School of Mathematical and Computer Sciences

Postgraduate Programme Handbook

MSc/PGD Computer Systems Management
MSc/PGD Data Science
MSc/PGD Information Technology (Business)
MSc/PGD Information Technology (Software Systems)
MSc/PGD Network Security
MSc/PGD Software Engineering

Dubai Campus

2017 – 2018

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PART A – CAMPUS AND PROGRAMME INFORMATION

1   SUMMARY OF KEY INFORMATION

1.1   KEY CONTACTS

Professor Ammar Kaka is the Head of the Heriot-Watt University Dubai Campus (HWUDC). There are 8 Academic Schools functioning within the Heriot Watt University Dubai Campus and each of them is managed by the Associate Head of School based in Dubai. Each Academic programme is led by a Programme Coordinator, supported by an experienced academic staff team located at the University's campus at Dubai International Academic City. The address and contact details are noted overleaf. In the first instance, students should contact us via our Reception staff who will be pleased to help direct queries to the appropriate person.

Heriot-Watt University Dubai Campus
Dubai International Academic City
PO Box 294345
Dubai
UAE
Tel: +971 4 4358700/ 8701/ 8702
Fax: +971 4 4477344 Web: www.hw.ac.uk/dubai.htm

1.2   SIGNIFICANT DATES IN ACADEMIC YEAR

HWU operates a two twelve-week semester system as shown below:

Event	Start	End
Welcome Week	Monday 4th September 2017	Saturday 9th September 2017
Semester 1 - Teaching	Sunday 10th September 2017	Saturday 2nd December 2017
Semester 1 - Examinations	Monday 4th December 2017	Friday 15th December 2017
Semester 1 - Break	Sunday 17th December 2017	Saturday 6th January 2018
Semester 2 - Teaching	Sunday 7th January 2018	Saturday 31st March 2018
Semester 2 - Break	Sunday 1st April 2018	Saturday 21st April 2018
Semester 2 - Examinations	Monday 23rd April 2018	Friday 18th May 2018
Graduation	July 2018 TBC	
Autumn Diet - Examinations (Resit)	Thursday 2nd August 2018	Friday 10th August 2018
Graduation	November 2018 TBC	

The Teaching Timetable for each Semester would be published on the link https://www.hw.ac.uk/students/studies/timetables.htm before the start of each Semester.

All examinations take place during the assessment blocks. Resit examinations are scheduled during the summer vacation. Full details of examination timetabling are published at the campus and can be found at:
http://www.hw.ac.uk/students/studies/examinations/timetables.htm

OFFICIAL UAE LOCAL HOLIDAYS & HERIOT-WATT UNIVERSITY DUBAI CAMPUS CLOSED DAYS
The official National holidays in the United Arab Emirates (UAE) are listed below. The Heriot-Watt University Dubai Campus will be closed on the approximate dates mentioned below:

Local Holiday	Proposed HWU Dubai Campus closed days *
Arafat (Haj) Day and Eid-Al-Adha	1-3 September 2017
Al-Hijra (Islamic New Year)	22 September 2017
Commemoration Day/ Mouloud (Prophet's Birthday)	30 November 2017
UAE National Day	2 December 2017
New Year's Day	1 January 2018
Leilat Al-Meiraj (Ascension of the Prophet)	13 April 2018
Eid-Al-Fitr (End of Ramadan)	14-15 June 2018

* All dates given, especially for Islamic holidays and special observations, are approximate dates only and will be confirmed nearer the time, along with any University closed days

1.3 LINKS TO FURTHER INFORMATION/SERVICES

Please refer to the University's websites at www.hw.ac.uk and http://www.hw.ac.uk/dubai.htm which contain detailed information about Heriot-Watt University and the Dubai Campus.

University Academic Registry :	http://www1.hw.ac.uk/registry/
Online Course Material:	http://vision.hw.ac.uk/
Student Self Service:	http://www.hw.ac.uk/selfservice
Online Enrolment:	http://www.hw.ac.uk/onlineenrolment
Online Results:	http://www.hw.ac.uk/selfservice
Forms:	http://www.hw.ac.uk/registry/forms.htm
Graduation:	http://www.hw.ac.uk/students/studies/graduation.htm

2   WELCOME AND INTRODUCTION

2.1   Welcome from the Principal

I am very pleased to welcome you to Heriot-Watt University!

I am delighted you have chosen to study at our innovative and distinctive University. You are now part of an unparalleled global community that connects students, staff and alumni.

As one of the most progressive and international Institutions based in Scotland, here you will have the opportunity to thrive, both personally and academically, during your time with us. As a student I invite you to contribute to our future together as we continue to develop the learning and teaching experience we deliver across the world – transforming people, society and the world we live in.

Our learning environment seeks to offer the very best in terms of study programmes which apply knowledge to real world challenges, together with the latest learning technologies, and outstanding support and facilities.

As students the University wants to encourage you to see the world, then change it. We have developed opportunities for student mobility through our Go Global inter campus exchange, encouraging all our students to benefit from working and socialising in an international institution, whether at a single campus location or abroad.
Our graduates are sought by global professions and industries. The very nature of a Heriot-Watt research-informed education, underpinned by our values, ensures you will have the opportunity to develop the leadership skills and confidence, to be global citizens of the world who are specialists in their chosen field and experts in their professions.

I hope you thoroughly enjoy the experience of being a Heriot-Watt student and on behalf of all of the staff, we look forward to you commencing your studies with us.

Professor Richard A Williams OBE
University Principal and Vice-Chancellor

2.2   Welcome from the Head of Dubai Campus

It is with great pleasure that we welcome you to the University's Dubai Campus

Heriot-Watt University is proud to be here in the UAE, providing a range of high quality programmes, relevant to the Middle East region, to the UAE and to the aspirations of its people. Heriot-Watt has a long tradition of providing vocationally relevant academic programmes, with strong industry and research links. There are currently over 500 Heriot-Watt Alumni living and working in the UAE and the Gulf States as well as our current students, so you will be joining a successful and vibrant community!

We welcome you to your chosen degree programme either as a postgraduate or undergraduate student and look forward to working with you to help you achieve your personal ambitions and goals.

Professor Ammar Kaka
A Vice Principal of Heriot-Watt University and
Head of Heriot-Watt University Dubai Campus

2.3   Welcome from Head of School

I am delighted to echo my colleagues' welcome to our University and to our Dubai campus. It is also my pleasure to welcome you to the School of Mathematical and Computer Sciences. You

are joining a thriving School with a strong tradition of research, scholarship and teaching in Computer Science and Information Technology. You are about to start on a well-established postgraduate programme leading to a highly regarded and internationally recognised qualification. As our student, you will enjoy the professionalism, enthusiasm and friendliness of our Dubai-based staff, confident that you are receiving the same high standards of teaching and assessment as your fellow students in Scotland.

I trust that you will find studying with us both stimulating and rewarding.

Professor Beatrice Pelloni
Head of the School of Mathematical & Computer Sciences

3   GENERAL INFORMATION ABOUT HERIOT-WATT UNIVERSITY AND THE DUBAI CAMPUS

Heriot-Watt University is an international university, based in Edinburgh, the capital of Scotland in the UK, with campuses in the north and south of Scotland, Dubai and Malaysia. The University also has a worldwide network of Learning Partners.

Wherever they are located, Heriot-Watt students have the opportunity to study programmes which will equip them to contribute immediately to the economy and wellbeing of the region in which they choose to work. This ethos of "doing things that matter" stretches right back to the origins of Heriot-Watt in 1821, when programmes were run to suit the needs of developing industries in Scotland.

The Heriot-Watt University Dubai Campus is located in the Dubai International Academic City. The University is the first to operate from this rapidly-developing site, and is offering programmes that meet the demands of the region and beyond.

The Dubai Campus is certified and permitted by Knowledge and Human Development Authority (KHDA) which is part of the Dubai Government (UAE). Heriot-Watt is running all its Programmes and activities of higher education in UAE under the rules and regulations of KHDA.

4   KEY STAFF AND CONTACT DETAILS

4.1 Campus Contacts

Point of Contact	Responsible Staff Name	Tel Number
A Vice-Principal of Heriot-Watt University and Head of Dubai Campus	Professor Ammar Kaka	+971 4 4358666
Director of Administration & Registrar	Ms Sheelagh Wallace	+971 4 4358666
Student President	Mr Franklin Thankachan	+971 4 4358795
Reception	Mr Biju Prasad/ Ms Soleil Sanchez	+971 4 4358700
Recruitment and Admissions Office	Dr Kishore Sirnani	+971 4 4358605
Academic Administration Office	Mrs Nandini Raj	+971 4 4358644
Visa Office	Mr. Ilyas Abdul Wahab	+971 4 4358628
Finance Office	Mr Suresh Kumar	+971 4 4358675
Library	Dr Ramakanta Rath	+971 4 4358661
IT Office (Help Desk)	Mr Nidhish Cherian	+971 4 4358685
Transport and Accommodation Office	Mr Anil Kumar	+971 4 4358621
Careers Development officer	Ms Kathryn Taylor	+971 4 4358791
Effective Learning Advisor	Dr Allyson Noble	+971 4 4358797

4.2 Academic School Contacts

Point of Contact	Responsible Staff Name	Direct line/Email/ Office location
Dubai Campus		
Academic Head	Mr Steve Gill	+971 4 4358761 S.Gill@hw.ac.uk F44, 3rd floor
Director of Postgraduate Studies	Dr Hind Zantout	+971 4 4358764 H.Zantout@hw.ac.uk F43, 3rd floor
Director of Undergraduate Studies	Mr Talal Shaikh	+971 4 4358762 T.A.G.Shaikh@hw.ac.uk F42, 3rd floor
Associate Director of Learning & Teaching	Dr Hani Ragab Hassen	971 4 4358727 H.RagabHassen@hw.ac.uk F67, 2nd floor
Director of Research	Dr Mohammad Hamdan	+971 4 4358789 M.Hamdan@hw.ac.uk F69, 2nd floor
Edinburgh Campus		
Head of School	Professor Beatrice Pelloni	B.Pelloni@hw.ac.uk
Head of Computer Science	Professor Andrew Ireland	A.Ireland@hw.ac.uk
Director of Postgraduate Studies	Dr Hamish Taylor	H.Taylor@hw.ac.uk
Postgraduate Administrator	Ms Rodi Amiridou	R.Amiridou@hw.ac.uk

4.3 Academic Staff Contacts

Point of Contact	Responsible Staff Name	Direct line/Email/ Office location
Assistant Professor *Programme Director:* *MSc/PGD Computer Systems Management*	Dr Mohamed Abdelshafy	+971 4 4358650 M.Abdelshafy@hw.ac.uk F85, 2nd floor
Associate Professor	Mr Steve Gill	+971 4 4358761 S.Gill@hw.ac.uk F44, 3rd floor
Assistant Professor *Programme Director:* *MSc/PGD Information Technology (software systems)*	Dr Mohammad Hamdan	+971 4 4358789 M.Hamdan@hw.ac.uk F69, 2nd floor
Assistant Professor *Programme Director:* *MSc/PGD Information Technology (business)*	Ms Smitha Kumar	+971 4 4358786 Smitha.Kumar@hw.ac.uk F68, 2nd floor
Assistant Professor *Programme Director:* *MSc/PGD Software Engineering*	Mr Talal Shaikh	+971 4 4358762 T.A.G.Shaikh@hw.ac.uk F42, 3rd floor
Associate Professor *Programme Director:* *MSc/PGD Network Security*	Dr Hani Ragab Hassen	+971 4 4358727 H.RagabHassen@hw.ac.uk F67, 2nd floor
Associate Professor *Programme Director:* *MSc/PGD Data Science*	Dr Hind Zantout	+971 4 4358764 H.Zantout@hw.ac.uk F43, 3rd floor

4.4 Support Staff Contacts

Point of Contact	Responsible Staff Name	Direct line/Email/ Office location
IT Lab.	IT Help Desk	+971 4 4358681 to 85 or 87 DubaiHelpdesk@hw.ac.uk 1st floor, left wing
PA to the Academic Head of Mathematical & Computer Sciences	Ms Resmi Nair	971 4 4358668 N.Resmi@hw.ac.uk AAO, Ground floor
Senior Officer – Undergraduate, Academic Administration Office	Mr. Shiju Balan	+971 4 4358641 s.balan@hw.ac.uk AAO, Ground floor
Officer – Postgraduate, Academic Administration Office	Ms Resmi Nair	971 4 4358668 N.Resmi@hw.ac.uk AAO, Ground floor
Academic Administration Office	Counter Service	+971 4 4358631 DubaiAAO@hw.ac.uk Ground floor

5 PROGRAMME OVERVIEW

Heriot-Watt University reserves the right to update materials from time to time and will ensure that advance notification concerning changes to materials is provided to students on the relevant section of the University website. It is the responsibility of students to check the website, particularly if they are returning to studies after a period during which their studies have been in abeyance.

All students registered for the programme are expected to have read and to be familiar with the contents of this Handbook.

Disclaimer: Every effort has been made to ensure the contents of this handbook are accurate at the time of printing. Unforeseen circumstances may necessitate changes to the procedures, curricula and syllabus described.

6 PROGRAMME STRUCTURE AND DELIVERY

The University operates a Heriot-Watt Assessment and Progression System (HAPS) which specifies minimum progression requirements. Schools have the option to apply progression requirements above the minimum University requirement, which are approved by the Studies Committees. Students should refer to the programme specific information on progression requirements. This information is detailed later in this handbook.

Graduate Attributes
As a student of Heriot-Watt University, you are part of our global community. You will meet new people, discover new interests, develop your life skills and enhance your employability and career prospects.

The University will provide you with opportunities to develop skills, qualities and academic abilities during your time as a Heriot-Watt student. These are known as the **Four Heriot-Watt Graduate Attributes**:

- *Specialist*
- *Creative*
- *Global*
- *Professional*

Further information can be found at:
https://www.hw.ac.uk/students/doc/StudentGraduateAttributes.pdf

While very effort is made to ensure that the contents of this handbook are correct at time of printing, changes may occur during the academic year. The most up-to-date version can be found at: http://www.macs.hw.ac.uk/students/home/dubai/

MSc PROGRAMMES

COMPUTER SYSTEMS MANAGEMENT

Programme Director: Dr Mohamed Abdelshafy

The aim of this MSc programme is to impart the skills and understanding required to enable students to manage complex computer systems as part of the support services of an organisation. This will include selection, installation, maintenance and support of a wide range of technologies, and an understanding of currently recommended methodologies.

