your solution.	You will learn to evaluate and assess alternative approaches to implementing your chosen solution from an agreed specification.	You will master the art of writing concise technical reports and defending presentations on advanced topics.	You will finely hone your skills in project management, including the management of time, risk and resources.
	MEng Individual Project	By working on (and if applicable, assessed through)	An individual project over 2 full terms gives you an intensive period of time to run a project, with a variety of assessments throughout.	Your developing skills in gathering and critically analysing information from reliable sources is assessed in an initial Literature Report.	Supported by feedback during supervisions, you will develop your ideas into a workable specification. (Assessed by project report.)	Guided by regular supervision meetings, you will work independently towards developing a working solution. (Assess by project report.)	Your technical communication will be assessed by constructing technical reports for a specified audience and defending your project in a viva setting.	You will work individually on a major project which develops your capacity to think independently and creatively about a specific area of electronic engineering and develop your problem solving in this area (assessed by report and viva).

Stage 4	ELE00097M	Progress towards PLO	You will be introduced to advanced cost--function based control design techniques, including optimal control (LQR) and model- predictive control (MPC).	You will deepen your insights into the theory and practice of optimal control via real-world examples.		You will learn to use CAD tools for the development of LQR and MPC controllers.		
	Advanced Control	By working on (and if applicable, assessed through)	Lectures, workshops and illustrative examples cover LQR, and provide a mathematical framework for the receding -horizon terminal constraints of MPC (assessed by exam).	You will use software tools on examples and case studies, in practical computer workshops and self -study, based upon the MATLAB environment.		Laboratory sessions will give you practical experience of control system design using CAD tools.		
Stage 4	ELE00007M	Progress towards PLO	You will understand how electrical signals are generated within the human body, and describe and apply techniques to model these signals.	You will become familiar with a range of computational and analytical methods appropriate to medical research and clinical practice	You will learn how medical diagnosis, therapy, risk assessment and dosimetry lead to engineering specifications on the use of EM fields and waves.	You will learn how to use image processing techniques to interpret the results of medical imaging scans.	You will develop your skills in critically evaluating and synthesising new information based on researched information and writing concise technical reports appropriate for the target audience. You will also able to design, deliver and defend persuasive technical presentations based on selected reliable evidence to the target audiences.	You will develop the skills necessary to undertake a small group research project in a topic related to electronics for medicine.
	Electronics for Medicine	By working on (and if applicable, assessed through)	Lectures introduce you to a range of methods appropriate to medical research and clinical practice (assessed by report and presentation).	Image processing laboratories provide a link between knowledge and practical experience.	Engaging with lecture material and directed reading will lead to an understanding of the role of EM waves in medicine. (Assessed through an individual report and presentation slides.)	A series of practical exercises in labs will illustrate how image processing can help with diagnosis.	An individual report (max 3000 words, assessed) and a presentation (slides assessed) allow you to develop the above technical communication skills.	The results of the group work are summarised and reflected upon in an individual report (assessed) and presented orally in a group (assessed).

Stage 4	ELE00103M	Progress towards PLO	You will learn the basic concepts involved in measuring and controlling position and motion for both mobile and fixed - arm robotic systems, examining the use of different forms of sensors and their use for the purposes of orientation control and navigation.	You will develop fluency in the analysis of robotic systems, and the use of mathematical descriptions of position, orientation, and forces involved in robot control.	You will explore the challenges and solutions involved in using robots in both the manufacturing and service industries, and for field applications.	You will develop insights into the practicalities of robotic control using specialist simulation tools.		
	Robotics	By working on (and if applicable, assessed through)	Information is delivered via lectures, workshops, worked examples and self study (assessed by closed-book examination).	MATLAB computer laboratory sessions and self study give you practical experience (assessed by closed-book examination).	By engaging with lecture content, worked examples and directed reading.	A series of laboratory sessions will provide experience in developing and testing robotic control systems.		
Stage 4	ELE00059M	Progress towards PLO	You will be able to understand the requirements for monitoring the environment; the nature and effects of the various forms of air and water pollution; the operation of sensors and instrumentation, particularly for environmental and industrial monitoring; and the limitations of sensors.		You will learn to specify appropriate sensors for a range of engineering and environmental problems, and appreciate the effects these have on system performance.		You will hone your ability to construct concise technical reports that critically evaluate and synthesise new information based on research, appropriate for the target audience.	
	Sensors & Instrumentation	By working on (and if applicable, assessed through)	Knowledge is gained by guided reading through lecture material and recommended scientific journal and conference papers (assessed by a techincal reseaarch report on a relevant topic).		Engaging with lecture material and through directed reading you will learn about real-world applications of sensors. (Assessed by closed-book exam.)		An individual technical reseach report (assessed) selected from the topics covered in the module allows you to communicate information about sensors and instrumentation.	

Stage 4	ELE00005M	Progress towards PLO	You will develop an understanding of information theory and its application to coding schemes used in wireless communication systems.	You will develop skills in the application of mathematical techniques and understand the implications of the answer.	You will learn to specify appropriate error control schemes for wireless systems, and evaluate their effects on system performance.	You will use simulation tools to evaluate and compare the performance of different types of error control codes.	You will develop your ability to explain and evaluate advanced techincal concepts concisely and accurately.	
	Information Theory & Error Control Coding	By working on (and if applicable, assessed through)	Knowledge comes through engaging with lectures and background studies on information and coding theory, focusing on error control coding as applied to wireless communication systems (assessed through formative tutorial questions and summative examination).	In labs and example exercises you will learn how to quantify information and compute entropy, mutual information and channel capacity, and how to encode & decode linear block codes and convolutional codes, and calculate decoded bit error rates (assessed through formative tutorial questions and summative examination).	By engaging with lecture material, working through example problems and directed reading you will learn the most common techniques of error control coding. (Assessed through a closed-book exam.)	A series of practical exercises will lead you through how to implement and evaluate error-control schemes.	A lab book kept during practical work allows you to demonstrate concepts of encoding and decoding procedures .	
Stage 4	ELE00105M	Progress towards PLO	You will gain knowledge of channel characteristics and physical layer techniques used for wired, optical and wireless digital communication systems.	You will be able to apply a range of mathematical tools and models to common transmission problems.	You will learn to specify realistic and achievable performance levels for real-world communication links.	You will learn to evaluate performance of transmission schemes using computer simulation,	You will be able to explain and evaluate advanced techincal concepts concisely and accurately.	
	Wired, Wireless & Optical Transmission	By working on (and if applicable, assessed through)	Lectures and wider reading to introduce the students to communication channel characteristics and technologies designed to exploit them and/or overcome constraints, as used in current systems and standards such as DSL, Ethernet, WiFi, 4G and DVB (assessed through formative tutorial questions and summative examination).	A series of lab exercises and example sheets helps develop your ability to calculate power budgets in wired, wireless and optical links, and to determine suitable channel models to analyse performance of wired, wireless and optical systems (assessed through formative tutorial questions and summative examination).	By engaging with examples presented in lectures and working though example sheets, you will learn how to specify real-world transmission systems. (Assessed by closed-book exam.)	By working through a series of laboratory simulation exercises using MATLAB you will evaluate and compare the performance of common modulation schemes.	You will be able to describe, explain and justify techniques used in current communication systems, in response to tutorial questions and in (assessed) examination papers.	

