Royal Holloway, University of London
Course specification for an undergraduate award

MENG COMPUTER SYSTEMS ENGINEERING (HG02)

Section 1 – Introduction to your course

This course specification is a formal document, which provides a summary of the main features of your course and the learning outcomes that you might reasonably be expected to achieve and demonstrate if you take full advantage of the learning opportunities that are provided. Further information is contained in the College prospectus, and in various handbooks, all of which you will be able to access online. Alternatively, further information on the College's academic regulations and policies can be found here.

Your degree course in **MEng Computer Systems Engineering** provides progressive structures in which you are able to gain ever-wider knowledge and understanding, and appropriate skills. The courses contain a combination of mandatory modules to introduce you to the theoretical knowledge and practical skills, with a range of stage three specialist options. The structure in stage one and two encourages you to work in teams, and in stage three to develop your own interests through informed choice among specialist options. In stage three you will be required to produce an individual project from conception through to production. Stage 4 develops group working/team dynamics and personal research techniques. In Stage 4 advanced options are available which allow personal and in-depth research, evaluation and practical application skills to be developed.

While Royal Holloway keeps all the information made available under review, courses and the availability of individual modules, especially optional modules are necessarily subject to change at any time, and you are therefore advised to seek confirmation of any factors which might affect your decision to follow a specific course. In turn, Royal Holloway will inform you as soon as is practicable of any significant changes which might affect your studies.

The following is brief description for some of the most important terminology for understanding the content of this document:

Degree course – May also be referred to as 'degree programme' or simply 'programme', these terms refer to the qualification you will be awarded upon successful completion of your studies.
Module – May also be referred to as 'course', this refers to the individual units you will study each year to complete your degree course. Undergraduate degrees at Royal Holloway comprise a combination of modules in multiples of 15 credits to the value of 120 credits per year. On some degree courses a certain number of optional modules must be passed for a particular degree title.

Section 2 – Course details			
Date of specification update	April 2020	Location of study	Egham campus
Course award and title	MEng Computer Systems Engineering	Level of study	Undergraduate
Course code	3381	UCAS code	HG02
Year of entry	2020/21		
Awarding body	Royal Holloway, University of London		
Department or school	Electronic Engineering	Other departments or schools involved in teaching the course	Computer Science
Mode(s) of attendance	Full-time	Duration of the course	Four years
Accrediting Professional, Statutory or Regulatory Body requirement(s	Applied for Institution of Engineering and Technology (IET) accreditation but the visit can only happen when the 2nd year cohort is in place. If the application is successful, it is expected that the 2019 cohort will be given accredited status on completion of the course (accreditation application currently under review).		
Link to Coursefinder entry for further information:	https://www.royalholloway.ac.uk/studying-here/undergraduate/electronic-engineering/computer-systems-engineering-meng/	For queries on admissions:	study@royalholloway.ac.uk.

Section 3 – Degree course structure										
3.1 Mandatory module information The following table summarises the mandatory modules which students must take in each year of study										
Stage	Module code	Module title	Contact hours*	Self-study hours	Written exams	Practical assessment	Coursework	Credits**	FHEQ level	Module status (see below)
1	EE1000	Embedded Systems Creative Team Project 1	100	200	-	25%	75%	30	4	MC
1	EE1010	Programming in C++	50	100	-	-	100%	15	4	MC
1	EE1020	Electronic circuits and components	50	100	60%	-	40%	15	4	MC
1	EE1030	Communications Engineering	50	100	60%	-	40%	15	4	MC
1	EE1110	Mathematics for Engineers 1	68	82	60%	-	40%	15	4	MC
1	EE1120	Mathematics for Engineers 2	68	82	60%	-	40%	15	4	MC
1	CS1840	Internet services	31	119	90%	-	10%	15	4	MC
2	EE2000	Embedded Systems Creative Team Project 2	100	200	-	20%	80%	30	5	MC
2	IY2840	Computer and Network Security	33	117	70%	-	30%	15	5	MC
2	IY2760	Introduction to information security	33	117	80%	-	20%	15	5	MC
2	EE2010	Software engineering	50	100	-	30%	70%	15	5	MC