In more detail, the programme aims to enable students to:

♦ Develop detailed knowledge and critical understanding of the main technologies and methodologies pertaining to computer systems management.
♦ Develop and use a significant range of principal and specialist skills, techniques and practices in the domain, including systems programming and scripting.
♦ Critically review existing practice and develop original and creative solutions to problems within the domain.
♦ Communicate and work effectively with peers and academic staff in a variety of tasks, demonstrating appropriate levels of autonomy and responsibility.
♦ Plan and execute a significant project of research, investigation or development in a specialist area, demonstrating advanced skills and a critical understanding of the technologies required in computer systems management.

Understanding, Knowledge and Cognitive Skills
♦ Critical understanding of the principal theories, principles and concepts relating to the domain of systems management.
♦ Extensive, detailed and critical understanding of at least one specialist area within the domain of systems management.
♦ Understanding and use of a significant range of the principal skills, techniques and practices in systems management, and a range of specialised skills, research and investigation techniques, and practices informed by current practices within the domain.
♦ A broad knowledge of the main areas of computer systems management, including terminology, conventions, underpinning theory, techniques and practices.
♦ Application-based knowledge and skills relating to the broad range of activities within the domain, and specialist knowledge and skills in applications relating to a number of specialist areas within the domain.
♦ Extensive and detailed knowledge of theories and algorithms relating to computer systems management, with specialist applicative skills appropriate to the sub disciplines.
♦ Extensive and detailed knowledge and understanding of technologies relating to computer systems management, and their application, including the ability to critically analyse and review such technologies to support original and creative application development.
♦ Specialist and critical knowledge, understanding and skills in a number of mainstream and specialist areas within the domain of computer systems management, including systems programming, technologies such as C# and .NET, methodologies such as ITIL.

Scholarship, Enquiry and Research
♦ Develop and apply skills in critical analysis, evaluation and synthesis in consideration of the range of theories, concepts and techniques in use within the domain of computer systems management, and in the design of projects and experimental models.
♦ An understanding of research ethics, and how to appropriately build on the work of others.
♦ Develop and utilise advanced problem-solving skills and techniques in the development of original and creative solutions to general and specialist issues within the domain.

Industrial, Commercial and Professional Practice
- ♦ Demonstrate critical awareness of current legal, social, ethical and professional issues within the discipline.
- ♦ Make informed judgements with incomplete or inconsistent data, or where there are no professional or ethical codes or practices for guidance.

Autonomy, Accountability and Working with Others
- ♦ Work autonomously and within teams, as appropriate, demonstrating a capability for both taking and critically reflecting on roles and responsibilities.

Communication, Numeracy and ICT
- ♦ Develop and demonstrate skills and techniques in communication with peers and academic/industrial staff, using a range of appropriate methods to suit different levels of knowledge and expertise within the audience.
- ♦ Develop and demonstrate critical knowledge and skills in the planning and usage of software tools and numerical techniques to develop, present and communicate information on projects and processes.

Students take 8 courses, 4 each in semesters 1 & 2, including a taught Research Methods and Project Planning course in semester 2. There are 4 mandatory courses and students must choose 4 courses from options (see below).

In semester 3 students, who have met the required criteria, will undertake their Masters dissertation.

Course Code	Title	Mandatory /Optional	Credits
Semester 1 (Sept– Dec)			
F21CN	Computer Network Security	M	15
F21IF	Information Systems Methodologies	M	15
F21DF	Databases and Information Systems	O	15
F21MC	Mobile Communications & Programming	O	15
F21SC	Industrial Programming	O	15
F21SF	Software Engineering Foundations	O	15
Semester 2 (Jan– Apr)			
F21RP	Research Methods and Project Planning	M	15
C11PA	Project Management	M	15
F21AN	Advanced Network Security	O	15
F21AS	Advanced Software Engineering	O	15
F21BD	Big Data Management	O	15
F21DE	Digital & Knowledge Economy	O	15
F21NA	Network Applications	O	15
Semester 3 (pending successful completion of 8 taught courses)			
F21MP	MSc Project & Dissertation	M	60

Part-time students starting in September or January should discuss their course choice with the Programme Director. All part time students must take F21RP in their final year.

DATA SCIENCE

Programme Director: Dr Hind Zantout

The aim of this MSc programme is to give good graduates with academic knowledge of databases and programming, the academic expertise they need to apply state of the art data analysis and visualization techniques to modern academic, business and government information processing problems. Particular issues of interest include data visualization, data mining, big data management and high performance information processing.

In more detail, the programme aims to impart to students:

♦ Detailed knowledge and critical understanding of the big data management and visualization techniques needed to analyse modern academic, business and government information sources.
♦ Significant range of principal and specialist skills, techniques and practices in applying IT, information systems and big data management techniques to large scale, complex and heterogeneous information analysis problems.
♦ Ability to critically review existing practice and develop original and creative solutions to managing challenging amounts and diversities of digital information for scientific, administrative and competitive commercial applications.
♦ Experience of executing a significant project, investigation or development in the area of applying IT and big data management techniques to modern information analytic processes that demonstrates advanced skills and a critical understanding of the technologies required.

In common with the other programmes in our postgraduate computer science discipline, the expected learning outcomes are as detailed below:

Understanding, Knowledge and Cognitive Skills
♦ Critical understanding of the main theories, principles and concepts relating to the domain of digital information management including terminology, conventions, standards and methodologies.
♦ Understanding and use of a significant range of the main skills, techniques and practices in big data processing, and a range of specialised skills, research and investigation techniques, and practices informed by current practices within the data science domain.
♦ Broad and deep knowledge of the main areas of information systems, databases, machine learning, data visualization, application-based knowledge and skills relating to the broad range of handling information processes, and specialist knowledge and skills in applications relating to a number of specialist areas such as business analytics, data mining, data visualization, data warehousing and high performance data processing.

Scholarship, Enquiry & Research
♦ Extensive, detailed and critical understanding of at least one specialist area within the domain of big data management application development obtained through researching the background to a substantial and challenging data analytics project by personal scholarship, design and development of a detailed information systems solution that incorporates significant proportions of software development or configuration to address the analysis issues at stake.
♦ Detailed knowledge and understanding of data sources relating to big information management application developments as well the practical skills in how to exploit them in support of original and creative data science application development.
♦ Specialist and critical knowledge, understanding and skills in a number of mainstream and specialist areas within the domain of digital information management application development including data analysis, data mining, parallel data processing, data visualization and data warehousing.

Autonomy, Accountability & Working with Others
♦ Work autonomously and within teams, as appropriate, demonstrating a capability for both taking and critically reflecting on roles and responsibilities.
♦ Develop and utilise advanced problem-solving skills and techniques in the shared development of original and creative solutions to general and specialist data science analysis and management issues.
♦ Develop and demonstrate skills and techniques in communication with peers and academic/industrial staff, using a range of appropriate methods to suit different levels of knowledge and expertise within the audience.

Industrial, Commercial & Professional Practice
♦ Demonstrate critical awareness of current issues within big data management application development, and make informed judgements about them in the light of relevant professional standards.
♦ Demonstrate an awareness of professional and research issues in the data science discipline, and an ability to critique current techniques and practice.

Communication, Numeracy and ICT
♦ Develop and demonstrate the ability to communicate and present the main issues involved in data science application development to a literate audience with appropriate use of modern presentational tools and aids.
♦ Demonstrate appropriate use of methods of calculation and estimation involved in planning digital and information systems solutions and solving information management applications of big data processing.

Students take 8 courses, 4 each in semesters 1 & 2, including a taught Research Methods and Project Planning course in semester 2. There are 4 mandatory courses and students must choose 4 courses from options (see below).

In semester 3 students, who have met the required criteria, will undertake their Masters dissertation.

Course Code	Title	Mandatory/Optional	Credits
Semester 1 (Sept– Dec)			
F21DL	Data Mining & Machine Learning	M	15
F21DV	Data Visualisation and Analytics	M	15
F21CN	Computer Network Security	O	15
F21IF	Information Systems Methodologies	O	15
F21SF	Software Engineering Foundations	O	15
Semester 2 (Jan– Apr)			
F21RP	Research Methods and Project Planning	M	15
F21BD	Big Data Management	M	15
F21AS	Advanced Software Engineering	O	15
F21DE	Digital and Knowledge Economy	O	15
F21SM*	Software Engineering Master Class	O	15
Semester 3 (pending successful completion of 8 taught courses)			
F21MP	MSc Project & Dissertation	M	60

Part-time students starting in September or January should discuss their course choice with the Programme Director. All part time students must take F21RP in their final year.

* -Special permission is required to take F21SM Software Engineering Master Class

INFORMATION TECHNOLOGY (SOFTWARE SYSTEMS)

Programme Director: **Mohammad Hamdan**

This programme is concerned with the use and application of Information Technology in the specification, design, development and deployment of software systems. Therefore the aims are to enable the students to:

♦ Develop detailed knowledge and critical understanding of the main areas of software systems (including theories, principles and concepts)

♦ Develop and use a significant range of principal and specialist skills, techniques and practices in the domain of software systems.

♦ Critically review existing practice and develop original and creative solutions to problems within the domain.

♦ Communicate and work effectively with peers and academic staff in a variety of tasks, demonstrating appropriate levels of autonomy and responsibility.

♦ Plan and execute a significant project of research, investigation or development in a specialist area within software systems, demonstrating extensive, detailed and critical understanding of that specialism.

The Programme provides opportunities for learners to achieve the following outcomes:

Understanding, Knowledge and Cognitive Skills

♦ Critical understanding of the principal theories, principles and concepts relating to the use of Information Technology in the domain of software systems.

♦ Extensive, detailed and critical understanding of at least one specialist area within the domain of software systems.

♦ Understanding and use of a significant range of the principal skills, techniques and practices in software systems, and a range of specialised skills, research and investigation techniques, and practices informed by leading-edge research and development domain of software systems, and specialist knowledge and skills in applications relating to a number of specialist areas within the domain.

♦ A broad knowledge of the main areas of software systems, including terminology, conventions, underpinning theory, techniques and practices.

♦ Detailed and critical knowledge of at least one area of specialism in software systems, incorporating awareness of current issues and research.

♦ Application-based knowledge and skills relating to the broad range of activities within the software systems domain, and specialist knowledge and skills in applications relating to a number of specialist areas within the domain.

♦ Fundamental knowledge and skills in the software engineering life-cycle, incorporating specification, design, development and deployment of software systems, and critical understanding of the range of tools and techniques available to support this process.

♦ Extensive and detailed knowledge of structured programming concepts and techniques, with advanced and specialist applicative skills in at least one programming language.

♦ Extensive and detailed knowledge and understanding of communications and network technologies, and their application in software systems, including the ability to critically analyse and review such technologies to support original and creative application development.

♦ Specialist and critical knowledge, understanding and skills in a number of mainstream and specialist areas within the domain of software systems, including databases, artificial intelligence, mobile communications, Digital & Knowledge Economy, computer games programming & internet engineering.

- ♦ Develop and apply skills in critical analysis, evaluation and synthesis in consideration of the range of theories, concepts and techniques in use within the domain of software systems, and in the design of projects and experimental models.
- ♦ Develop and utilise advanced problem-solving skills and techniques in the development of original and creative solutions to general and specialist issues within the domain of software systems.

Scholarship, Enquiry and Research
- ♦ Research skills and the capability of critical analysis, through review and analysis of current research literature.
- ♦ An understanding of research ethics, and how to appropriately build on the work of others.

Industrial, Commercial and Professional Practice
- ♦ Demonstrate critical awareness of current legal, social, ethical and professional issues within the discipline.
- ♦ Make informed judgements with incomplete or inconsistent data, or where there are no professional or ethical codes or practices for guidance.

Autonomy, Accountability and Working with Others
- ♦ Work autonomously and within teams, as appropriate, demonstrating a capability for both taking and critically reflecting on roles and responsibilities.

Communication, Numeracy and ICT
- ♦ Develop and demonstrate skills and techniques in communication with peers and academic/industrial staff, using a range of appropriate methods to suit different levels of knowledge and expertise within the audience.
- ♦ Develop and demonstrate critical knowledge and skills in the planning and usage of software tools and numerical techniques to develop, present and communicate information on projects and processes.

Students take 8 courses, 4 each in semesters 1 & 2, including a taught Research Methods and Project Planning course in semester 2. There are 3 mandatory courses and students must choose 5 courses from options (see below).

In semester 3 students, who have met the required criteria, will undertake their Masters dissertation.

Course Code	Title	Mandatory /Optional	Credits
Semester 1 (Sept– Dec)			
F21DF	Databases and Information Systems	M	15
F21CN	Computer Network Security	O	15
F21MC	Mobile Communications & Programming	O	15
F21SC	Industrial Programming	O	15
F21SF	Software Engineering Foundations	O	15
Semester 2 (Jan– Apr)			
F21RP	Research Methods and Project Planning	M	15
F21NA	Network Applications	M	15
F21AS	Advanced Software Engineering	O	15
F21DE	Digital & Knowledge Economy	O	15
F21GP	Computer Games Programming	O	15

Semester 3 (pending successful completion of 8 taught courses)			
F21MP	MSc Project & Dissertation	M	60

Part-time students starting in September or January should discuss their course choice with the Programme Director. All part time students must take F21RP in their final year.

INFORMATION TECHOLOGY (BUSINESS)

Programme Director: Smitha Kumar

This programme is concerned with the use and application of Information Technology in supporting business activities, particularly information handling, communications, and entrepreneurship.

Therefore the aims are to enable the students to:

♦ Develop detailed knowledge and critical understanding of the main areas of information technology usage in business (including theories, principles and concepts).
♦ Develop and use a significant range of principal and specialist skills, techniques and practices in the domain of business-related information technology.
♦ Critically review existing practice and develop original and creative solutions to problems within the domain.
♦ Communicate and work effectively with peers and academic staff in a variety of tasks, demonstrating appropriate levels of autonomy and responsibility.
♦ Plan and execute a significant project of research, investigation or development in a specialist area of information technology for business use, demonstrating extensive, detailed and critical understanding of that specialism.