Stage 4	ELE00062M	Progress towards PLO	You will learn how systems programming is different from applications programming. You will develop your skills in C progamming to an advanced level, and become familiar with low-level programming concepts such as processor modes, direct interaction with the stack, and writing interrupt and exception handlers.	You will start to learn the delicate art of systems-level debugging, analysing stack traces and memory dumps to find bugs.		You will develop skills in designing task scheduling and synchronisation algorithms suitable for embedded systems. You will learn to exploit the mechanisms available for the implementation atomic operations on an ARM Cortex M device, and to write substantial parts of a small operating system kernel for an ARM Cortex M device, in C and assembly language.	You will develop your report-writing skills, and also learn to produce code that is self-documenting and well commented.	
	Systems Programming for ARM	By working on (and if applicable, assessed through)	The lectures will introduce several new keywords and C language features, and you will get practice using these in the laboratory sessions. You will undertake a programming task, and submit your code and a technical report (assessed) to demonstrate your knowledge.	The laboratory sessions will give you plenty of opportunities for low-level debugging. Your submitted report and code (assessed) will show that you have engaged with this process.		In the laboratory sessions you will design a low-level systems in the context of an ARM-based embedded platform. (Assessed though a technical report and code submission.	During the laboratory sessions you will be encouraged to write readable, documented code. Your technical report and code submission (assessed) will provide evidence of your skills in this area.	
Stage 4	ELE00039M	Progress towards PLO	You will understand the various concepts of idea generation techniques and applications that can be used within an organization.	You will develop your capacity for analysis and synthesis of ideas.	You will develop your creativity and understanding of innovation.	You will develop your ability to generate ideas in a new area .	You will be able to generate, develop and communicate ideas to relevant stakeholders.	
	Ideation	By working on (and if applicable, assessed through)	BY: participating in lectures on creativity, intrapreneurship, idea refinement and commercial exploitation (assessed by individual report).	BY: working on an assignment on idea generation and selection (assessed by presentation and report).	BY: designing a selection approach for a new application area to allow the better ideas generated to be identified	BY: participating in lectures on creativity, intrapreneurship, idea refinement and commercial exploitation (assessed by individual report).	BY: communicating an idea through an 'elevator pitch', then more deeply through a written proposal (all assessed).	

Stage 4	ELE00022M	Progress towards PLO	You will be able to understand and explain the meaning of common strategic management terminology and strategic management issues.	You will be able to strategically analyse an organisation or business unit's position, compare strategic opportunities, and recommend a way forward.	You will learn to plan an organisation's structure and systems to achieve an agreed strategy.		You will enhance your ability to discuss and debate technical and commercial issues.	Your team working abilities and experience will be enhanced in a business context.
	Strategic Management	By working on (and if applicable, assessed through)	Lectures and wider reading material introduce students to the terminology and issues of strategic management (assessed by group and personal reflective reports).	You will analyse the strategic position and direction of a case study organisation in class exercises.	Working in class in a Company Board Room simulated setting will develop skills in analysing the strategic position and direction of a case study organisation.		You will work in a simulated Company Board Room setting to experience board level activities. You will construct concise technical reports (assessed) that critically evaluate and synthesise new information based on research, and design, deliver and defend a persuasive technical presentation (assessed) based on selected reliable evidence.	By working in a Company Board Room simulated setting you will learn how to analyse the strategic position and direction of a case study organisation (assessed by group report and personal reflective report).
Stage 4	ELE00104M	Progress towards PLO	You will be able to understand leadership from a theoretical perspective, the different types of leadership, leadership styles and leadership tools and techniques.	You will be able to analyse a business situation and to propose and justify appropriate leadership styles.			You will gain confidence in discussion, debating, and public speaking.	You will develop your team working abilities and enhance your personal development planning.
	Skills for Business Leadership	By working on (and if applicable, assessed through)	Information is delivered via lectures and wider reading on the theory and fundamentals of leadership.	Business analysis experience is obtained by working in groups on case studies.			Throughout the module there are opportunities to take part in class discussions and debates on appropriate leadership skills, and give a presentation of group findings to the class.	You will prepare a personal leadership development plan (assessed) which is informed by in-class debate and discussion.

Stage 4	ELE00102M	Progress towards PLO	You will understand the mathematical underpinning and uses of physical and spectral modelling synthesis techniques.	You will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.		Working with specialist software, you will gain practical experience of how physical and spectral modelling techniques can be applied to create sound.	You will learn to communicate and present theoretical and practical examples of physical modelling methods to a non--expert audience through an online publication.	
	Physical Modelling Synthesis	By working on (and if applicable, assessed through)	Lectures and laboratories allow you to develop skills in critically evaluating and synthesising new information based on recent research in this area (assessed through technical web-page).	Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)		Following a series of laboratory examples will lead you through the development of physical and spectral modelling algorithms. (Assessed through a technical web-page.)	An online report (assessed) allows you to take technical information developed in the laboratories and summarise and explain it for a non-expert audience on a multimedia web-page.	
Stage 4	ELE00100M	Progress towards PLO	You will be able to describe the advancement of information storage techniques, and to understand the basic principles of semiconductor storage and memories. You'll also be able to explain the principle of magnetic recording, to identify the limitations and gaps in the current memory and storage techniques, and to describe the next-generation of memories and storage.	You will be able to measure the length scale of current storage technologies.			You will develop your ability to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	

	Information Storage & Spintronics	By working on (and if applicable, assessed through)	Information is delivered by lectures and directed reading material explaining information storage techniques, supplemented by class examples and laboratory work on the fundamental concepts of information storage techniques (assessed).	Lectures and reading material explaining quantum mechanics lead to class examples and laboratories (assessed).			You will write an individual report (assessed) to describe the fundamental principles and operation of information storage techniques .	
Stage 4	ELE00127M	Progress towards PLO	You will gain knowledge of semiconductor devices, how they operate and how they are manufactured, and appreciate the challenges of fabrication, implications of technology nodes/sizes and consequences on device performance and behaviour.	You will appreciate the difference between abstract device/circuit behaviour, device models and physical implementation in hardware.	You will understand microelectronic design techniques.	You will be able to apply theoretical and practical knowledge and understanding of microelectronics in order to specify, design, simulate and test significant elements and building blocks of transistor-level electronic circuits.	You will develop the skills to communicate effectively with peers, and form learning/working groups.	You will gain problem solving and task identification skills, and work with peers on technical examples.
	Integrated Circuit Design & Simulation	By working on (and if applicable, assessed through)	BY: attending lectures and seminars on the concepts of microelectronic design techniques and systems (assessed by closed-book examination).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: applying the principles from the lectures and seminars (assessed by closed-book examination) to a series of practical examples in the labs (with formative feedback).	BY: a series of practical laboratories (including formative feedback) within the framework of industry standard design tools (e.g. Cadence, Mentor).	BY: participation in seminars, peer work in labs, and by clear technical analysis and communication (assessed by closed-book examination).	BY: participation in seminars, peer work in labs.

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Electronics BEng w/FY | Programmes: | BEng Electronic Engineering with Foundation Year (H604)

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Assess electronic engineering designs by applying detailed knowledge of algorithms, devices and systems and by consulting relevant documentation and research.	**Evaluate system & component performance through a variety of analytical techniques including computational methods and modelling.**	**Create designs to address real-world problems by synthesising ideas into engineering specifications.**	**Solve technical problems through employing skills in programming, CAD, construction and measurement and by using safe laboratory techniques.**	**Clearly communicate and explain electronic engineering issues and practice in a technically accurate manner to a variety of audiences, verbally, in writing and using multimedia.**	**Coordinate and execute complex projects (with effective time management, team working, and ethical decision-making) in preparation for technical careers in electronics, computing and related disciplines.**
Stage 0	ELE00001F	Progress towards PLO	You will gain basic numeracy skills which are the precursor to the maths required for competent engineering design.	You will be introduced to algebraic methods, useful for the modelling and analysis of engineering problems.	You will encounter the mathematical tools for describing and creating the physical and mechanical dimensions of practical engineering solutions.	You will develop skills in logical thought.	You will develop the skill of demonstrably stepping through and solving a problem systematically.	You will learn the importance of time management for meeting strict deadlines.