2	EE2020	Signals, Systems and Communications	50	100	50%	30%	20%	15	5	MC
2	EE2080	Professional and Sustainable Engineering	50	100	-	50%	50%	15	5	MC
2	CS2860	Algorithms and complexity	33	117	90%	-	10%	15	5	MC
3	EE3000	Individual project	110	340	-	20%	80%	45	6	MNC
3	EE3070	Digital Systems Design	40	110	-	30%	70%	15	6	MC
3	CS3490	Computational Optimisation	30	120	90%	-	10%	15	6	MC
4	EE4000	Group project	110	200	-	15%	85%	30	7	MNC
4	CS4100	Data analysis	40	110	80%-	-	20%	15	7	MC
4	EE4090	System on Chip Design	30	120	-	50%	50%	15	7	MC

This table sets out the most important information for the mandatory modules on your degree course. These modules are central to achieving your learning outcomes, so they are compulsory, and all students on your degree course will be required to take them. You will be automatically registered for these modules each year. Mandatory modules fall into two categories; 'condonable' or 'non-condonable'.

In the case of mandatory 'non-condonable' (MNC) modules, you must pass the module before you can proceed to the next year of your course, or to successfully graduate with a particular degree title. In the case of mandatory 'condonable' (MC) modules, these must be taken but you can still progress or graduate even if you do not pass them. Please note that although Royal Holloway will keep changes to a minimum, changes to your degree course may be made where reasonable and necessary due to unexpected events. For example; where requirements of relevant Professional, Statutory or Regulatory Bodies have changed and course requirements must change accordingly, or where changes are deemed necessary on the basis of student feedback and/or the advice of external advisors, to enhance academic provision

*Contact hours come in various different forms, and may take the form of time spent with a member of staff in a lecture or seminar with other students. Contact hours may also be laboratory or, studio-based sessions, project supervision with a member of staff, or discussion through a virtual learning environment (VLE). These contact hours may be with a lecturer or teaching assistant, but they may also be with a technician, or specialist support staff.

**The way in which each module on your degree course is assessed will also vary, however, the assessments listed above are all 'summative', which means you will receive a mark for it which will count towards your overall mark for the module, and potentially your degree classification, depending on your year of study. On successful completion of the module you will gain the credits listed. 'Coursework' might typically include a written assignment, like an essay. Coursework might also include a report, dissertation or portfolio. 'Practical assessments' might include an oral assessment or presentation, or a demonstration of practical skills required for the particular module.

3.2 Optional module

In addition to mandatory modules, there will be a number of optional modules available during the course of your degree. The following table lists a selection of optional modules that are likely to be available. However, not all may be available every year. Although Royal Holloway will keep changes to a minimum, new options may be offered or existing ones may be withdrawn. For example; where reasonable and necessary due to unexpected events, where requirements of relevant Professional, Statutory or Regulatory Bodies (PSRBs) have changed and course requirements must change accordingly, or where changes are deemed necessary on the basis of student feedback and/or the advice of External Advisors, to enhance academic provision.There may be additional requirements around option selection, so it is important that this specification is read alongside your department's Student Handbook, which you can access via their webpage or the Course Catalogue.

Stage 1	Stage 2	Stage 3	Stage 4
None	None	CS3870 Advanced algorithms	CS4860 Distributed and Networked Systems
		CS3940 Intelligent agents and multi-agent systems	CS4950 Deep learning
		CS3920 Machine learning	CS4940 Intelligent agents and multi-agent systems
		IY3612 Cyber security	CS4606 Smart cards, RFIDs and embedded systems security
		EE3010 Digital signal processing design	IY4609 Digital forensics
		EE3020 Renewable energy systems	EE4080 Pattern Recognition
		EE3060 Fundamentals of Biomedical Engineering	EE4100 Immersive Engineering 1

		EE3080 Advanced Communications Systems	EE4110 Immersive Engineering 2

3.3 Optional module requirements
In stage 3 you must choose 45 credits of optional modules at FHEQ level 6 (EE30XX, CS3xxx, IY3xxx) In stage 4 you must choose 60 credits of optional modules at FHEQ level 7 (EE40XX, CS4xxx, IY4xxx)

Section 4 - Progressing through each year of your degree course
For further information on the progression and award requirements for your degree, please refer to Royal Holloway's <u>Academic Regulations</u>.