The Programme provides opportunities for learners to achieve the following outcomes:

Understanding, Knowledge and Cognitive Skills
♦ Critical understanding of the principal theories, principles and concepts relating to the use of information technology in the business domain.
♦ Extensive, detailed and critical understanding of at least one specialist area of information technology support for business.
♦ Understanding and use of a significant range of the principal skills, techniques and practices necessary to utilise information technology to support business practice, and a range of specialised skills, research and investigation techniques, and practices informed by leading-edge research and development.
♦ A broad knowledge of the main areas of the use of information technology to support business practices, including terminology, conventions, underpinning theory, techniques and practices.
♦ Detailed and critical knowledge of at least one area of specialism in information technology for business, incorporating awareness of current issues and research.
♦ Application-based knowledge and skills relating to the broad range of activities within the information technology and business domain, and specialist knowledge and skills in applications relating to a number of specialist areas within the domain.
♦ Fundamental knowledge and skills in business and information analysis, incorporating specification, design, development and deployment of information technology to meet business need, and critical understanding of the range of tools and techniques available to support this process.
♦ Extensive and detailed knowledge of structured programming concepts and techniques, with advanced and specialist applicative skills in at least one programming language.
♦ Extensive and detailed knowledge and understanding of communications and network technologies, and their application in business systems, including the ability to critically analyse and review such technologies to support original and creative application development.
♦ Specialist and critical knowledge, understanding and skills in a number of mainstream and specialist areas within the domain of business information technology, including databases, information systems, communications, networks, entrepreneurship, enterprise management and organisational management techniques.

- ♦ Develop and apply skills in critical analysis, evaluation and synthesis in consideration of the range of theories, concepts and techniques in use within the domain of business information technology, and in the design of projects and experimental models.
- ♦ Develop and utilise advanced problem-solving skills and techniques in the development of original and creative solutions to general and specialist issues relating to the use of information technology to support business practices.

Scholarship, Enquiry and Research
- ♦ Research skills and the capability of critical analysis, through review and analysis of current research literature.
- ♦ An understanding of research ethics and how to appropriately build on the work of others.

Industrial, Commercial and Professional Practice
- ♦ Demonstrate critical awareness of current legal, social, ethical and professional issues within the discipline.
- ♦ Make informed judgements with incomplete or inconsistent data, or where there are no professional or ethical codes or practices for guidance.

Autonomy, Accountability and Working with Others
- ♦ Work autonomously and within teams, as appropriate, demonstrating a capability for both taking and critically reflecting on roles and responsibilities.

Communication, Numeracy and ICT
- ♦ Develop and demonstrate skills and techniques in communication with peers and academic/industrial staff, using a range of appropriate methods to suit different levels of knowledge and expertise within the audience.
- ♦ Develop and demonstrate critical knowledge and skills in the planning and usage of software tools and numerical techniques to develop, present and communicate information on projects and processes.

Students take 8 courses, 4 each in semesters 1 & 2, including a taught Research Methods and Project Planning course in semester 2. There are 3 mandatory courses and students must choose 5 courses from options (see below).

In semester 3 students, who have met the required criteria, will undertake their Masters dissertation.

Course Code	Title	Mandatory /Optional	Credits
Semester 1 (Sept– Dec)			
F21IF	Information Systems Methodologies	M	15
F21DF	Databases and Information Systems	O	15
F21SF	Software Engineering Foundations	O	15
C11CS	Competitive Strategy	O	15
C11SP	Strategic Project Management	O	15
Semester 2 (Jan– Apr)			
F21RP	Research Methods and Project Planning	M	15
F21DE	Digital & Knowledge Economy	M	15
F21BD	Big Data Management	O	15
F21NA	Network Applications	O	15
C11PA	Project Management	O	15
Semester 3 (pending successful completion of 8 taught courses)			
F21MP	MSc Project & Dissertation	M	60

Part-time students starting in September or January should discuss their course choice with the Programme Director. All part time students must take F21RP in their final year.

Programme Director: Dr Hani Ragab Hassen

The aim of this MSc programme is to give good honours graduates with an IT background the understanding and skills to elicit network security requirements, analyse security threats, formulate security policies, devise security regimes of mechanisms and services, deploy network security solutions and validate their effectiveness. It also aims to impart detailed understanding and knowledge of contemporary issues in network security research areas.

The aims of the programme are:

♦ Detailed knowledge and critical understanding of the main areas of computer network security including theories, principles and concepts.
♦ Significant range of principal and specialist skills, techniques and practices in the computer network security domain.
♦ Specialist knowledge of security techniques as they apply to developing distributed and networked applications.
♦ Ability to critically review existing practice and develop original and creative solutions to problems requiring computer network security solutions.
♦ Ability to communicate and work effectively with peers and academic staff in a variety of tasks, demonstrating appropriate levels of autonomy and responsibility.
♦ Ability to plan and execute a significant project of research, investigation or development in a specialist area within computer network security, demonstrating extensive, detailed and critical understanding of that specialism.

The Programme provides opportunities for learners to achieve the following outcomes:

Subject Mastery:
Understanding, Knowledge and Cognitive Skills
♦ Critical understanding of the main theories, principles and concepts relating to the domain of computer network security including conventions, methodologies, standards and terminology.
♦ Understanding and use of a significant range of the main practices, skills and techniques in network security software engineering, and a range of specialised skills, research and investigation techniques, and practices in designing and validating computer network security solutions informed by current best practice.
♦ Broad and deep knowledge of the computer network security areas of access control, cryptography, means of authentication, network security tools, security policy management, as well as application-based knowledge and skills relating to known security exploits, malware and their detection and prevention, and specialist knowledge and skills in applications relating to a number of specialist areas such as biometrics, firewall management, intrusion detection, penetration testing, public key certificates and user education in good security practice.

Scholarship, Enquiry and Research
♦ Extensive, detailed and critical understanding of at least one specialist area within the domain of Computer Network Security application development obtained through researching the background to a substantial and challenging network security engineering project that addresses a real or simulated sets of threats by personal scholarship, design, development and testing of a detailed means of prevention.
♦ Detailed knowledge and understanding of network security software engineering techniques relating to authentication, authorisation and auditing as well as the practical skills in how to exploit them in support of original and creative network security application development.

- Specialist and critical knowledge, understanding and skills in a number of mainstream and specialist areas within the domain of network security application development including cryptography, digital forensic techniques, malware analysis, network defence technologies and penetration testing.

Personal Abilities:

Industrial, Commercial and Professional Practice
- Demonstrate critical awareness of current issues within network security application development, and make informed judgements about them in the light of relevant professional standards.
- Demonstrate an awareness of professional and research issues in the network security discipline, and an ability to critique current techniques and practice.

Autonomy, Accountability and Working with Others
- Work autonomously and within teams, as appropriate, demonstrating a capability for both taking and critically reflecting on roles and responsibilities.
- Develop and utilise advanced problem-solving skills and techniques in the shared development of original and creative solutions to general and specialist network security engineering issues.
- Develop and demonstrate skills and techniques in communication with peers and academic/industrial staff, using a range of appropriate methods to suit different levels of knowledge and expertise within the audience.

Communication, Numeracy and ICT
- Develop and demonstrate the ability to communicate and present the main issues involved in network security application development to a literate audience with appropriate use of modern presentational tools and aids.
- Demonstrate appropriate use of methods of calculation and estimation involved in planning network security engineering solutions and deploying and validating such solutions.

Students take 8 courses, 4 each in semesters 1 & 2, including a taught Research Methods and Project Planning course in semester 2. There are 4 mandatory courses and students must choose 4 courses from options (see below).

In semester 3 students, who have met the required criteria, will undertake their Masters dissertation

Course Code	Title	Mandatory /Optional	Credits
Semester 1 (Sept– Dec)			
F21CN	Computer Network Security	M	15
F21SC	Industrial Programming	M	15
F21DF	Databases and Information Systems	O	15
F21MC	Mobile Communications & Programming	O	15
F21RS	Rigorous Methods for Software Engineering	O	15
F21SF	Software Engineering Foundations	O	15
Semester 2 (Jan– Apr)			
F21AN	Advanced Network Security	M	15
F21RP	Research Methods & Project Planning	M	15
F21AS	Advanced Software Engineering	O	15
F21BD	Big Data Management	O	15
F21NA	Network Applications	O	15
Semester 3 (pending successful completion of 8 taught courses)			
F21MP	MSc Project & Dissertation	M	60

Part-time students starting in September or January should discuss their course choice with the Programme Director. All part time students must take F21RP in their final year.

SOFTWARE ENGINEERING

Programme Director: Talal Shaikh

This programme is designed to impart the understanding and skills to engineer software at an advanced level to professional standards with an emphasis on developing dependable systems. To meet society's growing demand for software applications suited to supporting critical services. It teaches computing graduates how to use state-of-the-art techniques and methodologies to develop reliable, safe, secure and trustworthy software.

Therefore the aims are to enable the students to:

♦ Develop detailed knowledge and critical understanding of the main areas of software engineering for dependable systems development (including theories, principles and concepts).

♦ Develop and use a significant range of principal and specialist skills, techniques and practices in the domain.

♦ Critically review existing practice and develop original and creative solutions to problems within the domain.

♦ Communicate and work effectively with peers and academic staff in a variety of tasks, demonstrating appropriate levels of autonomy and responsibility.

♦ Plan and execute a significant project of research, investigation or development in a specialist area within mobile software systems, demonstrating extensive, detailed and critical understanding of that specialism.

The Programme provides opportunities for learners to achieve the following outcomes:

Subject Mastery:
Understanding, Knowledge and Cognitive Skills

♦ Critical understanding of the principal theories, principles and concepts relating to the development of reliable, safe, secure and trustworthy software.

♦ Extensive, detailed and critical understanding of at least one specialist area within the domain of software engineering.

♦ Understanding and use of a significant range of the principal skills, techniques and practices in engineering dependable software systems, and a range of specialised skills, research and investigation techniques, and practices informed by leading-edge research within the domain.

♦ A broad knowledge of the main areas of software engineering, including terminology, conventions, underpinning theory, techniques and practices.

♦ Application-based knowledge and skills relating to the broad range of activities within the domain, and specialist knowledge and skills in applications relating to a number of specialist areas within the domain.

♦ Extensive and detailed knowledge of high integrity programming concepts and techniques, with advanced and specialist applicative skills in at least one programming language.

♦ Extensive and detailed knowledge and understanding of software engineering methodologies, and their application including the ability to critically analyse and review such methodologies to support original and creative application development.

♦ Specialist and critical knowledge, understanding and skills in a number of mainstream and specialist areas within the domain of software engineering, including mobile networking, automated software engineering and information systems methodologies.

♦ Develop and apply skills in critical analysis, evaluation and synthesis in consideration of the range of theories, concepts and techniques in use within the domain of mobile software systems, and in the design of projects and experimental models.

♦   Develop and utilise advanced problem-solving skills and techniques in the development of original and creative solutions to general and specialist issues within the domain.

Scholarship, Enquiry and Research
♦   Research skills, and the capability of critical analysis, through review and analysis of current research literature.
♦   An understanding of research ethics, and how to appropriately build on the work of others.

Personal Abilities:
Industrial, Commercial and Professional Practice
♦   Demonstrate critical awareness of current legal, social, ethical and professional issues within the discipline.
♦   Make informed judgements with incomplete or inconsistent data, or where there are no professional or ethical codes or practices for guidance.

Autonomy, Accountability and Working with Others
♦   Work autonomously and within teams, as appropriate, demonstrating a capability for both taking and critically reflecting on roles and responsibilities.

Communication, Numeracy and ICT
♦   Develop and demonstrate skills and techniques in communication with peers and academic/industrial staff, using a range of appropriate methods to suit different levels of knowledge and expertise within the audience.
♦   Develop and demonstrate critical knowledge and skills in the planning and usage of software tools and numerical techniques to develop, present and communicate information on projects and processes.

Students take 8 courses, 4 each in semesters 1 & 2, including a taught Research Methods and Project Planning course in semester 2. There are 4 mandatory courses and students must choose 4 courses from options (see below).

In semester 3 students, who have met the required criteria, will undertake their Masters dissertation.

Course Code	Title	Mandatory /Optional	Credits
Semester 1 (Sept– Dec)			
F21IF	Information Systems Methodologies	M	15
F21RS	Rigorous Methods for Software Engineering	M	15
F21CN	Computer Network Security	O	15
F21MC	Mobile Communications & Programming	O	15
F21SC	Industrial Programming	O	15
Semester 2 (Jan– Apr)			
F21AS	Advanced Software Engineering	M	15
F21RP	Research Methods & Project Planning	M	15
F21BD	Big Data Management	O	15
F21GP	Computer Games Programming	O	15
C11PA	Project Management	O	15
F21SM*	Software Engineering Master Class	O	15

Semester 3 (pending successful completion of 8 taught courses)			
F21MP	MSc Project & Dissertation	M	60

Part-time students starting in September or January should discuss their course choice with the Programme Director. All part time students must take F21RP in their final year.

* - Special permission is required to take F21SM Software Engineering Master Class.

OVERVIEW AND STRUCTURE

MSc CALENDAR 2017 - 2018

Activity	Dates
MSc Assessment Period – semester 1	Monday 4 December 2017 to Friday 15 December 2017
MSc Assessment Period – semester 2	Monday 23 April 2018 to Friday 4 May 2018
Semester 3 Dissertation (15 weeks)	Monday 7 May 20178– Thursday 16 August 2018
MSc Board of Examiners Meeting – Progression (after which progression results are released)	First week of June 2018 (TBC)
MSc Reassessment Period – semester 3	Thursday 2 August 2018 – Friday 10 August 2018
MSc Dissertation Submission	Thursday 16 August 2018
MSc Poster Session	Thursday 23 August 2018 (TBC)
MSc Board of Examiners Meeting – Award (after which award results are released)	First week September 2018 (TBC)
Graduation	November 2018 (TBC)

MACS Student Website
Lots of information regarding MACS programmes and courses can be found at:
http://www.macs.hw.ac.uk/students/

Student Portal
You can access the University Student Portal at: http://portal.hw.ac.uk/

Virtual Learning Environment (VLE)
Most courses have on-line material available at the University's Virtual Learning Environment (VISION) which can be found at: http://vision.hw.ac.uk/

Student Self Service
This is where you can update your address and where you will get your on-line results - www.hw.ac.uk/selfservice.