	Maths I	By working on (and if applicable, assessed through)	Lectures and workshops cover Arithmetic - decimals, fractions and percentages; notation, brackets and precedance; factors, cancellation and prime numbers; standard form, place value, simple indices and working with surds. Assessed by summative coursework and examination.	Lectures and workshops cover Introductory algebra - simplification, substitution, expansion and factorisation, solution of simple equations and simultaneous equations, linear inequalities, quadratic equations and inequalities, and the basics of probability and statistics. Assessed by summative coursework and examination.	Lectures and workshops cover Geometry - area and volumes of simple shapes, introduction to coordinate geometry, straight line graphs, quadratic graphs. Trigonometry - basic trigonometric functions, right angled triangles, similar triangles and radians. Assessed by summative coursework and examination.	Summatively assessed problem sheets help you practice logical problem solving, in preparation for a summatively assessed examination.	Exercises on summatively assessed problem sheets also help you to prepare for a summatively assessed examination.	Clearly stated deadlines for the hand-in of regular summatively assessed problem sheets, with penalties for late submission, require diligent time management.
Stage 0	ELE00002F	Progress towards PLO	You will understand relevant fundamental physical concepts.	You will learn to model mechanical, physical and electrical systems to define and predict their behaviour.		You will learn to apply physical and mathematical knowledge and develop practical skills in observation and measurement.	You will learn to present solutions to physical problems clearly and systematically, and to practise writing in a scientifically rigourous manner and in an appropriate style.	You will learn the importance of time management for meeting strict deadlines.
	Physics and Electronics I	By working on (and if applicable, assessed through)	Your knowledge of the introductory material on mechanics, the properties of matter, heat and electricity, introduced in the lecture series is assessed by summative coursework and an exam.	Your use of the introductory material on the properties of matter, heat and electricity is assessed by summative coursework and an exam.	Hello	Laboratory experiments on mechanics, the properties of matter and electricity are assessed by marking of laboratory reports.	The upkeep of a summatively assesed laboratory notebook and the preparation of summatively assessed lab reports with clearly recorded experimental observations and data analysis, help to prepare you for a summatively assessed examination.	Summatively assessed problem sheets and laboratory reports, with clearly stated deadlines for submission and penalties for late submission, help practice your workload management.
Stage 0	ELE00003F	Progress towards PLO	You will learn the concepts of voltage and current and their characteristic behaviour in key electronic components and simple circuits.			You will develop electronic laboratory skills and become familiar with modern test equipment.	You will be able to practice writing in a scientifically rigourous manner in an appropriate style for the intended readership.	

	Fundamentals of Electronic Measurement	By working on (and if applicable, assessed through)	Lectures and labs introduce you to the basic function of resistors, diodes, capacitors and logic gates in electronic circuits.			Laboratories introduce you to the construction of simple electronic circuits using electronic components and standard laboratory equipment, and are assessed by marking records and reports in the laboratory notebook.	The upkeep of a laboratory notebook helps you to prepare laboratory reports (assessed) with clearly recorded experimental observations and data analysis and in an appropriate style.	
Stage 0	ELE00004F	Progress towards PLO	You will develop knowledge and facility in the maths required for competent engineering design at the level required to excel in Stage 1.	You will develop familiarity with mathematical methods useful for the modelling and analysis of engineering problems at the level required to excel in Stage 1.		You will continue to develop your skills in logical thought.	You will further your skill of demonstrably stepping through and systematicallysolving problems.	You will develop your time management skills for meeting strict deadlines.
	Maths II	By working on (and if applicable, assessed through)	Your knowlege of matrices, series, logarithms and exponentials, calculus, complex numbers and vectors, introduced in the lectures, is assessed by summative coursework and an exam.	Lectures introduce further topics in algebra - working with indices, trigonometric equations and identities, functions and graphs, simple first-order differential equations. Assessed by summative coursework and an exam.		Summatively assessed problem sheets help you practice logical problem solving, in preparation for a summatively assessed examination.	As in Maths I, summatively assessed problem sheets also help you to prepare for a summatively assessed examination.	Regular deadlines for mathematical coursework allow you to plan and develop your personal management techniques.
Stage 0	ELE00005F	Progress towards PLO	You will develop an understanding of physical concepts to the level required to excel in Stage 1.	You will develop the ability to model mechanical, physical and electrical systems and to define and predict their behaviour at the level required to excel in Stage 1.		You will learn to apply further physical and mathematical knowledge and develop practical skills in observation and measurement.	You will develop your ability to present solutions to physical problems clearly and systematically, and to practise writing in a scientifically rigourous manner and in an appropriate style.	You will develop your time management skills for meeting strict deadlines.

	Physics and Electronics II	By working on (and if applicable, assessed through)	Lectures introduce further study of mechanics and electricity, an introduction to basic vectors, electromagnetism, optics, waves and oscillations, electrostatics, alternating current, atomic physics and gravitation. Your knowledge is assessed by summative coursework and an exam.	In lectures and labs you will study the topics (left), and your ability to model and predict system behaviour is assessed by coursework and an exam.		Laboratory experiments on electricity, optics and vibrations and waves are assessed by summative marking of laboratory reports.	The upkeep of a summatively assesed laboratory notebook and the preparation of summatively assessed lab reports with clearly recorded experimental observations and data analysis, help to prepare you for a summatively assessed examination.	Summatively assessed problem sheets and laboratory reports, with clearly stated deadlines for submission and penalties for late submission, help practice your workload management.
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.
	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.

Stage 1	ELE00026C	Progress towards PLO	You will learn about the operation of microprocessors and microcontrollers, and the techniques of assembly-language and low-level programming.			You will learn to write programs in machine code and assembly language, and to write programs for interfacing using higher-level languages.	You will learn to explain technical concepts concisely and accurately.	You will be able to manage your own progress in implementing software solutions.
	Digital Systems	By working on (and if applicable, assessed through)	The lectures will give you all the information that you need, and laboratory sessions will give you practice. A technical report (assessed) will test your knowledge.			A series of lab-based assignments will teach you to develop microcontroller-based solutions. (Assessed by report and submitting code)	You will write a report (assessed) that clearly describes the operation of low-level code and its interaction with target hardware.	A large-scale summative design exercise at the end of the module helps you to manage work leading to a technical report with accompanying code (both assessed).
Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of approprirate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.
	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).

Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.
	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		
	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		

	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)

Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.
	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00041I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration).	Group designed products with tangible outputs	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstration)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).

Stage 2	ELE00035I	Progress towards PLO	You will learn about the operation and functions of semiconductor devices.	You will learn to simulate analogue circuits involving semiconductor devices and compare the results with theoretical predictions.		You will learn to design, construct and debug circuits using discrete semiconductor devices, and evaluate their performance against given specifications and theoretical predictions.	You will develop your ability to accurately document experimental procedures and results.	You will be able to manage and schedule your laboratory time and work effectively.
	Semiconductor Devices & Circuits	By working on (and if applicable, assessed through)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)	Lectures will provide you with the required knowledge. Laboratory work, including completing the design of circuits, will help you to reinforce that knowledge, and working on tutorial problems will allow you to monitor your progress. (Assessed by exam.)		You will gain proficiency in working at the component level through a series of lab-based experiments. (Assessed by an open-book exam)	Your lab book will contain accurate summaries of the design exercises and their results, and this is assessed by an open-book exam.	The laboratory work (assessed by open-book exam) involves designing, debugging and evaluating circuits, and forms a stepping-stone to more complex projects in Stage 3.
Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	
	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 3	ELE00004H	Progress towards PLO	You will learn more about the important engineering approaches to solving problems, and will advance your knowledge considerably in the subject area of your project.	You will gain experience in analysing the scientific literature in a specialised area, and making an informed selection of tools and techniques to apply.	Specify, design, construct and verify a project in an advanced and/or specialised area of engineering	Independently evaluate and assess alternative approaches to specific engineering problems	You will present and defend your own work through a written initial report, final report and oral presentation.	You will be able to confidently define specifications and propose suitable timescales, work independently and also interact with colleagues, plan your own time, and consider and evaluate the risks in your project.