Section 5 – Educational aims of the course

- to engage you imaginatively in the process of learning through creative hands-on group and individual project based activities, enabling them to develop leadership, management and independent critical thinking and judgement;
- to encourage you to appreciate how computer sciences and electronic engineering is the heart of many systems.
- to equip you with the technical knowledge, practical skills and confident verbal and written communication abilities that demonstrate their decision making skills in new, complex and unpredictable situations in industrial team working;
- to produce graduates that fully meet the demands required for employment in industry, including independent learning in the development of new ideas ;
- to gain experience in the application of creativity in solving computer systems engineering problems;
- to encourage an awareness of environmental and social issues, investigating new materials and using them in ways that have a beneficial effect on humanity;
- to encourage you to take progressive responsibility for your own study through negotiating subject areas of specialism with other students in practical's and workshops, through the informed choice of options and an individual major project in the final year that leads to a final product;
- to develop an understanding of legal and ethical issues and responsibilities of a professional engineer in social and industrial context ;

Section 6 - Course learning outcomes

In general terms, the courses provide opportunities for students to develop and demonstrate the following learning outcomes. (*Categories – Knowledge and understanding (K), Skills and other attributes (S), and Transferable skills (*)*)

1. extensive knowledge and comprehensive understanding of the scientific principles of computer sciences and electronic engineering, software engineering, hardware engineering, cyber and network security, data analyses and large-scale data storage and processing, materials, electronic components and circuit design(K);
2. develop systematically methodologies and critiques enabling new designs to be implemented in the context of, for example, mobile communications, computer networking and security, transport systems, energy systems, medical applications, domestic appliances, TV, radio, music studios and gaming devices (K);
3. the historical context and developing technologies used in everyday life (K);
4. wide knowledge and understanding of design and data processing and methodologies (K);
5. understanding of concepts from areas outside engineering (K);
6. an understanding of issues facing this and future generations such as green energy provision, communication systems and appliance control (K);
7. sustainability generation and environmental issues (K);
8. development of electronic devices and circuits (K);
9. computer and network security techniques and applications (K);
10. algorithms and complexity, and Internet services (K);
11. the practical use of embedded systems (K);
12. the C++ programming language (K);
13. software engineering and optimisation techniques (K);
14. cyber security (K);
15. machine learning (K);
16. intelligent agents and multi-agent systems (K);
17. Smart cards, RFIDs and embedded systems security (K);
18. large-scale data storage and processing (K);
19. a critical awareness of current issues, current research and their

24. analysis and critical interpretation of text and data (S);*
25. sensitivity to and responsiveness and an understanding of industrial conventions (S);
26. the ability to conduct literary research independently using traditional and electronic resources (S); *
27. use fundamental knowledge to investigate new and emerging technologies (S);*
28. able to assess the limitations of mathematical and computer based models for problem solving (S);*
29. adapt process design and methodology to unfamiliar situations (S):*
30. command of a relevant wider vocabulary and appropriate critical and theoretical terminology (S);
31. planning and execution of formal reports and project-work, bibliographical skills, developing a reasoned argument (S);*
32. advanced written and oral presentation skills, including the ability to present logical and coherent written and oral arguments of varying lengths (S);*
33. the ability to organise and interpret complex information in a structured and systematic way, and to comprehend and develop sophisticated concepts in the context of writing a journal article (S);*
34. the capacity for independent thought and judgement, along with skills in critical reasoning (S);*
35. information technology skills (including word processing, email, WWW, information handling and retrieval), and the ability to engage with the textual use of new media, video, TV, DVD and electronic (S);*
36. experience in group working and properly prepared to present reasoned verbal and written arguments in a confident manner;* interpersonal skills, involving non-judgmental communication whilst recognising and respecting the viewpoints of others (S);*
37. time management and organisational skills including working to deadlines, conducting commercial risk assessments, prioritising tasks, organising work/social time (S);*
38. ability to produce ingenious solutions that are prototyped and brought to product

interpretation in the context of professional practice (K);
20. comprehensive knowledge and understanding of mathematical and computer models (K);
21. understanding of business management and practical engineering leadership (K);
22. specialise in an area of personal interest in their individual project (K);
23. comprehensive understanding of relevant research (K).