Course Summaries
Please refer to Appendix A. or http://www.macs.hw.ac.uk/students/cs/courses/

Course Choices
Students select courses at the pre-enrolment session with guidance from Academic staff, but may change their selection in the first two weeks of the semester that the relevant course runs.

Teaching and Learning Approaches and Expectations

The course is taught primarily in a traditional lecture-based approach, with a variety of supporting laboratory-based practicals. Students may be expected to complete coursework in groups, teams and pairs, as well as individually, and courses offer a range of types of coursework for assessment, from discursive essay-style assignments to code design and generation. In some courses, team teaching approaches are adopted to provide additional support and variety, and electronic support, in the form of email lists, newsgroups and bulletin boards may be used to disseminate information and support student communication and practice.

As it is a postgraduate programme students must develop advanced skills that go beyond that required for undergraduate programmes. Students are expected to be able to *critically evaluate* the techniques and methodologies they are taught, not simply apply the skills. The examinations will test abilities not just to recall and apply techniques, but to provide, for example, a discussion of their advantages in particular unseen cases. Students also are expected to develop a level of professional awareness, and skills in team working and communication.

Heriot-Watt University does not tolerate plagiarism on any level. Work presented as your own must be your own and not use any words or code from others. More information is available in the Postgraduate handbook. If you copy coursework, or if you cut-and-paste material from the Web and pass it off as your own words, then you will be sent to the University Disciplinary Committee. In some cases students may be compulsorily withdrawn from the University as a result.

Communication

Please check your University email regularly – we will use this method of communication to send out important information to you.

Please make sure Student Services has your current home and semester address at all times.

Course Assessment

Courses on the programme may be assessed by coursework only, or by a mixture of coursework and examination.

In some taught courses there is an exam. This is held at the end of the relevant Semester (see Calendar on page 2). Examination marks are weighted with any coursework mark (eg 80%-20%) to provide a final mark. There is a nominal pass mark on a course basis. However, assessment marks are averaged for progression purposes (see below).

Past exam papers can be found at: http://www.macs.hw.ac.uk/students/cs/.   To access these pages from outside the university, go to http://vpn1.hw.ac.uk first and sign in with your Heriot Watt email username and password. Then enter the URL for the past papers.

Examination timetables can be found at:
https://www.hw.ac.uk/students/studies/examinations/timetables.htm

For courses assessed by coursework only (including the project), coursework-based summative assessment within and at the end of the course will provide a mark and grade.

Grades & Assessments

Grades for each course are awarded as follows:

Grade A	Excellent	Overall mark of approximately 70% or more
Grade B	Very Good	Overall mark of approximately 60% to 69%
Grade C	Good	Overall mark of approximately 50% to 59%
Grade D	Satisfactory	Overall mark of approximately 40% to 49%
Grade E	Adequate	Overall mark of approximately 30% to 39%
		Minimum required for the award of credits
Grade F	Inadequate	Fail

Programme & Examination Requirements

Attendance Requirements

In order to achieve course and programme learning outcomes, students are expected to attend all scheduled course learning sessions (e.g. timetabled lectures, tutorials, lab sessions, etc). Should you have to missed a timetabled session due to ill health or other legitimate reasons, you should submit a self-certification or medical certification or an application for consideration of Mitigating Circumstances https://www.hw.ac.uk/students/studies/examinations/mitigating-circumstances.htm

Students who fail to satisfy course attendance requirements may, after due warning, be disallowed from presenting themselves for examination in the course (see http://www.hw.ac.uk/students/doc/withdrawalprocedures.pdf).

Coursework must be handed in by the stipulated dates, and students are required to see their personal mentors at agreed times. Students who fail to submit compulsory coursework may also be disallowed from presenting themselves for examination in the relevant courses.

All lectures and tutorials are compulsory and registers of attendance may be taken.

If you are absent from class due to illness for four days or less, you should complete a self-certification form, obtainable from the Student Services and return it to the Student Services within a week of your return. If you are absent for more than four days, you must supply a medical certificate to the Student Services within a week of your return.

Examinations

It is the student's responsibility to check all relevant examination timetables (including resits) on the Registry web page https://www.hw.ac.uk/students/studies/examinations.htm

Should you be required to be re-assessed in any examinations, you *must* be available to take them. **The re-assessments take place in early August.**

All examinations must be taken at the Dubai Campus.

Calculators, Dictionaries & Electronic Devices

Where a calculator is required for the completion of an examination, a student may use any basic scientific calculator, except the following: graphics calculator, programmable calculator and a calculator which features text storage or retrieval facilities.

Students are not allowed to have mobile phones or other communication devices on or about their person during examinations. Phones may be left at the front of the examination room but must be switched off.

No translation dictionaries are permitted in any of the University's examinations. The only exception to the policy is in the case of individual students who had been assessed by the University's Disability Service as requiring access to a translation dictionary.

Unauthorised Material

You <u>must not</u> have any unauthorised pre-printed materials or electronic devices or in the examination room. Cheating in an examination is treated very seriously by the University. If you do have any material relevant to the exam which you have brought in by mistake, you must hand it over to an invigilator before the start of the examination. Invigilators will carry out checks on authorised materials and calculators.

Feedback

Feedback is a two-way process. Feedback is provided to students in a variety of ways in order to help you to reflect on and to evaluate your progress and to assist you to take steps to improve before the next relevant assessment. For most courses, students can expect feedback on assessed coursework within three teaching weeks of the coursework due date.

Feedback is sought from students via Student-Staff Liaison Committees and various surveys so that the School can continue to enhance the student learning experience. Your feedback is valued by the School, so please be sure to provide feedback whenever it is sought.

Assessments Results

Details on how and when you will receive your Assessment Results can be found at: https://www.hw.ac.uk/students/studies/examinations/results.htm

The official mechanism for receiving all your assessment results is on-line at Student Self Service www.hw.ac.uk/selfservice.

You will officially receive the provisional results of your semester 1 assessments in mid-January. You will receive the final results of your semester 1 & 2 assessments in mid-June. You will receive your dissertation result and your award recommendation in mid-September. You will receive an email to your University email account to inform you when you can view your official results on-line at www.hw.ac.uk/selfservice.

You will receive a final assessment results letter with your award recommendations in mid-September. This letter will be sent to the Dubai Campus for you to pick up.

On-line results show marks and grades while your official Assessments Results Letter will only show grades.

Progression to Dissertation

To pass your MSc you must obtain a credit weighted average of 50% or more over all 8 taught courses at grades A to D, a mark on F21RP Research Methods of 45% or above, and a grade C or better in your MSc project. However, students must also fulfil a progression requirement after doing the 8 taught courses before they are allowed to attempt to complete their MSc project. It requires them to obtain the credit weighted average of 50% or more over all 8 taught courses at grades A to D and at least 45% on F21RP beforehand.

MSc students, who fail to meet the progression requirement, may be able to meet it by doing resits as detailed below. If improved marks obtained in resits then enable the student to meet it, the student may continue at that point with their MSc project.

The Masters dissertation counts as 600 effort hours (4 courses), in Semester 3. Detailed guidelines on the conduct of the project and the production of the dissertation are provided in Appendix B, MSc Project Guidance.

The final dissertation is submitted in mid-August (see dates). Students must also give a poster presentation of their work. Dissertation marks are awarded with 90% of the marks coming from the dissertation itself, and 10% of the marks coming from a poster presentation and demonstration of the work.

Students may graduate with a Postgraduate Diploma without doing the main project. In this case, the requirement is to get a credit weighted average of at least 40% over all 8 taught courses (including Research Methods), with at least grade E passes in all of them.

Further details on the MSc Dissertation is given in Appendix B

Re-Assessment Opportunities
Students will be able to be re-assessed in a **maximum of 3 courses**. Where this is by examination it will be at the next opportunity which will be in the resit diet in August, subject to payment of the appropriate fees to the University, and may be required to do so to obtain the necessary credits for completion of their programme or for progression.

A student who has been awarded a Grade E or a Grade F in a course must be re-assessed in that course (up to a maximum of 3 courses). A student who has been awarded a Grade D in a course may be re-assessed in that course in order to proceed to, or be eligible to receive the award of, Masters.

There is no non-discretionary re-assessment opportunity for the Dissertation.

MSc Poster Session
The poster session takes place in the week following the dissertation hand-in (see dates). All MSc students are required to create an A1 size poster and to present it in person on the MSc poster day for a scheduled period of about half an hour. This provides an opportunity for your supervisor, second reader, external sponsors, other staff and fellow students to see the tangible outcome of your year's work and provides you with the opportunity to present your work to them. In addition students will be given a scheduled period of about half an hour in which to demonstrate any outcomes of their project. This is optional but can be advantageous to the student to ensure the second reader and their supervisor appreciates what their project has been about. The poster presentation will be independently marked and contributes 10% to an MSc student's final dissertation mark.

Submission of Coursework
Students are required to complete all coursework at a satisfactory level. Coursework must be submitted by the deadline given. The default policy of the School is that coursework submitted late should have its given mark reduced by 10% for each working day it is late. Lecturers will supply details of how coursework will be submitted for their course.

Students who have serious concerns about meeting submission dates for coursework should consult the Course Leader as soon as possible. Any extension to the submission deadline must be approved by the Course Leader, and the reason for the extension will be recorded. Applications for extensions made **after** the due submission date will not normally be approved.

Mitigating Circumstances

If you experience any Mitigating circumstances which affect your ability to complete your assessments you must notify us as soon as possible.

You should read the University's Policy on Mitigating Circumstances in Relation to Assessment and then complete the application form at: https://www.hw.ac.uk/students/studies/examinations/mitigating-circumstances.htm. This form along with any relevant evidence (eg medical certificates) should be submitted to the Academic Administration Office.

<u>Evidence submitted after your results have been published cannot be taken into account.</u>

Dealing with Problems

If you or your class has any concerns about the course please talk to the lecturer concerned or to the Postgraduate Director. They will be very willing to help. Please speak to your lecturer after the lecture, or email the Postgraduate Director to make an appointment.

If you have personal problems that are getting in the way of your study please contact your mentor, or the Postgraduate Director.

Award Criteria

	No. of Course Passes (Credits)	Overall Mark/Grade	Basis of Overall Mark/Grade	Other Requirements
MASTER DISTINCTION	9 (180)	>= 70%/ A	Credit weighted average >=70% over 8 courses plus a dissertation/projects at grade A	
MASTER	9 (180)	>= 50% / C	Credit weighted average >=50% over 8 courses at grades A-D plus a dissertation/projects at minimum grade C	Minimum grade of 45% in F21RP.
DIPLOMA DISTINCTION	9 (120)	>= 70% / A	Credit weighted average >=70% over 8 courses at grades A-C	
DIPLOMA	8 (120)	>= 40% / D	Credit weighted average >=40% over 8 courses at grades A-E	
CERTIFICATE	4 (60)	>= 40% / D	Credit weighted average >=40% over 4 courses at grades A-E	

Full details of award and progression rules are in Appendix C.

Prizes

The following prizes are available to each MSc cohort:

- Dr Alison Cawsey Memorial Prize for the most deserving MSc student (£200) – Edinburgh & Dubai
- School Prize for best MSc student (£200) - Edinburgh & Dubai
- School Prize for best MSc Dissertation (£200) - Edinburgh & Dubai

Graduation

When you have completed your degree your award is conferred at a graduation ceremony. Details on graduation, including how to apply, deadlines for applying and the cost, can be found at: https://www.hw.ac.uk/students/studies/graduation.htm.

Thinking of Leaving

Many students think about leaving university at some stage during their studies. If anything is bothering you or you are thinking about leaving, please speak to a member of staff to explore and understand what you can do.

There may be other options such as additional help (perhaps advice on how to improve your academic skills), a temporary suspension of studies or transferring to another programme.

Further information is available at: https://www.hw.ac.uk/students/studies/leaving.htm

Complaints and Appeals

Our aim at Heriot-Watt is to ensure that your experience while studying with us is of the highest quality. However, we recognise that during your time at the University there may be circumstances that occur where you feel you need to make a complaint or to appeal a decision.