	BEng Individual Project	By working on (and if applicable, assessed through)	Your individual project, which will run over two terms, will involve significant independent reading and research, guided by regular supervision meetings. Assessed via written initial report, final report and oral presentation.	With the guidance of your supervisor, you will be expected to gather and critically analyse information from reliable sources, and use this information to guide your project work. Assessed via written initial report, final report and oral presentation.	Assessed during project displays, reports and viva	Experience of an independent project from specifications, analysis, simulation and design, to report writing	You'll be able to construct detailed and accurate technical reports for a specified audience (initial and final reports assessed) and defend your project work in a viva setting (assessed).	Throughout the project time you will be developing your skills in project management, including the management of time, risk and resources. These are assessed from evidence provided in your report and viva.
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		
	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				

	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		
	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		

Stage 3	ELE00046H	Progress towards PLO	You will learn about the propagation mechanisms of electromagnetic waves within materials, and how to classify materials according to the nature of a wave propagating through them. You will also learn about the principles of waveguiding, the importance of antennas in all types of radio communication systems, the problems of interference and fading, and channel models.	You will learn to determine the interactions of electromagnetic waves at boundaries between materials, and to describe and calculate the loss and dispersion limits of propagation distance in fibre optical links. You will also learn to to specify the performance of a radio system in terms of antenna characteristics, and to estimate the channel losses for guided, ground, sky and freespace waves, including the effects of diffraction and reflections, and know what applications use these propagation modes.	You will know how to use the Smith Chart for transmission line calculations; will be able to design single stub and quarterwave matching networks; and to appreciate the main considerations in design of freespace and guided optical links.	You will learn how to use an RF network analyser, and how to use Smith charts to analyse distributed circuits, as well as how to prototype and construct high-frequency circuits.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Applications of EM	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will provide you with the knowledge you need. Laboratory tasks and workshop exercises will help you reinforce your knowledge. (Assessed by closed-book exam.)	Lectures will provide you with the information that you need, and workshop exercises will help reinforce it. Laboratory tasks using a bespoke software simulator to model and characterise a transmission line will put your knowledge into a practical context. (Assessed by closed-book exam.)	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	A series of laboratory exercises will lead you through the design, build and measuement of distributed circuit elements.	Laboratory tasks with peers allow you to discuss the issues with each other and with lab leader/lab instructors/technicians.	

Stage 3	ELE00045H	Progress towards PLO	You will learn about the underlying circuit principles of analogue filters including a variety of filter approximations. You will learn about various ADC and DAC topologies and their limitations, and the operation and limitations of power circuits including switched mode power supply units (SMPSUs).	You will learn to calculate the order and type of a filter based on specifications; and to select, adapt and apply a range of mathematical techniques to solve advanced problems.	You will learn how to synthesise analogue filters using passive and active components, and to select and specify an appropriate power supply for a practical electronic system.	You will increase your knowledge of analogue simulation by using CAD packages to design analogue filters, and in particular learn about non-linear simulation through designing SMPSUs.	You will be able to explain and evaluate advanced technical concepts concisely and accurately.	
	Analogue Engineering	By working on (and if applicable, assessed through)	Guided reading through lecture material and recommended texts will build your knowledge. Workshop exercises will give you practice. Assessed by closed-book exam.	Laboratory tasks, using a simulation tool to predict the performance of designed circuits and systems, will develop your analytical skills. Assessed by closed-book exam.	Engagement in lecture material and a series of laboratory exercises will give you experience of the comparative benefits of power supply designs. (Assessed by an exam).	A series of labs will give you experience in using advanced CAD tools to design power supply and filter circuits.	You will keep a lab book documenting the design and performance of the lab circuits.	
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	
	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	

Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		
	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			

	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	
Stage 3	ELE00011H	Progress towards PLO	You will develop the ability to design complex digital circuits that take into account performance and testability, and to exploit IP components in the design of digital circuits. You will gain experience in interfacing custom circuits with external components.	You will become familiar with the tools required to analyse circuits from the point of view of performance and testability, and with the use of advanced testing and test-bench design techniques to verify digital circuits.		You will further your design skills using a hardware description language to build a omplex system including IP components.	You will develop your skills in the documentation of digital circuits, including timing- and test-related information.	You will hone your skills in team working and time management.

	Digital Engineering	By working on (and if applicable, assessed through)	Lectures will provide you with knowledge, and a set of lab exercises will give you practice. You will also read and understanding IP component documentation. You will complete a final project involving the design of high-performance, testable circuits that use IP components. Assessed through lab and final project reports.	A set of lab exercises, involving the use of simulation tools to implement and verify digital circuits that meet performance and/or testability constraints, will give you this familiarity. Assessed through lab and final project reports.		A set of lab exercises will lead you through the process of including IP components in a design of a high-performance, testable digital system, and implementing it in a Field Programmable Gate Array (FPGA). (Assessed by lab and final project reports.)	The laboratory and project reports (assessed) require professional presentation and annotation of VHDL code (including timing and testing considerations), testbenches, and simulations.	You will work on a sequence of laboratory-based group tasks and a final group project (assessed)that require independent work outside of supervised lab hours.
Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.
	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.

Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	
	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportunity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	
Stage 3	ELE00025H	Progress towards PLO	You will learn to combine the principles and laws of optics, semiconductor physics and technology, and quantum mechanics in the context of photonics and nanophotonics.	You will learn to apply the apparatus of ordinary and partial differential equations, eigenvalue problems, Fourier analysis etc. to analysis of light propagation in photonic and nanophotonic devices, their modal structure, and ultimately their performance.	You will learn how the use of photonic and nanophotonic technology, devices, and subsystems are used in long-distance communications, storage and retrieval (e.g. DVD/Blu-Ray) and data acquisition (photonic sensors), and the requirements of photonic components for each of these applications		You will be able to explain the principle and performance of photonics and nanophotonics on both qualitative level (verbal explanations) and quantiative level (phenomenological and if required microscopic analysis) and show the logical progression from fundamental principles to peformance issues.	
	Photonics & Nanophotonics	By working on (and if applicable, assessed through)	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Lectures, workshop questions, and supporting material will explain the principles of optics, semiconductor physics and quantum mechanics. Assessed through closed-book exam.	Engagement in lectures, workshops and reading supporting material. (Assessed by a closed-book exam.)		You will be expected to synthesis the knowledge and experience from lectures, workshop questions, and supporting material explaining the principles of photonics. Assessed by examination.	

Programme Map: Module Contribution to Programme Learning Outcomes

This table maps the contribution to programme learning outcomes made by each module, in terms of the advance in understanding/ expertise acquired or reinforced in the module, the work by which students achieve this advance and the assessments that test it. This enables the programme rationale to be understood:

· Reading the table vertically illustrates how the programme has been designed to deepen knowledge, concepts and skills progressively. It shows how the progressive achievement of PLOs is supported by formative work and evaluated by summative assessment. In turn this should help students to understand and articulate their development of transferable skills and to relate this to other resources, such as the Employability Tutorial and York Award;

· Reading the table horizontally explains how the experience of a student at a particular time includes a balance of activities appropriate to that stage, through the design of modules.

(Add additional rows as required)

Music Technology BEng w/FY | Programmes: | BEng Music Technology Systems with Foundation Year (H662)

Stage	Module		Programme Learning Outcomes					
			PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**
			Assess electronic engineering and audio technology designs by applying detailed knowledge of algorithms, devices and systems and by consulting relevant documentation and research.	**Evaluate system & component performance through a variety of analytical techniques including computational methods and modelling.**	**Create designs to address real-world problems involving audio hardware and software by synthesising ideas into engineering specifications.**	**Solve technical problems through employing skills in programming, CAD, construction and measurement and by using safe laboratory techniques.**	**Clearly communicate and explain audio and electronic engineering issues and practice in a technically accurate manner to a variety of audiences, verbally, in writing and using multimedia.**	**Coordinate and execute complex projects (with effective time management, team working, and ethical decision-making) in preparation for technical careers in electronics, computing and music technology.**
Stage 0	ELE00001F	Progress towards PLO	You will gain basic numeracy skills which are the precursor to the maths required for competent engineering design.	You will be introduced to algebraic methods, useful for the modelling and analysis of engineering problems.	You will encounter the mathematical tools for describing and creating the physical and mechanical dimensions of practical engineering solutions.	You will develop skills in logical thought.	You will develop the skill of demonstrably stepping through and solving a problem systematically.	You will learn the importance of time management for meeting strict deadlines.