readiness for market (S);*
39. lifelong learning and contributions to the wider community (these include personal motivation; the ability to work autonomously and with others; self-awareness and self-management; empathy and insight; intellectual integrity; awareness of responsibility as a local, national and international citizen; interest in lifelong learning; flexibility and adaptability; creativity) (S);
40. leadership skills (S);*
41. evaluating and critiquing practical methodologies (S);*
42. writing a research journal article to a standard suitable for publication (S);*
43. make sound judgements in solving practical problems (S);*
44. autonomous working skills and self-direction in practical work (S);*
45. awareness of environmental, social, legal and ethical issues, in professional engineering and industrial communities (S);*

Section 7 - Teaching, learning and assessment

Teaching activities will include lectures, workshops and seminars and practical project work will be carried out in groups and individually in purpose-built thinking, prototyping and fabrication laboratories. In particular, the underlying principles of the course are the exploitation and development of creative skills in the context of proposing ingenious solutions to emerging problems prior to the prototype and product development stages.

Various assessment methods will be used including examinations for theoretical subjects, formal presentations, reports and practical demonstrations for project work with an additional viva voce examinations for final year individual projects. In addition, you will be involved in workshops and will produce various forms of creative work. Full details of the assessments for individual modules can be obtained from the Department.

Section 8 – Additional costs

There are no single associated costs greater than £50 per item on this degree course.

These estimated costs relate to studying this particular degree course at Royal Holloway. General costs such as accommodation, food, books and other learning materials and printing etc., have not been included, but further information is available on our website.

Section 9 – Indicators of quality and standards	
QAA Framework for Higher Education Qualifications (FHEQ) Level	4-7
Your course is designed in accordance with the FHEQ to ensure your qualification is awarded on the basis of nationally established standards of achievement, for both outcomes and attainment. The qualification descriptors within the FHEQ set out the generic outcomes and attributes expected for the award of individual qualifications. The qualification descriptors contained in the FHEQ exemplify the outcomes and attributes expected of learning that results in the award of higher education qualifications. These outcomes represent the integration of various learning experiences resulting from designated and coherent courses of study.	
QAA Subject benchmark statement(s)	http://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/sbs-engineering-15.pdf?sfvrsn=f99df781_10
Subject benchmark statements provide a means for the academic community to describe the nature and characteristics of courses in a specific subject or subject area. They also represent general expectations about standards for the award of qualifications at a given level in terms of the attributes and capabilities that those possessing qualifications should have demonstrated.	

Section 10 – Further information
This specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate when taking full advantage of the learning opportunities that are available. More detailed information on modules, including teaching and learning methods, and methods of assessment, can be found via the online course catalogue. The accuracy of the information contained in this document is reviewed regularly by the university, and may also be checked routinely by external agencies, such as the Quality Assurance Agency (QAA).
Your course will be reviewed regularly, both by the university as part of its cyclical quality enhancement processes, and/or by your department or school, who may wish to make improvements to the curriculum, or in response to resource planning. As such, your course may be revised during the course of your study at Royal Holloway. However, your department or school will take reasonable steps to consult with students via appropriate channels when considering changes. All continuing students will be routinely informed of any significant changes.

Section 11 – Intermediate exit awards (where available)		
You may be eligible for an intermediate exit award if you complete part of the course as detailed in this document. Any additional criteria (e.g. mandatory modules, credit requirements) for intermediate awards is outlined in the sections below.		
Award	**Criteria**	**Awarding body**
BEng in Computer Systems Engineering	Failure to pass the group project (EE4000) and its resit would mean being unable to graduate with an accredited MEng. The BEng will have been completed successful to have entered the MEng year, and therefore an accredited BEng Computer Systems Engineering is offered as an exit route.	Royal Holloway, University of London
Diploma in Higher Education (DipHE)	Pass in 210 credits of which at least 90 must be at or above FHEQ Level 4 and at least 120 of which must be at or above FHEQ Level 5	Royal Holloway and Bedford New College
Certificate in Higher Education (CertHE)	Pass in 120 credits of which at least 90 must be at or above FHEQ Level 4	Royal Holloway and Bedford New College

Section 12 - Associated award(s)
MEng Computer Systems Engineering
MEng Computer Systems Engineering with a Year in Industry