Further information is available at: https://www.hw.ac.uk/students/studies/complaints-appeals.htm

APPENDIX A

Course Descriptors

Semester 1

Course Code: F21CN	Course Title: Computer Network & Security	Course Co-ordinator: Hani Ragab Hassen Hamish Taylor & Mike Just
Pre-requisites:	Fundamental knowledge of computer networking, formal methods & Java programming	
Aims:	♦ Impart critical understanding of key concepts, issues, theories and principles of computer network security. ♦ Develop detailed theoretical and practical knowledge of foundational issues in computer network security. ♦ Provide detailed understanding and practical experience with key services and tools used for computer network security purposes. ♦ Give practical experience of analysing requirements, designing, implementing and testing security solutions for computer network applications.	
Syllabus:	♦ Security concepts and definitions, basics of cryptography (concepts, definitions, steganography), symmetric cryptography (historical, hash functions, MACs, block and stream encryption), asymmetric cryptography (basic number theory, RSA, DH, digital signatures), cryptographic key management, operating system security (concepts, memory management, buffer overflow, race conditions, file/disk encryption), security-enhanced Linux, authentication & access control (biometrics, passwords, role- and capability-based), as well as some Linux-based security tools (e.g., GPG, openssl). ♦ Computer network security concepts, X.800 model - attacks, mechanisms, services. Computer network layers, reference model, TCP/IP and its vulnerabilities. Network service fundamentals - sockets, services, threads and their protection. Digests – MD5, symmetric ciphers, JCE. Digital signatures, public key certificates. X.509 certificates, certificate authorities and hierarchical trust models. Secure key exchange – Diffie Hellman, SSL/TLS, SSH. Applets, Java security model and tools, signing applets with CA keys. PGP public keys, OpenPGP, web of trust, network security tools - VPNs, Firewalls, Intrusion Detection Systems, malware scanners.	
Learning Outcomes: Subject Mastery	*Understanding, Knowledge and Subject-Specific Skills* ♦ Detailed and critical understanding of the concepts, issues, principles and theories of computer network security ♦ Critical theoretical and detailed practical knowledge of a range of computer network security technologies as well as network security tools and services ♦ Practical experience of analysing, designing, implementing and validating solutions to computer network security challenges using common network security tools and formal methods.	
Learning Outcomes: Personal Abilities	*Cognitive skills, Core skills and Professional Awareness* ♦ Ability to deal with complex issues and make informed judgements about network security in the absence of complete or consistent data. ♦ Exercise substantial autonomy and initiative in addressing computer network security challenges. ♦ Showing initiative and team working skills in shared computer network security application development. (PDP) ♦ Demonstrate critical reflection on network security issues. (PDP)	
Assessment Methods:	Assessment: Examination: (Weighting 60%) Coursework: (weighting – 40%)	Re-assessment: Examination: (weighting –100%)

Course Code: **F21DF**	Course Title: **Databases and Information Systems**	Course Co-ordinator: **TBC** **Albert Burger & Ken McLeod**
Pre-requisites:	Undergraduate experience of database technologies, at least at application level. Numerate background.	
Aims:	♦ To equip students with a detailed and critical understanding of the processes and methodologies required for the analysis, specification and design of database systems and information systems, and the inter-relationship between such systems. ♦ To enable students to develop a critical understanding of the relationship between organisations, human activity systems and information systems, and to utilise that understanding to design and develop appropriate specialised systems. ♦ To provide the students with practical experience in designing, building and using databases, and critical awareness in the development and deployment of databases and information systems within organisations**.**	
Syllabus:	♦ Introduction to Information Systems; Case Study – Sir Edward Kelly; ♦ Domain and Types of Information Systems; ♦ Databases and Database Management System Concepts; ♦ Data Modelling & Database Design; ♦ Relational Data Model ♦ SQL Language and Constructs; ♦ Database connectivity ♦ Emerging database technologies: e.g .XML, Data Warehousing, alternative database models	
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Subject-Specific Skills* ♦ Extensive, detailed and critical understanding of the nature, scope and boundaries of data models and database management systems, in relational and XML paradigms. ♦ Both theoretical and practical knowledge of methodologies for specification and design of databases. ♦ Skill in the use of software tools and languages for database design, development and management. ♦ A critical understanding of and practical skills in interfacing DBMS and programs ♦ A critical understanding of emerging database technologies	
Learning Outcomes: **Personal Abilities**	*Cognitive skills, Core skills and Professional Awareness* ♦ Taking responsibility for own work, taking responsibility in the development of resources, critical reflection on development process and work undertaken by self. ♦ Critical analysis, evaluation and synthesis of current database and information system technologies leading to original and creative response to design task. ♦ Effective communication in electronic and written report form.	
Assessment Methods:	Assessment: Examination: (weighting – 80%) Coursework: (weighting – 20%)	Re-assessment: Examination: (weighting –100%)

Course Code: **F21DL**	Course Title: **Data Mining & Machine Learning**	Course Co-ordinator: **Hani Ragab Hassen** **Diana Bental & Katya Komendantskaya**
Pre-requisites:	F29AI AI and Intelligent Agents or basic knowledge of AI concepts and issues	
Aims:	To introduce students to the fundamental concepts and techniques used in data mining and machine learning. To develop a critical awareness of the appropriateness of different data mining and machine learning techniques. To provide familiarity with common applications of data mining and machine learning techniques.	
Syllabus:	**Data Mining:** Basic concepts (datasets, dealing with missing data, classification, statistics), regression analysis, cluster analysis (k-means clustering, hierarchical clustering), unsupervised learning, self-organising maps, naïve Bayes, k-nearest-neighbour methods **Machine Learning:** decision tree learning, ensemble methods (bagging and boosting, random forests), deep learning architectures, support vector machines	
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)* ♦ Extensive understanding of the data mining process. ♦ Detailed understanding of the mathematical basis of machine learning. ♦ Critical awareness of the appropriateness and performance of different techniques.	
Learning Outcomes: **Personal Abilities**	*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT* ♦ Rational problem identification and definition. ♦ Critical analysis and solution selection. ♦ Thorough and robust preparation of testing strategies. ♦ Reflection on system development and performance.	
Assessment Methods:	Assessment: Coursework: (weighting – 100%) (verified by short oral exam)	Re-assessment: Coursework: (weighting – 100%) (verified by short oral exam)

Course Code: **F21DV**	Course Title: **Data Visualisation and Analytics**	Course Co-ordinator: **TBC** **Mike Chantler**
Pre-requisites:	Numeracy and good programming ability.	
Aims:	To provide students with the theory, principles and tools to enable them: ♦ To create engaging and intuitive graphical and interactive applications that allow users to search, explore, reveal, partition, understand, discover and communicate the structure and information in large data sets; ♦ To convey ideas effectively, considering both aesthetic form and required functionality that will provide insights into different types of dataset (structured and unstructured); ♦ To stimulate user engagement, attention and discovery; ♦ To be able to implement interactive web-based visualisation systems and assess their effectiveness.	
Syllabus:	Overall aims: ♦ Use case scenarios (browsing, search, engagement, summarisation, brain storming) ♦ Example data sets and visualisations. ♦ Design principles and Data source types ♦ D3 JavaScript library and programming ♦ Data, information and display/infographic types (bar, pie, tree, pack, line, map) ♦ Abstraction methods including clustering, topic modelling, dimensional reduction ♦ Interaction (exploration, browsing, filtering, focussing ♦ Project requirements (D3 web application)	
Learning Outcomes: Subject Mastery	*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)* ♦ A detailed and integrated knowledge and understanding of the data visualisation and data analysis processes. ♦ Extensive knowledge of different infographic types, interactivity and design choices. ♦ Extensive knowledge of different information and data types. ♦ Demonstrate a critical awareness of the main types of information and the appropriateness and effectiveness of associated visualisation and analysis techniques. ♦ Ability to understand requirements of different user groups and be able to adapt visualisations accordingly	
Learning Outcomes:: Personal Abilities	*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT* ♦ Rational problem identification, conceptualisation and definition. ♦ Ability to deal with complex issues and apply critical analysis and solution selection. ♦ Exercise substantial autonomy, initiative, and creativity in the application of data visualisation & analysis techniques. ♦ Demonstrate critical reflection on system development and performance (PDP). ♦ Communicate with peers, senior colleagues and specialists (PDP).	
Assessment Methods:	Assessment: Coursework: (weighting – 100%)	Re-assessment: Coursework: (weighting – 100%)

Course Code: **F21IF**	Course Title: **Information Systems Methodologies**	Course Co-ordinator: **Steve Gill** **Jenny Coady**
Pre-requisites:	None	
Aims:	This course explores a range of issues concerning advanced contemporary methodological approaches to information systems development. The aim is to enable students to develop critical faculties and techniques in relation to the selection and application of these methodological approaches.	
Syllabus:	There is a growing requirement in industry for engineers and scientists with good and appropriate analytical skills when considering the development and evolution of systems, in particular information systems. This course develops further the knowledge and skills students should have already gained in the Information Systems and Software Engineering courses in topics such as: ♦ General Systems Principles; ♦ Systems Classification and Taxonomy Models; ♦ Information Systems Life Cycle and Functions; ♦ Paradigmatic Approach to Methodology Classification; ♦ Framework for Analysis and Comparison of Methodologies (NIMSAD & Fitzgerald's); ♦ Process Improvement Models;	
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Subject-Specific Skills* This course develops further the knowledge and skills students should have already gained in the Information Systems and Software Engineering courses. It will enable students to: ♦ Determine alternative approaches to gathering requirements and systems development ♦ Compare methodologies for use in organisations using a standardised Framework ♦ Rationalise systems development to prepare a more relevant system	
Learning Outcomes:: **Personal Abilities:**	*Cognitive skills, Core skills and Professional Awareness* ♦ Critical reading and reviewing works in the field ♦ Evaluating Methods under an agreed Framework ♦ Structuring an argument (PDP) ♦ Presentations of mini lectures to show understanding of the topic area (PDP) ♦ Use of VLE as a means of learning, contributing and discussing	
Assessment Methods:	Assessment: Examination: (weighting – 60%) Coursework: (weighting – 40%)	Re-assessment: Examination: (weighting – 100%)

Course Code: **F21MC**	Course Title: **Mobile Communications & Programming**	Course Co-ordinator: **Mohamed Abdelshafy**
Pre-requisites:	Knowledge of network communications and object oriented programming	
Aims:	♦ To introduce students to the particular problems of building networks which include mobile computing devices and to explain how they may be overcome using current technology ♦ To introduce students to the issues surrounding ad hoc networking and give an understanding of how these can be addressed ♦ To introduce students to programmable mobile and handheld devices ♦ To develop students' skills in developing applications for mobile and handheld devices	
Syllabus:	♦ Fixed node IP routing - routing techniques for conventional wired networks ♦ Mobile IP routing - routing for wireless mobiles to IP ♦ Ad hoc networks and routing ♦ Security protocols - identification and authorisation, infrastructure security ♦ Small device characteristics - screen size, memory, power consumption, input mechanisms ♦ Current devices - tablet PC, mobile phone, PDA ♦ Application development environments - Java APIs, C# and .NET	
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)* ♦ To understand and apply the principles of secure, effective communication over networks including mobile elements. ♦ To be able to explain the operation of current and proposed protocols for communication over networks which include mobile elements ♦ To understand and be able to explain the issues introduced by ad-hoc networking. ♦ To have critical understanding of common ad-hoc routing protocols ♦ To explain and critically evaluate current and proposed mobile devices ♦ To design applications for mobile devices including use of wireless communications where appropriate. ♦ To program such applications using current application development environments	
Learning Outcomes:: **Personal Abilities:**	*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT* ♦ To be able to select and apply suitable techniques of analysis in assessing the effectiveness of a technical solution ♦ To be able to critically review the issues of security and privacy relating to networking ♦ To be able to write good technical documents in support of problem solving within the domains of mobile networking and of mobile and handheld device solutions.	
Assessment Methods:	Assessment: Examination: (weighting – 80%) Coursework: (weighting – 20%)	Re-assessment: Examination: (weighting – 100%)

Course Code: F21SF	Course Title: Software Engineering Foundations	Course Co-ordinator: TBC Katrin Lohan & Manuel Maarek
Pre-requisites:	Knowledge of programming, though not necessarily in Java or an object oriented language	
Aims:	♦ To equip students with an understanding of the object oriented paradigm and the process of object oriented design. ♦ To provide knowledge of simple data structures and algorithms ♦ To support the development of object oriented programs in the Java programming language.	
Syllabus:	♦ Programming in Java: Objects, classes, encapsulation, inheritance, aggregation, polymorphism, abstract classes, interfaces. Constants and variables, primitive data types, reference variables, strings, collection classes, arrays, control structures for selection and iteration ♦ Methods: Signatures, parameters, return types. I/O File handling. Exceptions. ♦ Graphical user interface design and implementation: labels, buttons, text fields, sliders, panels, frames; menus & lists; file selection; state-based design. ♦ Object-oriented design including UML notation: CRC cards, Use cases, Activity diagrams, Interaction diagrams.	
Learning Outcomes: Subject Mastery	*Understanding, Knowledge and Subject-Specific Skills* ♦ Knowledge and understanding of the Java programming model. ♦ Theoretical and practical knowledge of the design and implementation of object oriented solutions to problems. Skill in the use of Java programming language. ♦ Demonstration of skill in design and implementation of practical GUI based applications	
Learning Outcomes: Personal Abilities	*Cognitive skills, Core skills and Professional Awareness* ♦ Critical appreciation of the object oriented approach to software engineering. ♦ Ability to develop creative solutions to complex problems using the Java programming language. ♦ Ability to critically reflect on and refine a proposed solution. ♦ Design, implement and evaluate an object oriented solution to a problem. ♦ Awareness of role of interface in mediating between user and system	
Assessment Methods	Assessment: Examination: (weighting – 60%) Coursework: (weighting – 40%)	Re-assessment: Examination: (weighting –100%)

Course Code: **F21SC**	Course Title: **Industrial Programming**	Course Co-ordinator: **Smitha Kumar** **Hans-Wolfgang Loidl**
Pre-requisites:	Programming skills in a language such as C or Java	
Aims:	♦ To develop proficiency in contemporary industrial programming languages and platforms; ♦ To enable the elaboration and combination of system components in different languages; ♦ To enable an agile and flexible response to changes in industrial practices; ♦ To enable participation by industrial practitioners to provide context and applicability.	
Syllabus:	♦ Programming in a modern general purpose language e.g. C#, C++11 ♦ Programming for concurrency using state-of-the-art libraries and language extensions ♦ Rapid prototyping in a major scripting language with associated libraries and frameworks e.g. Python, PHP, Ruby, Lua ♦ Coverage of advanced language features where languages have been met in earlier courses ♦ Foresight of emerging programming language technologies ♦ Practical experience with standard environments (Unix, Windows), virtual machines (.NET) and tools (e.g. compilers, debuggers, libraries, shell)	
Learning Outcomes: **Subject Mastery:**	*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)* ♦ Critical appreciation of role of different programming paradigms in programming/managing systems ♦ Autonomous problem analysis/solution ♦ Critical understanding of core characteristics of contemporary operating systems and virtual machines ♦ Detailed knowledge of key abstractions across programming languages ♦ Technical proficiency in advanced language techniques in different programming paradigms	
Learning Outcomes: **Personal Abilities:**	*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT* ♦ Ability to choose/deploy/combine appropriate languages, architectures and tools ♦ Ability to employ an agile approach to software development	
Assessment Methods:	Assessment: Coursework: (weighting – 100%)	Re-assessment: Coursework: (weighting –100%)