	Maths I	By working on (and if applicable, assessed through)	Lectures and workshops cover Arithmetic - decimals, fractions and percentages; notation, brackets and precedance; factors, cancellation and prime numbers; standard form, place value, simple indices and working with surds. Assessed by summative coursework and examination.	Lectures and workshops cover Introductory algebra - simplification, substitution, expansion and factorisation, solution of simple equations and simultaneous equations, linear inequalities, quadratic equations and inequalities, and the basics of probability and statistics. Assessed by summative coursework and examination.	Lectures and workshops cover Geometry - area and volumes of simple shapes, introduction to coordinate geometry, straight line graphs, quadratic graphs. Trigonometry - basic trigonometric functions, right angled triangles, similar triangles and radians. Assessed by summative coursework and examination.	Summatively assessed problem sheets help you practice logical problem solving, in preparation for a summatively assessed examination.	Exercises on summatively assessed problem sheets also help you to prepare for a summatively assessed examination.	Clearly stated deadlines for the hand-in of regular summatively assessed problem sheets, with penalties for late submission, require diligent time management.
Stage 0	ELE00002F	Progress towards PLO	You will understand relevant fundamental physical concepts.	You will learn to model mechanical, physical and electrical systems to define and predict their behaviour.		You will learn to apply physical and mathematical knowledge and develop practical skills in observation and measurement.	You will learn to present solutions to physical problems clearly and systematically, and to practise writing in a scientifically rigourous manner and in an appropriate style.	You will learn the importance of time management for meeting strict deadlines.
	Physics and Electronics I	By working on (and if applicable, assessed through)	Your knowledge of the introductory material on mechanics, the properties of matter, heat and electricity, introduced in the lecture series is assessed by summative coursework and an exam.	Your use of the introductory material on the properties of matter, heat and electricity is assessed by summative coursework and an exam.	Hello	Laboratory experiments on mechanics, the properties of matter and electricity are assessed by marking of laboratory reports.	The upkeep of a summatively assesed laboratory notebook and the preparation of summatively assessed lab reports with clearly recorded experimental observations and data analysis, help to prepare you for a summatively assessed examination.	Summatively assessed problem sheets and laboratory reports, with clearly stated deadlines for submission and penalties for late submission, help practice your workload management.
Stage 0	ELE00003F	Progress towards PLO	You will learn the concepts of voltage and current and their characteristic behaviour in key electronic components and simple circuits.			You will develop electronic laboratory skills and become familiar with modern test equipment.	You will be able to practice writing in a scientifically rigourous manner in an appropriate style for the intended readership.	

	Fundamentals of Electronic Measurement	By working on (and if applicable, assessed through)	Lectures and labs introduce you to the basic function of resistors, diodes, capacitors and logic gates in electronic circuits.			Laboratories introduce you to the construction of simple electronic circuits using electronic components and standard laboratory equipment, and are assessed by marking records and reports in the laboratory notebook.	The upkeep of a laboratory notebook helps you to prepare laboratory reports (assessed) with clearly recorded experimental observations and data analysis and in an appropriate style.	
Stage 0	ELE00004F	Progress towards PLO	You will develop knowledge and facility in the maths required for competent engineering design at the level required to excel in Stage 1.	You will develop familiarity with mathematical methods useful for the modelling and analysis of engineering problems at the level required to excel in Stage 1.		You will continue to develop your skills in logical thought.	You will further your skill of demonstrably stepping through and systematicallysolving problems.	You will develop your time management skills for meeting strict deadlines.
	Maths II	By working on (and if applicable, assessed through)	Your knowlege of matrices, series, logarithms and exponentials, calculus, complex numbers and vectors, introduced in the lectures, is assessed by summative coursework and an exam.	Lectures introduce further topics in algebra - working with indices, trigonometric equations and identities, functions and graphs, simple first-order differential equations. Assessed by summative coursework and an exam.		Summatively assessed problem sheets help you practice logical problem solving, in preparation for a summatively assessed examination.	As in Maths I, summatively assessed problem sheets also help you to prepare for a summatively assessed examination.	Regular deadlines for mathematical coursework allow you to plan and develop your personal management techniques.
Stage 0	ELE00005F	Progress towards PLO	You will develop an understanding of physical concepts to the level required to excel in Stage 1.	You will develop the ability to model mechanical, physical and electrical systems and to define and predict their behaviour at the level required to excel in Stage 1.		You will learn to apply further physical and mathematical knowledge and develop practical skills in observation and measurement.	You will develop your ability to present solutions to physical problems clearly and systematically, and to practise writing in a scientifically rigourous manner and in an appropriate style.	You will develop your time management skills for meeting strict deadlines.

	Physics and Electronics II	By working on (and if applicable, assessed through)	Lectures introduce further study of mechanics and electricity, an introduction to basic vectors, electromagnetism, optics, waves and oscillations, electrostatics, alternating current, atomic physics and gravitation. Your knowledge is assessed by summative coursework and an exam.	In lectures and labs you will study the topics (left), and your ability to model and predict system behaviour is assessed by coursework and an exam.		Laboratory experiments on electricity, optics and vibrations and waves are assessed by summative marking of laboratory reports.	The upkeep of a summatively assesed laboratory notebook and the preparation of summatively assessed lab reports with clearly recorded experimental observations and data analysis, help to prepare you for a summatively assessed examination.	Summatively assessed problem sheets and laboratory reports, with clearly stated deadlines for submission and penalties for late submission, help practice your workload management.
Stage 1	ELE00023C	Progress towards PLO	You will learn about the operation and functions of passive electronic components and op-amps, and be able to relate them to physical principles.	You will learn to simulate analogue circuits involving passive components and op-amps, and compare the results with theoretical predictions.	You will learn how real-world problems can be expressed in terms of engineering specifications.	You will learn to design, construct and debug simple circuits, and evaluate their performance.	You will develop your technical communication skills in accurately documenting experimental procedures and results.	You will learn how to manage time and work effectively with a partner in laboratories.
	Analogue Electronics & Physics	By working on (and if applicable, assessed through)	You will learn about circuit theory and physics in lectures. You will undertake laboratory work including completing the design of circuits, and will work on tutorial problems that help reinforce the knowledge. (Assessed by exam.)	Laboratory work, including completing the design of circuits, engagement in lectures and working on tutorial problems. (Assessed by exam)	The laboratory scripts and lectures lead you through a large-scale design exercise to design and construct a soundcard. (Assessed by open-book exam.)	Laboratory design exercises. (Assessed by an open-book exam)	Keeping an accurate lab book (assessed by an open-book exam) will help your technical written communication.	By carrying out laboratory work in pairs (assessed by open-book exam) you will be able to practice team planning and time skills.
Stage 1	ELE00024C	Progress towards PLO	You will learn about the historical context of synthesis techniques and their application in contemporary music, and understand the theory behind sampling and synthesis systems.	You will learn to manipulate and analyse digital audio signals against target specifications.	You will take an idea for a synthesiser, and translate this into an specification for implementation in the PureData audio programming environment.	You will take your specification, and implement this in PureData to produce a working synthesiser.	You will construct basic technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	You will develop skills in analysis, problem solving, critical evaluation, innovation and creativity.