Course Code: F21RS	Course Title: Rigorous Methods for Software Engineering	Course Co-ordinator: Hind Zantout Lilia Georgieva
Pre-requisites:	F28SD Software Design *or equivalent*.	
Aims:	To provide knowledge and understanding of tools and techniques which support rigorous software engineering.	
Syllabus:	- The course addresses the challenges of engineering safe and secure software systems. - It covers a range of rigorous processes and formal methods that support the development of high integrity software systems. - From modelling and reasoning about designs through to code, students will experience a range of state-of-the-art static analysis tools and techniques. - While theory based, the course has a strong practical element, drawing upon industrial case study material where appropriate.	
Learning Outcomes: Subject Mastery	*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)* - A detailed and integrated knowledge and understanding of a range of rigorous processes and formal methods that support the development of high integrity software systems. - Critical understanding of the relationship between code level annotations and high-level formal specifications. - Extensive knowledge of the mechanisms that underlie advanced static analysis techniques. - To be able to demonstrate a critical understanding of the relationship between code level annotations and flow analysis techniques. - To be able to demonstarte a critical understanding of program proof and how it can be used to provide strong formal correctness guarantees.	
Learning Outcomes:: Personal Abilities	*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT* - Conceptualize and define new abstract problems within the context of automated software development. - Deal with complex issues and make informed judgements in situations in the absence of complete or consistent data. - Exercise substantial autonomy, initiative and creativity in the application of software engineering techniques. - Demonstrate critical reflection. (PDP) - Communicate with peers, more senior colleagues and specialists. (PDP)	
Assessment Methods:	Assessment: Examination: (weighting – 60%) Coursework:(weighting – 40%)	Re-assessment: Examination: (weighting – 100%)

Course Code: **C11CS**	Course Title: **Competitive Strategy**	Course Co-ordinator: **TBC** **John Sanders**
Pre-requisites:	None	
Aims:	♦ To provide students with a sound understanding of the theoretical and practical issues involved in the strategic management of organisations. ♦ To allow students to develop knowledge and skills that will be of immediate and real value in their future careers. ♦ To strategically analyse and propose solutions to business case scenarios ♦ Enhance business planning skills and strategic thinking	
Syllabus:	♦ Introduction ♦ Strategic purpose ♦ Analysing the Strategic Environment ♦ Strategic Group Mapping ♦ Porter's Five Forces Model ♦ Analysing Resources and Capabilities ♦ Value Chain Analysis ♦ Organisational design ♦ Managing change ♦ Strategy and Culture ♦ Stakeholder Behaviour ♦ Course Review	
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Subject-Specific Skills* ♦ Provide an understanding of the key elements of the strategic management process and conceptual models of analysis. ♦ Understand the dynamics of the strategic management process. ♦ Understand the importance and impact of strategic management issues for private, public and voluntary sector organisations. ♦ Understand the application of theoretical and analytical models to real life business situations through the use of case studies.	
Learning Outcomes: **Personal Abilities**	*Cognitive skills, Core skills and Professional Awareness* ♦ Develop individual analytical and problem-solving skills. ♦ Develop independent and team/group-working skills. ♦ Develop communication skills. ♦ Develop presentation skills.	
Assessment Methods:	Assessment: Examination (Weighting – 50%) Coursework: (Weighting – 50%)	Re-assessment: Examination (Weighting – 100%)

Course Code: C11SP	Course Title: Strategic Project Management	Course Co-ordinator: TBC Amos Haniff
Pre-requisites:	None	
Aims:	♦ To develop knowledge and skills that differentiate between the management of projects, programmes and portfolios ♦ To develop the ability to translate between business strategy, strategy implementation and project management ♦ To examine the relationship between the pipeline of requirements for expansion of a business and how it should best relate to the portfolio of strategic projects. ♦ To study how this relationship can best be put into practice in terms of the Governance Regimes which describe how individuals should best interact to achieve the intended goals and what their optimum roles and responsibilities should be. ♦ To explore the current base of knowledge of leadership through projects and management by projects so as to add more precision to the term so that it can become a valuable component of business management science. ♦ To teach postgraduate students about the emerging techniques and methodologies in ways that they can contribute to that evolution. ♦ To involve business leaders so that the techniques and methodologies can be ratified as valid in a practical environment. ♦ To apply strategic planning tools	
Syllabus:	♦ Introduction to strategic project management ♦ Project initiation ♦ Project stakeholders and the management of expectations ♦ Project leadership ♦ Systems, life cycles and methodologies ♦ Alignment and integration of business, information and organisation strategies ♦ Research trends in PM ♦ The nature of Governance Regimes in business, strategy, programmes and projects ♦ Managing the investment pipeline	
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Subject-Specific Skills* ♦ Apply leadership through projects to the process of strategy development and implementation ♦ Demonstrate knowledge and understanding of the integrative nature of project management ♦ Explain the importance and complexity of a sound strategic project plan for a business. ♦ Critically analyse the options open to business executives to allow them to draw up, optimise and monitor the strategic project plan. ♦ Determine suitable options from a range of options for investment finance and how this can be assessed afterwards as to its effectiveness. ♦ Understand the role and their interrelationships needed in a business to allow a Governance Regime to operate and the skills and characteristics needed by individuals to fill these roles. ♦ Analyse the Information Systems Architecture and how it can be enhanced by development of the business's information systems and how this can change the way the business should operate. ♦ Discuss current research and practice in the field of Management by Projects	

Learning Outcomes: Personal Abilities	*Cognitive skills, Core skills and Professional Awareness*
	♦ Use a range of strategic project management tools and methods
	♦ Analyse a range of project management situations and recommend suitable actions
	♦ Critical assessment of previous and current practice in creating and monitoring a strategic project plan.
	♦ Solve problems in the development of methodologies and techniques for balancing the requirements pipeline with the strategic project portfolio.
	♦ Become skilled in searching for relevant literature.
	♦ Develop team-working and communication skills with other students and with business practitioners.
	♦ Develop self-awareness and self-management skills from working on research-based tasks.
	♦ Learn through reflection on practice and experience.

Assessment Methods:	Assessment: Coursework: (weighting – 100%)	Re-assessment: Coursework: (weighting – 100%)

Course Descriptors

Semester 2

Course Code: **F21AN**	Course Title: **Advanced Network Security**	Course Co-ordinator: **Hani Ragab Hassen** **Mike Just**
Pre-requisites:	Good understanding of fundamental computer security topics such as might be obtained by taking F21CN Computer Network Security	
Aims:	♦ Improve students' critical analysis skills in computer network security and allow them to identify network security threats in a systematic way. ♦ Provide the student with in-depth understanding of penetration testing concepts and methodologies. ♦ Give practical experience of exploiting vulnerabilities in common computer system architectures. ♦ Impart a deep understanding of common techniques to implement countermeasures.	
Syllabus:	♦ Internet Security: review of some TCP/IP stack Protocols and their known vulnerabilities. ♦ Wireless Security: Wired Equivalent Privacy (WEP) vulnerabilities, Wireless Protected Access (WPA) and IEEE802.11i ♦ ISO27001: Information Security Management. Security Policy, Organisational Security, Asset Classification and Control, Personal Security, Physical and Environmental Security, Communications and Operations Security, Access Control, System Development and Maintenance, Business Continuity Management, and Compliance. ♦ Penetration testing: penetration testing process: Reconnaissance, Scanning, Gaining access, Maintaining access, and Covering tracks. ♦ Digital Forensics: introduction, EnCase and open source tools. ♦ Privacy and P3P.	
Learning Outcomes: Subject Mastery	*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)* At the end of this course, the students will be able to: ♦ Identify and explain vulnerabilities of network protocols. ♦ Design and implement countermeasures to protect a network from unauthorised network access. ♦ Identify threats and implement measures to protect against threats in wireless networks. ♦ Test and evaluate the security of an IT infrastructure.	
Learning Outcomes: Personal Abilities	*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT* ♦ Ability to critically appraise the security of an IT infrastructure. ♦ Showing teamwork skills and being an effective member of a penetration testing team. ♦ Develop a set of ethical best practices needed for a security career. ♦ Ability to make decisions regarding how to secure a system in absence of a complete picture of its configuration	
Assessment Methods	Assessment: Examination (weighting - 60%) Coursework: (weighting – 40%)	Re-assessment: Examination: (weighting 100%)

Course Code: **F21AS**	Course Title: **Advanced Software Engineering**	Course Co-ordinator: **Mohammad Hamdan** **Michael Lones, Katya Komendantskaya**
Pre-requisites:	Knowledge of Java programming and software engineering at undergraduate level	
Aims:	♦ To consolidate proficiency in imperative programming and software development ♦ To further develop object oriented programming and object oriented design methods ♦ To provide knowledge of simple data structures and algorithms ♦ To introduce concurrent programming techniques ♦ To instil understanding of the concepts and benefits of advanced software engineering methods ♦ To give further practical experience of the use of UML in software engineering ♦ To give practical experience of developing a substantial software engineering team project ♦ To enable the deployment of patterns in software engineering	
Syllabus:	♦ Data structures: stacks, queues, lists, priority queues, binary trees ♦ Algorithms: searching (linear and binary) and sorting ♦ Advanced object oriented design techniques ♦ Thread based programming: thread creation and interaction, shared variables and synchronisation ♦ Methodologies in software engineering practice; Unified Modelling Language; design patterns ♦ Project planning and management in software engineering ♦ Comparison of agile and plan driven approaches	
Learning Outcomes: Subject Mastery	*Understanding, Knowledge and Cognitive Skills Scholarship, Enquiry and Research (Research-Informed Learning)* ♦ Skill in the use of UML notation and translation of UML designs to working programs ♦ Understanding of basic data structures and algorithms and ability to critically evaluate their appropriateness and limitations for a range of moderately complex problems. ♦ Demonstration of skill in design and implementation of practical GUI based and threaded applications ♦ To demonstrate a critical understanding of modern software engineering practice and be able to evaluate the strengths and weaknesses of current software engineering methods and techniques ♦ To be able to choose appropriate metrics to measure software quality and quantity in a modern software engineering environment ♦ To be able to choose a suitable software development environment and development methodology for specific software development tasks and justify the choice	
Learning Outcomes: Personal Abilities	*Industrial, Commercial and Professional Practice, Autonomy, Accountability and working with others, Communication, Numeracy and ICT* ♦ Appreciation of use of methodology to ground system analysis, design and development ♦ Understanding of different programming paradigms and their inter-relation ♦ Practice in working in a group, choosing a methodology, reaching a consensus, and working with others to a deadline ♦ Taking responsibility for own work, taking responsibility in the development of resources, critical reflection on development process and work undertaken by self. ♦ Effective appreciation of professional standards in modern software engineering practice. ♦ Showing initiative, creativity and team working skills in collaborative software development	

Assessment Methods:	Assessment: Examination: (weighting – 50%) (2 hours) Coursework: (weighting – 50%)	Re-assessment: Examination (weighting –100%)

Course Code: **F21BD**	Course Title: **Big Data Management**	Course Co-ordinator: **Hind Zantout** **Alasdair Gray, Albert Burger**
Pre-requisites:	Academic knowledge of fundamentals of databases and logic.	
Aims:	♦ Review principle abstractions, methods and techniques for the management of large and complex data sets ("Big Data"). ♦ Develop an understanding of the foundations and tools of the Semantic Web. ♦ Enable students to appreciate critically a range of data integration solutions.	
Syllabus:	**Complex data sets:** RDF, triple stores, SPARQL, Big Data vs Smart Data vs Broad Data, NoSQL, indexing data. **Semantic Web Foundations:** RDFS, OWL, Ontologies, Reasoning, Protégé. **Data Integration:** Linked Data, Mash-ups, Ontology mapping, Data Provenance.	
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)* ♦ A detailed and integrated knowledge and understanding of a range of data representation and data management techniques for big data sets. ♦ Critical understanding of the role of semantic web technologies in the context of big data management. ♦ Extensive knowledge of the mechanisms that underlie data integration techniques. ♦ To be able to demonstrate a critical understanding of appropriateness and effectiveness of different techniques.	
Learning Outcomes: **Personal Abilities**	*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT* ♦ Conceptualize and define new abstract problems within the context of complex data sets. ♦ Deal with complex issues and make informed judgements about the applicability of semantic web solutions to big data questions. ♦ Exercise substantial autonomy, initiative and creativity in the application of data integration techniques. ♦ Demonstrate critical reflection. (PDP) ♦ Communicate with professional level peers, senior colleagues and specialists. (PDP)	
Assessment Methods:	Assessment: Examination: (weighting – 70%) Coursework: (weighting – 30%)	Re-assessment: Examination: (weighting – 100%)

Course Code: F21DE	Course Title: Digital & Knowledge Economy	Course Co-ordinator: TBC Jessica Chen Burger
Pre-requisites:	Fundamentals of logic, grasp of computational thinking.	
Aims:	♦ To provide an overview of advanced topics in Digital and Knowledge Economy, including current developments and future trends in developed economies resulting from deploying new technologies and utilising emerging knowledge. ♦ To discuss e-Business, as a new breed of modern business model that leverages technical advancements to create economic growth. ♦ To provide a high level description of business and technological issues related to Digital and Knowledge Economy. ♦ To introduce technologies and methodologies so as to provide a deep understanding of the Digital and Knowledge Economy, including business, organisational, knowledge and technology based issues. ♦ To impart rigorous technical modelling and analytical methodologies for working with complex problems in this area. ♦ To facilitate the dialogue between business and computing personnel, and translate business requirements to computing ones and vice versa. ♦ To impart deep understanding of the motivation and rationale behind the conversations between business and IT, as well as other relevant technologies and future trends - so that students can recommend them and/or participate in the decision making process for future planning.	
Syllabus:	♦ Introduction to Digital and Knowledge Economy 　o Introduction to Digital and Knowledge Economy 　o Its relevance to e-Business ♦ Topics in Digital Economy 　o An overview of technologies and tools for e-Business 　o What is a business model? What are the different types of business models? 　o What are the relationships between business models and innovative/disruptive technologies? 　o Current development and future trends in Digital and Knowledge Economy 　o Relevant technology offerings, e.g. Bitcoin, IBM's cloud computing platform ♦ Knowledge based technologies in Knowledge Economy 　o introduction to knowledge management, knowledge modelling technologies, including ontologies 　o Introduction to logic, Intelligent Systems and related technologies, including semantic web based technologies 　o Case studies of Intelligent Systems and Future trends ♦ Supply Chain Management and its relation to Digital Economy 　o What is SCM? What are the standard practices in SCM, e.g. SCOR? 　o Introduction to process modelling, business operations and SCM. 　o What is global SCM? Case studies, e.g. IKEA's global SCM; Current and future trends ♦ Business Intelligence: Fundamentals issues and technologies	
Learning Outcomes: Subject Mastery	*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)* ♦ In-depth understanding of key issues in Digital and Knowledge Economy.	

	♦ In-depth understanding of ontologies, conceptual and knowledge modelling technologies, in terms of design, critical evaluation and suitable practical uses.
	♦ In-depth understanding of issues in intelligent systems, supply chain management and business intelligence and the roles technologies may play.
	♦ In-depth understanding of issues and the motivation and rationale of business and technical problems in Digital and Knowledge Economy.
	♦ Ability to select and construct conceptual models, including ontologies, and can create appropriate evaluation criteria to assess them.
	♦ Ability to take self-initiatives to critically review relevant literature independently in Digital and Knowledge Economy.
Learning Outcomes:: Personal Abilities	*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT* ♦ Extensive analytical skills in conceptual modelling methods, including ontologies, process and knowledge modelling, for business problems. ♦ Ability to make well-informed evidence-based arguments towards supporting or rejecting technologies to solve business problems. ♦ Ability to deal with complex issues and make informed judgements, e.g. about ontologies, knowledge modelling, intelligent and business systems in the absence of complete or consistent data. ♦ Exercise extensive autonomy and initiative in addressing digital and knowledge economy challenges. ♦ Demonstrate critical reflection on digital and knowledge economy. ♦ Ability to judge technology hypes and develop personal opinions on future trends.
Assessment Methods:	Assessment: Examination:(weighting– 70%) Coursework:(weighting – 30%) Re-assessment: Coursework: (weighting – 100%)

Course Code: **F21GP**	Course Title: **Computer Games Programming**	Course Co-ordinator: **Mohammad Hamdan** **Ruth Aylett & Stefano Padilla**
Pre-requisites:	C++ programming skills	
Aims:	To develop programming skills and techniques specific to the area of 2D and 3D computer games	
Syllabus:	♦ Computer Games Design Concepts (Genres, Narrative and Fun). ♦ Elements of Game Design (Formal, Dramatic and System Dynamics). ♦ Character and World Design. ♦ Design Programming Patterns (Input, loops, structures, objects and optimisation). ♦ Games Creation Concepts (Conceptualisation, Prototyping, Playtesting). ♦ Game-state, simulator, renderer, (hierarchical) controllers. ♦ Tools, environments and coding practices– e.g. graphics, C++ and engines. ♦ 2D and 3D game programming techniques. ♦ Physically-based modelling, particle systems, flocking. ♦ Obstacle avoidance and path planning. ♦ Group movement. ♦ Learning and adaptation in games. ♦ Action and behaviour selection. ♦ Procedural Generation. ♦ Course summary and review.	
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)* ♦ Critical appreciation of game theory and computer games history, genres and impact ♦ Ability to critically evaluate game design concepts, elements and characters. ♦ Critical understanding of available tools and their application. ♦ Knowledge of algorithms for path planning and navigation ♦ Understanding and knowledge of physically-based modelling in games and selection of techniques. ♦ Understanding and knowledge of AI techniques in games and selection of techniques. ♦ Ability to design and implement a small-scale game using 2D and 3D tools. ♦ Practical skills in graphics and AI programming in the computer games context.	
Learning Outcomes: **Personal Abilities**	*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT* ♦ Representation of, planning for, and solution of problems. ♦ Ability to plan, design, prototype critically evaluate and communicate a game. ♦ Ability to think and plan in three dimensions. ♦ Team working skills.	
Assessment Methods:	Assessment: Examination: (weighting – 50%) Coursework: (weighting – 50%)	Re-assessment: Examination: (weighting – 100%)

Course Code: F21NA	Course Title: Network Applications	Course Co-ordinator: Talal Shaikh Hamish Taylor
Pre-requisites:	Reasonable software development skills in Java and basic knowledge of data communications and the web	
Aims:	♦ To impart knowledge and understanding of the theories, principles and protocols underlying the primary network applications on the Internet ♦ To develop the ability to appreciate critically the range of network application technologies and standards ♦ To develop skills in a range of the principal network technologies, to impart the main design and practical issues faced in their application, and confer the ability to select and apply relevant techniques for a given network application development problem. ♦ To have students creatively develop in teams a substantial network application involving web and application server technologies to an original design of their own	
Syllabus:	Network services – service styles and models, Internet, DNS, sockets, implementing services; e-mail - MIME, SMTP, POP, IMAP; web protocols - URIs, HTTP versions and characteristics; web content - HTML, XML, XHTML, HTML 5, forms, tables, embedded objects; CSS style properties; JavaScript – object prototypes, standalone and web client programming; DOM versions, CSS 3, DHTML, AngularJS; web server programming in Java and JavaScript - REST web services, CGI, servlets, JSP, Node.js, web frameworks; asynchronous use of HTTP - AJAX, JSON, JSONP; textual conferencing - IM, IRC, web chat via short and long polling, HTTP streaming, applet sockets and web sockets; web sessions – URL rewriting, web storage, cookies; HTTP authentication.	
Learning Outcomes: Subject Mastery	*Understanding, Knowledge and Subject-Specific Skills* ♦ Extensive, detailed and critical knowledge and understanding of the theories, techniques and principles underlying the design of network applications and the range of their application ♦ Theoretical and practical knowledge of the major network application types including email, web and chat applications and services ♦ Critical awareness of protocols and standards underlying key network applications especially the web and of enabling technologies for network applications such as sockets, DNS, XML ♦ Ability to design and develop useful network applications including web, email and chat software using apt technologies and languages: HTML, XML, JavaScript, CSS, Java applets, CGI, servlets, active web server pages, REST web services etc.	
Learning Outcomes: Personal Abilities	*Cognitive skills, Core skills and Professional Awareness* ♦ Skills in selecting, applying and evaluating apt technologies in a professional way given a problem requiring network interaction ♦ Ability to build on initial skills and knowledge by independent research using online resources ♦ Showing initiative, creativity and team working skills in shared network application development	
Assessment Methods:	Assessment: Examination: (weighting – 60%) Coursework: (weighting – 40%)	Re-assessment: Examination: (weighting – 100%)

Course Code: **F21RP**	Course Title: **Research Methods and Project Planning**	Course Co-ordinator: **Hind Zantout** **Oliver Lemon**
Pre-requisites:	None.	
Aims:	To enable students to develop skills in critical thinking, research planning, academic writing and experimental design appropriate for a post-graduate programme. To enable students to gain skills in project planning and an awareness of legal, social and professional issues relevant for IT professionals.	
Syllabus:	♦ Research aims and objectives, literature search, critical analysis and review. ♦ Technical writing. ♦ Project planning, testing, risk analysis, requirements and design. ♦ Human factors in software development. ♦ Experimental design and software evaluation. ♦ Professional standards. ♦ Legal, social, ethical and professional issues in IT.	
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Subject-Specific Skills* ♦ Ability to write literature review which critically evaluates research and current technical developments against a stated aim. ♦ Ability to search for and evaluate the value of written and online material. ♦ A critical understanding of the role of human factors in software development, and of a range of techniques for designing and evaluating with users in mind. ♦ A detailed understanding of general issues in experimental design, and how to verify a research hypothesis. ♦ An ability to apply general methodologies for project planning, and more specific methodologies related to IT projects.	
Learning Outcomes: **Personal Abilities**	*Cognitive skills, Core skills and Professional Awareness* ♦ A proper appreciation of current professional standards in software documentation, and professional legal and ethical standards relevant to the IT industry. ♦ Ability to work independently on a small project, planning and managing time. ♦ Ability to present work effectively to others, orally and written. ♦ An ability to use software tools appropriate to IT project planning and evaluation.	
Assessment Methods:	Assessment: Continuous assessment (weighting – 100%)	Re-assessment: Coursework (weighting – 100%)

Course Code: **F21SM**	Course Title: **Software Engineering Master Class**	Course Co-ordinator: **Hind Zantout**

Pre-requisites:	None
Aims:	To introduce students to the cutting edge of research in their field, using the guidance and expertise of active research groups. ♦ To provide students with an opportunity to create and deliver a master-class on a topic to their peers.
Syllabus:	♦ Investigate a topic proposed and supervised by an academic ♦ Develop training/teaching materials (lectures/labs/etc) ♦ Self study
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Subject-Specific Skills* ♦ Demonstrate advanced, critical knowledge of a specialist area of software engineering/computer science. ♦ Apply appropriate technologies to develop and deliver learning materials on this topic. ♦ Demonstrate an awareness of current and emerging applications of, and alternatives to, the chosen topic. ♦ Provide appropriate answers to questions posed by peers on the chosen topic. ♦ Critically reflect on feedback provided by peers on the delivered learning materials.
Learning Outcomes:: **Personal Abilities**	*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT* ♦ Critically evaluate, review, analyse and organise complex, ambiguous and unreliable information sources. ♦ Develop original and creative solutions to, and judgements on, open-ended problems. ♦ Make presentations of complex material to professional audiences
Assessment Methods:	Assessment: Coursework: (weighting – 100%)	Re-assessment: Coursework: (weighting – 100%)

Course Code: **C11PA**	Course Title: **Project Management**	Course Co-ordinator: **TBC** **Reza Mohammadi**
Pre-requisites:	None	
Aims:	♦ To develop an appreciation of the knowledge and skills required to perform as a professional project manager ♦ To develop competence in using a generic set of quantitative and qualitative project planning and control tools and techniques. ♦ To enable recognition of the limitations and appropriateness of the varied approaches to project management ♦ To demonstrate the progression from strategy formulation to the execution of projects ♦ To provide basic training in a project scheduling software package ♦ To define the role and current issues faced by project managers in the context of project control	
Syllabus:	♦ Organisation Strategy and Project Selection ♦ Organisation and Project Structures ♦ Project Definition ♦ Estimating Project Time and Costs ♦ Developing a Project Plan ♦ Managing Risk ♦ Scheduling Resources ♦ Reducing Project Duration ♦ Progress and Performance Control ♦ Project Audit and Closure ♦ Project Management and the Future ♦ Leadership and Managing Project Teams	
Subject Mastery: **Subject Mastery**	*Understanding, Knowledge and Subject-Specific Skills* ♦ Critically and effectively analyse strategic project proposals ♦ Recognise good and bad project management practices ♦ Demonstrate ability to project management an industry-based strategic project scenario ♦ Demonstrate knowledge and understanding of project planning and control tools and techniques ♦ Develop knowledge and experience of commercial project management software packages	
Personal Abilities: **Personal Abilities**	*Cognitive skills, Core skills and Professional Awareness* ♦ Demonstrate team working abilities. ♦ Demonstrate leadership skills ♦ Develop analytical and problem solving skills ♦ Develop communication and presentation skills	
Assessment Methods:	Assessment: Exam: (weighting – 50%) Coursework:(weighting – 50%)	Re-assessment: Exam: (weighting – 100%)

Course Code: F21MP	Course Title: **Masters Project and Dissertation**	Course Co-ordinator: **Hind Zantout** **Katya Komendantskaya**
Pre-requisites:	MSc Level performance in taught courses and 45% or above in F21RP Research Methods & Project Planning	
Aims:	♦ To provide the student with an opportunity to undertake extensive investigation of an advanced or specialised topic relating to their course. ♦ To provide the opportunity to plan and execute a significant project of research, investigation or development.	
Syllabus:	This course is preceded by the linked course on requirements analysis and design, and so focuses on implementation and evaluation of software systems, as appropriate to the specific MSc programme, typically: ♦ Implementation of a significant software system OR conduct of substantial piece of empirical research. ♦ Evaluation of software system. ♦ Critical assessment of contributions to research or effectiveness of software solution. ♦ Presentation of work.	
Learning Outcomes: **Subject Mastery**	*Understanding, Knowledge and Subject-Specific Skills* ♦ Critical understanding of a specialised area including principal theories and concepts. ♦ Critical knowledge and skills in the application of design, implementation and evaluation techniques.	
Learning Outcomes: **Personal Abilities**	*Cognitive skills, Core skills and Professional Awareness* ♦ Take responsibility for own work. ♦ Communicate with peers, senior colleagues and specialists through an extensive dissertation and poster display. ♦ Develop original and creative responses. ♦ Apply critical analysis, evaluation and synthesis to advanced or specialised topics.	
Assessment Methods:	Assessment: Dissertation: (weighting – 90%) Presentation (weighting – 10%)	Re-assessment: None

APPENDIX B

MSc Project Guidance

MSc Project Guidance

The following section gives information about the conduct of MSc projects and the preparation and submission of MSc dissertations. Further information and advice is provided in the F21RP Research Methods and Project Planning course.

MSc Project Conduct and Milestones

An MSc project is a substantial and extensive investigation of a challenging topic in the subject area of an MSc. It is intended to give an MSc student a major opportunity to exercise their new understanding and advanced skills acquired on their programme by applying them to a significant and advanced practical problem. It is primarily assessed by means of a major piece of writing that describes the full scope of their MSc project from its aims and objectives through its requirements analysis, design of software or experiments to implementation, summative evaluation and conclusions. Students are supervised by a qualified academic with expert knowledge in the subject area while they are doing the MSc project.

Preparations for the MSc project begin in the second semester on the mandatory course F21RP Research Methods and Project Planning. That course develops student skills in critical thinking, research planning, academic writing and experimental design appropriate to their MSc project. It also explains appropriate approaches to planning the project. Students are made aware of legal, social, ethical and professional issues at stake and how to address them. Students are expected to meet with their supervisors throughout semester 2 for guidance and assistance in researching the background to their project. This research phase issues in the student writing a research background report which is part of the assessed coursework for the F21RP course.

The research background report has 3 main elements:

1. Literature review
2. Requirements analysis of software or experiments to be attempted
3. Project plan

The first two elements can also be used as part of the MSc dissertation after suitable revision to reflect any changes in the project's direction and details.