	Audio Technology	By working on (and if applicable, assessed through)	Lectures, and reading & multimedia material, will show the development of audio technology from the early 1900s up to the present day. In-class examples will help you develop your understanding of synthesisers, and you will show an understanding of this in the final technical report (assessed).	Laboratory exercises will introduce and develop fluency in the Pure Data multimedia programming environment.	A series of structured laboratory exercises will lead you through the stages required to design a synthesiser. (Assessed by a report about the design project.)	The laboratory exercises will guide you in the implementation of your synthesiser design. (Assessed by a report about the design project.)	You will work on a concise technical report (assessed) to document a synthesis exercise.	Your work in the computer laboratory on structured examples (with formative feedback) lead to the management of a synthesis design & development project (assessed).
Stage 1	ELE00025C	Progress towards PLO	You will learn about the operation of fundamental digital logic circuits in a variety of applications.	You will gain familiarity with digital simulation techniques.		You will learn how to design, implement and test digital circuits using programmable logic devices.	You will be able to state basic technical concepts concisely and accurately.	You will learn to plan and manage your time spent in a laboratory setting.
	Digital Circuits	By working on (and if applicable, assessed through)	Laboratory work and workshop exercises will help to reinforce this knowledge. Formative laboratory reports will allow you to get early feedback on your learning, and there will be an exam (assessed).	The laboratory work will help you develop this familiarity.		The laboratory sessions will lead you through the stages required to design and implement basic digital functions in programmable logic.	Regular record keeping of your laboratory work in a lab book (assessed formatively) reinforces your consise technical written communication.	The laboratory work and workshop exercises (assessed formatively) demand preparation and organisation.
Stage 1	ELE00027C	Progress towards PLO	You will learn about the technical and practical impacts of the engineering design of new products on society. You will also discover the best methods of learning about the design and implementation of products in an engineering environment.		You will learn how to take real-world problems and convert them to a practical engineering specification for a simple product.	You will learn to implement a simple electronic system involving both hardware and software design, including the use of approprirate development tools, and then to evaluate your solution against set criteria.	You will be able to communicate basic technical knowledge to a general audience.	You will develop and appreciate basic team working skills and project management skills and practice. You'll also know, understand and be able to apply the correct ethical behaviours at an individual and institutional level, and will understand the need for safe working practices alongside security of information and intellectual property.

	Engineering Design	By working on (and if applicable, assessed through)	You will develop your knowledge by working in a group to design and implement a project using hardware and software. (Assessed by video, blog & report.)		Through participating in a group project, you will specify and design a simple product using hardware and software. (Assessed by video, blog and report).	The group project will require the design, construction, testing and evaluation of an electronic system. (Assessed by video, blog and report.)	By producing a video, contributing to a shared blog and writing a technical reflective report identifying reliable sources of information, recognising issues of plagiarism and collusion (all assessed), you will gain practice in technical communication via multiple media.	The above skills are developed through working on a group designed and implemented project using hardware and software, and by creating an outline project requirements specification, work breakdown structure with outline timescale and a basic risk register (assessed by video, blog & report).
Stage 1	ELE00029C	Progress towards PLO	You will learn about the basic syntax and structure of both the Python and C programming languages, and how to translate a design specification into a working program.		You will translate a real-world problem into a detailed programming specification and test procedure.	You will learn to implement programs to a given specification in both Python and C, including writing test procedures, evaluating code and debugging using modern software development tools.	You will be able to document the operation of a program clearly and accurately.	You will learn to manage your own progress in implementing the software solutions.
	Introduction to Programming	By working on (and if applicable, assessed through)	Detailed laboratory scripts will help you learn the material through practical assignments and exercises. (Assessed by submitting a report and code.)		A series of lab-based assignments will lead you through the stages required to develop a programming specification and test procedure. (Assessed by report)	Working through a series of laboratory scripts will lead you through the processes required to implement and test a large-scale programming task.. (Assessed by report and submitting code)	Your documentation skills are developed through writing a report (assessed) which clearly and accurately describes the operation of your code and a test procedure.	A large-scale summative design exercise at the end of the module (assessed by report and code) gives you the opportunity to self-manage the design and coding process of software development.
Stage 1	ELE00030C	Progress towards PLO	You will learn to apply a range of key mathematical tools that are essential for engineers.	You will learn about the mathematical principles underlying simulation and modelling techniques.		You will learn to select and apply appropriate mathematical techniques to engineering design issues .		

	Mathematics	By working on (and if applicable, assessed through)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)	Lectures will provide the information that you need. Worksheets and laboratory sessions will help reinforce your learning. (Assessed by exam.)		A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 1	ELE00031C	Progress towards PLO	You will learn the recording studio environment, multitrack recording formats and the associated signals and systems involved.			You will learn how to operate a software based Digital Audio Workstation environment together with a range of mixing and processing options for recording, editing and production work; how to select and use microphones appropriate for recording live and studio based scenarios; and how to mix component audio tracks into a stereo master track.	You will be able to produce technical documentation to support your creative output.	You will be able to demonstrate your ability to work individually to complete a range of creative and technical studio based tasks, and to self-reflect on that work.
	Recording Studio Techniques	By working on (and if applicable, assessed through)	Lectures and reading materials will help you learn the information you need, which you will then put to use in studio practical sessions. You will submit a technical studio report (assessed) in which you will demonstrate your knowledge.			A series of studio-based practical sessions will demonstrate the techniques used by recording engineering, techniques which are then practiced and refined in individual studio-time. (Assessed by a creative recording portfolio).	By writing a technical studio report (assessed) you will develop the skills to document the studio work process.	The above skills are developed through a creative recording portfolio (assessed), requiring the planning of time and resources effectively throghout the process. The process is documented in a reflective report (assessed) to accompany the recording portfolio.
Stage 2	ELE00031I	Progress towards PLO	You will develop an understanding of integral transforms and multivariable calculus, and appreciate the mathematical principles underlying signals and system theory.			You will learn to select and apply advanced mathematical techniques to solve problems that arise in engineering design.		

	Engineering Mathematics, Systems & Signals	By working on (and if applicable, assessed through)	Completing worksheets, and engaging with laboratory sessions and lectures, will help you develop and check your knowledge. (Assessed by summative closed-book exam.)			A series of worksheets, laboratory sessions and lecture-based instruction will provide a familiiarity with the techniques, and the opportunity to practice their application. (Assessed by closed-book exam)		
Stage 2	ELE00034I	Progress towards PLO	You will gain knowledge of electromagnetic field theory, and its application in electronic components and systems.	You will learn to use the methods of vector calculus to predict the performance of components, transmission lines and electromagnetic waves.		You will learn to predict, quantify and ameliorate problems in electronic circuit design caused by electromagnetic effects.	You will develop your ability to accurately document experimental procedures and results.	You will develop your time management and work effectiveness with a partner in laboratories.
	Noise, Waves & Fields	By working on (and if applicable, assessed through)	Lectures will provide you with the informationt that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)	Lectures will provide you with the information that you need. Worksheets and laboratory sessions will help you apply and check your knowledge. (Assessed by summative closed-book exam.)		Working through a series of assigned problem sheets and laboratory exercises will give you practice applying the theory, and then the ability to apply your skills to mitigate EM interference in high-speed circuits. (Assessed by a closed-book exam.)	The keeping of an accurate lab book (assessed by an open-book exam) helps you to succinctly record your practical work.	The practical laboratory work (assessed by an open-book exam) is done in pairs, giving you opportunity to plan work and time together.
Stage 2	ELE00030I	Progress towards PLO	You will learn about the structure and syntax of a hardware description language, and the design flow for digital circuits.	You will become familiar with the use of simulation tools to implement and verify digital circuits.		You will gain experience in the use of a Hardware Description Language to design synthesizable digital circuits.	You will be able to professionally document a digital circuit design.	You will develop your ability to manage time and work effectively with a partner in a pair-programming scenario.
	Digital Design with HDL	By working on (and if applicable, assessed through)	Lectures will provide you with the information that you need. A set of lab exercises, and a final project involving the design of increasingly complex multi-component digital circuits, will enable you to reinforce your learning and put it to use. (Assessed through lab and final project reports.)	The lab exercises will involve the use of simulation tools to implement and verify digital circuits. (Assessed through lab and final project reports.)		A series of lab exercises will develop skills in using a hardware description language. You will then apply these skills to implement a digital design in a Field Programmable Gate Array. (Assessed through lab report and the final project report.)	Lab reports (assed) require professional presentation and annotation of VHDL code and simulations. The final project report extends these and is also assessed.	You will work on a sequence of laboratory-based group tasks of increasing complexity that require independent work outside of supervised lab hours. (Assessed by report and submitted design.)

Stage 2	ELE00040I	Progress towards PLO	You will learn about software engineering methodologies, object-oriented programming and the syntax and structure of the JAVA programming language.		You will learn how to translate a real-world problem to an implementable software specification and test procedure.	You will learn to Implement a program to match a given specification, including writing a test procedure.	You will be able to document the operation and development of a program clearly and accurately.	You will learn how to manage time and software development with other developers.
	Java Programming	By working on (and if applicable, assessed through)	Laboratory exercises and assignments will help you learn in a practical context. (Assessed by report and submitting code.)		A guided series of assignments will lead you through the process of translating a requirement to a specification. (Assessed by a wrtten report.)	You will work through the process of translating a specification into a working program, and of implementing and running test procedure and debugging the program. (Assessed by report and submitted code)	Your technical communication is assessed by writing a report that clearly and accurately describes the design process, the operation of the code and a test procedure.	A large-scale design exercise (assessed) at the end of the module tests your ability to work on software development in small teams.
Stage 2	ELE00042I	Progress towards PLO	Know, understand and apply appropriate processes in microprocessor and peripheral design, waste management, climate change and use of alternative energies. Gain and apply knowledge of music technology systems and synthesis techniques.	Analyse and apply appropriate processes in microprocessor systems, waste management, climate change and use of alternative energies. Analyse a system requirement for a sound generation process.	You will identify a practical problem, and develop the specification for an engineering solution.	You will learn about the practical issues of designing for manufacture, including supply chains, production engineering, quality control and safe, legal disposal.	You will develop your skills in gathering information from reliable sources and constructing technical presentations and reports.	You will develop your project management and team-working skills, building on the experience of the group work in Stage 1 Engineering Design.
	Design, Construction & Test for Audio	By working on (and if applicable, assessed through)	Lecture and laboratory working. (Assessed by report and final presentation / demonstration)	Group designed products with tangible and audio outputs.	Working through a designed series of exercises, you will go through the process from identifying a problem to producing an implementatble specification for a product. (Assessed by final report.)	You will design, implement, test and document your design. (Assessed by report and final presentation/demonstration)	Your design and development project work is assessed through presentation and submission of a technical report.	You will learn how to create a detailed project requirements specification from the client requirements, including a work breakdown structure with activity durations and GANTT charts, then working in groups on a product involving hardware and software using embedded processors (assessed through presentation and technical report).

Stage 2	ELE00028I	Progress towards PLO	You will learn about key numerical methods and computational algorithms and their usage.	You will gain an advanced knowledge of the MATLAB numerical processing environment.		You will learn to select and apply standard algorithms and numerical methods solve common computational problems including search and optimisation.	You will be able to clearly document the operation of a script implementing a numerical algorithm.	
	Algorithms & Numerical Methods	By working on (and if applicable, assessed through)	You will learn from lectures, and put your learning into practice in laboratory sessions. Worksheets will help reinforce your learning and monitor your progress. (Assessed by summative closed-book exam.)	The laboratory sessions will develop your skills using MATLAB.		You will gain experience working with numerical techniques by engaging with lecture material, and working through a series of laboratory exercises. (Assessed by a programming assignment.)	An assessed report requires the clear and accurate description of the operation of a script and its validation testing.	
Stage 2	ELE00027I	Progress towards PLO	You will learn about the principles of acoustic energy transmission; about pitch, loudness and timbre perception; about auditory streaming with special reference to hearing music; and about interaural time delay (ITD) and interaural intensity delays (IID).	You will learn to appreciate and analyse the acoustic properties of different classes of acoustic instruments and the human voice.	You will learn how to characterise the acoustic properties of real spaces.	Yoi will learn to select and apply a range of mathematical techniques to solve problems in sound transmission.	You will be able to explain commonly -encountered technical concepts concisely and accurately, and to summarise and show understanding in technical reports based on information selected from a variety of reliable sources, to a specified audience.	
	Acoustics & Psychoacoustics	By working on (and if applicable, assessed through)	Lectures, labs and reading about acoustics and psychoacoustics in the context of audio and music production and listening, informed by recent developments in the field, will help you to develop this knowledge. (Assessed by multiple choice exam.)	You will develop critical analysis skills in the context of practical work in sound presentation.	You will work through an exercise characterising and modifying a room's acoustic characteristics. (Assessed by a report.)	You will use mathematical techniques to analyse measurements to derive and interpret frequency and impulse response of physical spaces. (Assessed by multiple-choice exam and a report.)	Your technical communication is developed by keeping a laboratory logbook and by writing a technical report for the room acoustics design exercise (assessed).	

Stage 3	ELE00004H	Progress towards PLO	You will learn more about the important engineering approaches to solving problems, and will advance your knowledge considerably in the subject area of your project.	You will gain experience in analysing the scientific literature in a specialised area, and making an informed selection of tools and techniques to apply.	Specify, design, construct and verify a project in an advanced and/or specialised area of engineering	Independently evaluate and assess alternative approaches to specific engineering problems	You will present and defend your own work through a written initial report, final report and oral presentation.	You will be able to confidently define specifications and propose suitable timescales, work independently and also interact with colleagues, plan your own time, and consider and evaluate the risks in your project.
	BEng Individual Project	By working on (and if applicable, assessed through)	Your individual project, which will run over two terms, will involve significant independent reading and research, guided by regular supervision meetings. Assessed via written initial report, final report and oral presentation.	With the guidance of your supervisor, you will be expected to gather and critically analyse information from reliable sources, and use this information to guide your project work. Assessed via written initial report, final report and oral presentation.	Assessed during project displays, reports and viva	Experience of an independent project from specifications, analysis, simulation and design, to report writing	You'll be able to construct detailed and accurate technical reports for a specified audience (initial and final reports assessed) and defend your project work in a viva setting (assessed).	Throughout the project time you will be developing your skills in project management, including the management of time, risk and resources. These are assessed from evidence provided in your report and viva.
Stage 3	ELE00049H	Progress towards PLO	You will develop an understanding of the fundamental tools for the analysis and design of simple analogue controllers for linear, time invariant, continuous dynamic systems.	You will gain practical insights into using the Laplace transform to analyse the behaviour of a range of dynamic systems.	You will gain an understanding of how control systems are used in a variety of real-world contexts.	You will develop skills in the use of Matlab and Simulink for the analysis of systems and the design of control systems.		
	Control	By working on (and if applicable, assessed through)	Lectures will present the majority of the information that you need. Regular question sheets and exercises will help you reinforce your learning and assess your progress, and practical laboratories will put your new knowledge into practice. (Assessed by closed-book exam.)	You will work on developing and analysing transfer functions for a range of systems, by hand and using software tools. (Assessed by closed-book exam.)	Engagements with lecture material will show examples of real control applications.	You will work through a planned series of laboratory sessions, developing your skills in using CAD tools.		
Stage 3	ELE00048H	Progress towards PLO	You will gain an understanding of fundamental concepts in wired and wireless communications.	You will develop your skills in problem solving, critical analysis and applied mathematics.				

	Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will build your knowledge of communication signals and their transmission over radio and through cables. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)	You will practice selecting and applying appropriate mathematical techniques to solve advanced problems, including time-domain and frequency-domain functions. Formative tutorial questions will help you gauge and pace your learning. (Assessed by closed-book exam.)				
Stage 3	ELE00055H	Progress towards PLO	You will gain an understanding of digital signal processing techniques.	You will learn about the mathematical principles underlying digital signal analysis.	You will learn about filter design.	You will further develop skills in MATLAB by designing and implementing digital filters and evaluating their performance.		
	Principles of DSP	By working on (and if applicable, assessed through)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	Lectures will build your knowledge, and worksheets and laboratory sessions will reinforce it and help put it into practice. VLE-based formative tests will help you pace and check your learning. (Assessed by summative closed-book exam.)	You will work through a series of lab-based design challenges in supported lab sessions.	You will work through a series of lab-based design challenges in supported lab sessions.		
Stage 3	ELE00051H	Progress towards PLO	You will gain knowledge of, and experience in using, a commonly--used programming language. You will also learn about the principles of good user-interface design for audio applications.	You will learn to critically assess your own work against external standards.	You will learn to develop a specification for a creative piece of user-friendly software to address a real-world problem, industry standards.	You will gain experience of applying and developing your programming skills within the development environment for iOS.	You will develop your ability to document software to professional standards.	You will hone your skills in personal time and workflow management while learning new languages and libraries, coordinating information from lectures, labs and external sources, and delivering a finished app to a deadline.

	iOS Audio Programming	By working on (and if applicable, assessed through)	Your learning will come from lectures and computer labs using Apple's Swift language and external library AudioKit to make musical/audio-processing software for iOS devices (assessed by software submission).	The laboratory exercises will help you with this, and you will review your own work against company criteria provided by Apple.	Lectures and provided reading will develop an appreciation of user - interface design considerations. (Assessed by a submitting a software app.)	Working though a graded series of computer laboratories will introduce key programming features and audio programming skills. (Assessed by submitting a software app.)	You will produce a piece of software (iOS app, assessed) while following Apple's guidelines and app-store submission requirements. You will also create engaging documentation for software, both within the software itself and via an external web-page (both assessed).	You will manage the process of producing a creative piece of user--friendly software to industry standards (assessed).
Stage 3	ELE00054H	Progress towards PLO	You will learn to understand and appreciate the relationship between picture and sound.		You will learn about the process of developing a soundtrack for professionally produced media.	You will develop a working knowledge of the tools required for audio postproduction, including a Digital Audio Workstation based recording environment, and the associated handling and management of audio and video based assets.	You will be able to support creative output with comprehensive and reasoned technical documentation.	You will develop your ability to work both individually and in teams to complete creative and technical audio/video postproduction based tasks.
	Multimedia Sound Design	By working on (and if applicable, assessed through)	Lectures, and associated reading and multimedia material, will introduce you to the art and science of creating music and sound effects for visual media such as television, film and computer games (assessed by creative technical group project and individual report).		You will develop a script for the soundtrack for a piece of provided video (assessed by report).	Formative laboratory sessions will explain and provided experience in using the Digital Audio Workstation tools, then a group-based multimedia exercise will allow you to practice and develop these skills. (Assessed by a submitted soundtrack.)	An individual report (assessed) allows you to detail and reflect upon the technical and creative work done by the group and your own contribution to it.	A complex multimedia project (assessed), allows you to gain experience working in teams, similar to industry--based production companies.
Stage 3	ELE00057H	Progress towards PLO	You will be introduced to the concept of the state of a control system, and given an introduction to the techniques of state-variable control. You will learn about the impact of introducing samplers and data holds into feedback control systems.	You will learn about the analysis of multivariable systems, and multivariable transfer functions.	You will learn to use feedback control to modify the response of a multivariable control system, and to appreciate the impact of introducing samplers and data holds into a control system design.	You will further develop your MATLAB skills by modelling advanced control systems.	You will be able to carry out, document and explain control system analysis, modelling and transformations using the correct mathematical tools and processes.	

	State Space & Digital Control	By working on (and if applicable, assessed through)	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts.	Lectures, workshops and a range of illustrative worked examples will develop your familiarity and fluency with the key concepts. Assessed by closed-book exam.	A series of practical exercises will challenge you to design and simulate digital control systems.	You will develop fluency in communication via group discussion in workshops (formative feedback) and in writing in a closed examination (assessed).	
Stage 3	ELE00050H	Progress towards PLO	You will learn about the key operating principles and technologies behind digital communication systems, and about the important design principles and trade-offs in digital communication system design.	You will develop your skills in identifying and using appropraite numeric and algebraic techniques to calculate properties of communications signals, including signal bandwidth, power spectra, and bit error rates, and to compare and contrast several common modulation schemes.				
	Digital Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce radio systems and baseband data transmission. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.	Lectures and wider reading will introduce the knowledge that you need.. Formative tutorial questions will help you with your learning. Assessed through a closed-book exam.				
Stage 3	ELE00052H	Progress towards PLO	You will learn about wired communication networks and the operation of the Internet.	You will learn to evaluate and compare the efficacy of different protocols, given a network specification.	You will learn to design and specify networks for a variety of real-world scenarios.	You will learn to use a protocol analyser to investigate the performance of communication networks.		

	LAN & Internet Protocols	By working on (and if applicable, assessed through)	Lectures and wider reading will equip you with an understanding of networking principles and a range of protocols, including Internet standards. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will equip you with an understanding of the efficiencies of common flow control and error control techniques. Formative tutorial questions will help you to reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in network design. (Assessed through exam.)	Working through lab sessions will give you the knowledge and experience to use a protocol analyser to investigate network.		
Stage 3	ELE00012H	Progress towards PLO	You will learn about the fundamental design principles and trade-offs behind mobile communication systems.	You will learn to analyse alternative designs and assess their suitability for a particular application scenario, using mathematical models.	You will learn to design mobile communication networks, considering the effects of real-world network requirements and geography.			
	Mobile Communication Systems	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to a wide range of technologies employed in mobile communication system standards. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Lectures and wider reading will give you the information that you need. Formative tutorial questions will help reinforce your learning. Assessed through a closed-book examination.	Working through example sheets and engaging in lecture contect will develop skills in the design of mobile communication networks. (Assessed through exam.)			
Stage 3	ELE00047H	Progress towards PLO	You will learn about the requirements of a distributed computing environment, and its application to cloud-based services.	You will learn to exploit the fundamental modes of interaction in a distributed environment and their associated failure models.	You will learn to design systems to ensure the security of distributed and cloud-based environments.		You will develop skills in gathering and critically analysing information from reliable sources and constructing technical reports for a specified audience.	
	Cloud & Distributed Computer Systems	By working on (and if applicable, assessed through)	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.	Engagement in lecture material and directed reading will lead you to the preparation of an assessed report.		You will produce a critical design study report (assessed) to practice these skills.	

Stage 3	ELE00015H	Progress towards PLO	You will learn about, and be able to create, formal financial documents for a business. You will learn the difference between incremental and zero-based budgeting, how budgets are constructed within organisations, and the interaction between Costs, Volume and Profit in the context of product manufacture.	You will learn about the different types of assets required within an organisation to enable it to trade, and the value to an organisation of an investment opportunity. You will learn to analyse the interaction between Costs, Volume and Profit in the context of product manufacture and apply CVP analysis techniques to financial decision making.				You will build a good understanding of the foundations of accounting and finance including appropriate terminology and tools and techniques. This will help you to use and analyse financial issues such as company performance, investment opportunities and product costing and pricing in the business and new venture contexts.
	Accounting & Finance	By working on (and if applicable, assessed through)	Lectures and wider reading will introduce you to the documents, models, concepts and principles (assessed by closed-book exam).	Lectures and wider reading will provide you with knowledge, problems available through the VLE Question Bank will help reinforce your learning (assessed by closed-book exam).				Experience is gained through a synthesis of lectures, wider reading and through problems available via an on-line Question Bank.
Stage 3	ELE00023H	Progress towards PLO	You will learn to describe the development of quantum mechanics in the context of nanoelectronics. You will learn about the theory behind nanoelectronics, nanodevices, spintronics and molecular electronics, and to differentiate between electron behaviour in mesoscopic and nanoscale systems.	You will learn to calculate the electron transport in a quantum well and nanoscale systems.	You will learn to design appropriate nanoelectronic devices which demonstrate useful functionality.		You will be able to construct technical reports and identify reliable sources of information, recognising issues of plagiarism and collusion.	

	Nanoelectronics	By working on (and if applicable, assessed through)	Lectures and reading material will explain quantum mechanics. Class examples and workshops (assessed) of equation solving on fundamental concepts of nanoelectronics lead to a final exam.	Lectures and reading material will explain quantum mechanics. Class examples and workshops of equation solving on fundamental concepts of nanoelectronics (assessed, along with a final summative exam).	Engaging with lecture material and directed reading will provide the knowledge of the limitations and uses of nanoscale devices.		Workshop reports give you the opportinity to describe the fundamental theory and behaviour of nanoelectronic devices (assessed).	