Immediately after the MSc exams at the end of semester 2, students begin work on their MSc project and continue full time on the project for 15 weeks until near the end of August. At that point they submit an MSc dissertation, as described below. After that they prepare an MSc poster in a one week period up until the MSc poster day at which they present their poster at a special session and give a demonstration of any practical work they have accomplished. Their posters are assessed along with their dissertations and that completes their MSc programme.

The milestones of an MSc project are as follows:

1. project selection period at start of semester 2
2. project allocation in following week
3. research background to MSc topic completed by end of semester 2
4. begin full-time project immediately after end of semester 2 exams
5. project dissertation submission towards end of August
6. project poster presentation and demonstration one week later

See the earlier MSc calendar for the exact dates.

MSc Project Selection

At the start of the second semester MSc students will be invited to select their MSc project. Students can either select projects from a list of projects that will be made available on the web or they can propose their own project. Lectures on the course F21RP Research Methods & Project Planning will give guidance on this process.

Projects listed on the web will include the proposed project title, the proposer, a description of its content, some references, an optional hyperlink to further details and the kinds of knowledge and skills that are required to attempt it. The project proposer will be an academic in the department and that person will normally supervise the project. However, in a few cases another supervisor may be arranged instead. Project selection is done online by filling a form specifying 1st, 2nd and 3rd choices. In cases where the project title is very generic, the actual project attempted and its final title will be determined by negotiation between the student and their supervisor. Students are advised to contact the project proposer and discuss what the project involves and whether they are suitable before making a project selection. After the selection deadline has passed, students will be informed as to who has been allocated which project. This allocation is done so as to try to ensure that every student has as close to their 1st choice as possible.

Students may also propose their own project. If they do so, they should write on an A4 page, the project's title, a description of its content, their name and programme being studied, and detail any special software or equipment requirements. The level of detail required should be similar to the level of detail given in published project proposals by academics. The student should then submit the MSc project proposal to their programme director. Their programme director will be responsible for vetting the project for suitability and then if it qualifies or qualifies after being suitably amended, their programme director will also help them find them a supervisor.

Either way the student will fill in the MSc project form once it has been agreed and get their programme director and supervisor to sign it. It should then be submitted to Peter King who manages project allocation. Problems about project allocation can be resolved through Peter King, who is in charge of project allocations, and their programme director.

MSc Project Supervision

Once an MSc student has been given a supervisor, the student should seek an early meeting with that supervisor. Students are expected to meet with their supervisor once a week until the end of their MSc project. It is the student's responsibility to make that first meeting, and it is the student's responsibility to ensure that they attend every weekly meeting throughout the entire project period. Failing to meet your supervisor regularly every week is a fairly good way of setting yourself up to fail your MSc project. Arranging to meet a supervisor can be done either in person by going to that academic's room in the department during office hours or by asking for an appointment by e-mail.

Even the cleverest MSc student is unlikely to be able to anticipate all the guidance that can be obtained from their supervisor. Only by attending supervisions is a student going to be well placed to get a good mark on their MSc project. MSc projects require research, practical work and writing. Students can expect extensive help with all these aspects from their supervisor.

MSc Dissertation - Format and Length

As a general rule, the body of the dissertation should be between 15,000-20,000 words - this will normally correspond to about 45-60 pages if you include some diagrams. Dissertations which are significantly outside this range may be penalised for being too short or too long. We don't have a prescriptive style/format, but you should choose a font that is easy to read (normally 10 or 12 point) and are encouraged to use one-and-a-half line spacing. You should include appendices for additional material not central to the report (e.g., questionnaires, screenshots) and these will be in addition to the 45-60 pages for the main body.

MSc Dissertation - Content and Structure

Your project will be assessed primarily from the dissertation and it is therefore essential that it is a full account of your work and clearly presented. The detailed structure will depend on the type of project, and you should obtain advice from your supervisor. Your supervisor can also be expected to comment on outlines and drafts. When writing your dissertation, make sure to pitch it at the right level. You should not assume that your reader is an expert in the specialist topic that you are reporting, but should assume they have a good knowledge of the general discipline (CS/IT). If you think a good fellow student would understand it, then that is about right.

All dissertations will normally have the following elements:

- Title Page
- Declaration that the dissertation is your own work (see discussion in section on submission)
- Abstract: A summary of the dissertation highlighting major points and describing the dissertation's scope and conclusions.
- Acknowledgements: Anyone you wish to thank.
- Table of Contents: Detailed breakdown with chapter headings, section headings, and maybe subsection headings, each with page numbers.
- Table of Figures: Location, number and legend of all figures in document (optional)
- Chapters of Content (see later)
- References (see later)
- Bibliography (optional - recommended reading such as sources that you have used but not cited)
- Appendices (optional)

Chapter 1 will normally start with a short introduction to the problem you are addressing and your aims and objectives, give a short review of the context, and describe what follows in the main body of the report.

Chapter 2 will normally include a critical review of relevant literature, so the reader understands what you are building on. You may also describe techniques, guidelines and even existing products if relevant to what you will be presenting later. It is important that this review is written in your own words throughout, reads as a coherent and connected piece of writing, shows the *relevance* of the material presented to the problem being addressed, and provides some critique/analysis of the material and its applicability to the problem. In essence it is your analysis and understanding that we are interested in, how you build on existing work, understand its limitations, select from available methods/tools, and present that coherently.

It is important to select your *references* carefully in your review. It is not sufficient to find 15 web sites which seem to have something relevant to say. Sources should be authoritative, accurate, and preferably should still be around in 5 years time. Academic papers and books usually meet these criteria, but also some web site sources are acceptable - sometimes a web site is indeed the most appropriate and authoritative source on a subject. See later for how to cite your references.

The structure of the middle section of your dissertation will vary according to the type of project. Many possible structures are possible but two typical structures are discussed below:

A. Software Engineering Project.

   The goal is to develop some software to solve some problem. The chapters should cover requirements, design, prototyping and redesign, implementation, evaluation, conclusion.

   This structure is appropriate where you have a customer (external or supervisor) who wants some software for a real (or imagined!) problem. A successful project is one where you elicit the

customer's needs, develop a reliable and functional solution, and test/evaluate the software to demonstrate that it does indeed meet the customer's needs. It should also of course be technically non-trivial. A simple set of web pages might satisfy some customers but would not result in you getting an MSc.

B. Research Project:
The goal is to advance understanding by carrying out an investigation which may include prototyping a system. The chapters will present the problem (sometimes as a hypothesis), review existing work (as above), describe the research undertaken (including design of any experiments), present the results of any experiments, present any conclusions, relating these to past work and suggesting further work.

This structure is appropriate for open-ended investigations inspired by either a novel idea (like "The use of multimedia can negatively affect the experience of learning") or a plausible principle or hypothesis (such as "Distribution of a database provides information access speedup"). The aim is to investigate something about which not enough is already known or understood, and hence make a modest contribution to knowledge. Where a program is developed, it is not an end in itself. Rather it is an instrument for experimentation and discovery. The interest, significance and quality of the results are the primary criteria of success (bearing in mind that negative results of a well-conducted investigation are often as valuable as positive.)

Many variants of these structures are possible. For example, some projects will centre on the evaluation of an existing software system, and the structure will reflect that. Some projects may involve surveys of user or organisation opinion, and it may be the design of these surveys that forms a central element. Don't feel constrained to structure your document in a particular way, but ensure that the structure is discussed with your supervisor.

Note that in both styles of dissertation the final chapter will normally present conclusions and discuss further work. It should be clear just what has been achieved against the original objectives/problem description set out in chapter 1. It is important to make clear what has been learned and achieved and what further work could be undertaken by you or others to further the objectives of the project.

MSc Project Evaluation
It is not enough to achieve something in doing your MSc project by way of software development or by conducting some experiment. You also need to demonstrate the worth of what you have achieved by some kind of independent standard other than your own satisfaction with what you have done. With a software development project you can do this by conducting an evaluation with the help of some third parties.

Evaluation is different from testing your software. The aim of testing is to verify that your software does what it is designed to do. The aim of evaluation is to validate that your software fulfils the project's requirements. A minimum evaluation might be a checklist comparison of what the original requirements were and what you succeeded in implementing. However, this is usually insufficiently convincing as it is too simple to subvert. You could easily rewrite the requirements to fit with whatever software you succeeded in producing and give yourself a perfect evaluation score.

More convincing is to conduct an evaluation where you exercise your software in accordance with the project aims and get independent persons to give judgements about the worth of what you have done. Since most software is interactive, a typical evaluation might consist of giving users a series of representative tasks to perform using the software and assessing how well they succeeded in doing them. You could record whether they succeeded or needed help to succeed or gave up or failed and score how well they succeeded in doing (efficacy, accuracy, time, effort etc.) The testers can contribute to that assessment by filling in a questionnaire addressing a range of usability and functionality aspects of the system. Their judgements would help establish the independence of the evaluation. The

questionnaire could ask users to rate aspects of the system along various quality dimensions and you could provide average scores of these ratings. The questionnaire could also ask users to give free text comments about what worked and what needs improvement. The number and choice of testers needn't be so numerous and balanced that they would eliminate all biases to a scientific level of respectability. However, between 5 and 10 testers of varied character should be enough to be reasonably indicative of how well your software does what it is supposed to and what its shortcomings are.

Your evaluation should be written up and presented in your dissertation after you describe what you have achieved. Usually you would present this in a special chapter by itself. No software is perfect so the evaluation is likely to reveal shortcomings. You shouldn't try to hide or disguise them. You are unlikely to convince your dissertation markers that your software was one big success story if your evaluation just presents a bland picture of a successful outcome. You should turn around the shortcomings by being honest and realistic about them and even take the opportunity to say how they might be ameliorated. That self-critique is often the most interesting part of a dissertation. It is also a hallmark of a good project write-up that the author is capable of recognising the project's limitations and can clearly see what needs improving.

MSc Dissertation References

Your dissertation may cite a wide range of sources (e.g., papers or web sites that you have used) as background and context for the work. Sources are cited at the relevant point in the text and full source information is given in the references section. There are a variety of acceptable citation and referencing styles, but the most commonly used styles in Computer Science are the Harvard style and the IEEE style. These are briefly discussed below.

Harvard (author-date) style
The author's name and the date of publication are used in the body of the text when citing sources - e.g., (Jones, 2003). Variations are possible, for example we can say that Jones (2003) has developed a new technique. The bibliography is given alphabetically by author. Journal and book names are italicised, e.g.

Annas, G.J. (1997), 'New drugs for acute respiratory distress syndrome', *New England Journal of Medicine*, vol. 337, no. 6, pp. 435-439.

Grinspoon, L. Bakalar, J.B. (1993), *Marijuana: the forbidden medicine*, Yale University Press, London.

Notice that there is a lot of information about the articles cited, not just the title and author. This ensures that the reader can find the article in question. Find out what is expected for different types of article (e.g., books, conference papers) and aim to give as complete information as possible.

IEEE style
Here references are listed alphabetically but given a number. The citation number is used when citing the document in the body of the text (e.g., [2]). Differences in how the references are listed are otherwise minor.

[2] W. Chen, R. Yeung, and P.P. Wainwright, "Linear networks - assessing their feasibility", *Phys. Rev.,* vol. 12, no. 1, pp. 105-119, April 1994.

You should select which style to use and use it consistently. Look up how to reference different kinds of sources, taking particular care with electronic sources. Give as much information about these as possible (title, author, date if possible) and consider just using footnotes for non-authoritative electronic sources. If you want to use another style apart from IEEE and Harvard then you should discuss it with your supervisor.

With the increasing use of Web sources you should take particular care how you cite these. You should make sure to put more than simply the URL, as URLs often go out of date. The guiding principle is that you should maximise someone's chances of finding the document. You should also state when the web page was last accessed, as web resources often change their location. One format that you can use is the following:

Author's name, title of document, publisher, date of document, size of document, URL web address, (date last accessed)

For example, using the Harvard style we might have:
> Taylor, H., (2009), *MSc Dissertation Preparation Guidance*, Heriot-Watt University, 29572 bytes, http://www.macs.hw.ac.uk/macshome/courses/pg/diss_prep.html, (last accessed 1/5/2009)

Whatever style you use the references section should come between the main text and the appendices. Normally references should start on a new page, and should not have a chapter or section number, just the heading "References". Some word processing tools may provide help with referencing - consider using these. However, the main thing is to give proper thought to how and what you cite.

MSc Dissertation Style
Style in technical writing is discussed in more detail elsewhere. See for example:
> *The Elements of Style: A Style Guide for Writers* (2005), by William Strunk, ISBN 0-97522-980-X, http://academic.csuohio.edu/simond/courses/elos3.pdf

The main point to make is to present material clearly and concisely, and in an objective fashion as possible. Your personal impressions and feelings should rarely come into it. You should normally avoid using expressions like "I did this" and instead report the work in a passive voice ("it was done"). However, where you are genuinely voicing an individual opinion, you may use the first person. Also, while the passive voice is normal for scientific writing it is not used universally, so don't feel forced into a style that you find awkward. The main thing is clarity and objectivity.

While considering style we should re-iterate what has been said elsewhere about plagiarism. If you copy more than half a line directly from a source without quoting and citing it then it is considered plagiarism. If something is so good you want to cite it literally then do it like this:
Taylor provides a concise discussion of how we can quote material:

> "While considering style we should re-iterate what has been said elsewhere about plagiarism. If you copy more than half a line directly from a source without quoting and citing it then it is considered plagiarism. If something is so good you want to cite it literally then do it like this." [2]

Note that the copied material is in quotation marks AND the source is cited. Plagiarism detection tools use techniques like looking for any 7 successive words that are the same in the examined text and also occur in another text.

MSc Dissertation Preparation Tools
There are many tools to support document preparation, from LaTeX to tools built into Microsoft Word. Find out about them and use them. Spelling errors will not be acceptable if there are spelling checkers you could have used to detect them. Errors in referencing and poorly laid out graphics may be penalised where you could have used a simple tool to insert them for you.

MSc Dissertation Assessment
Your dissertation will be marked by your supervisor and by a second reader. If they disagree by more than a certain amount, a third marker will be brought in to ensure the appraisal is balanced. If it is borderline (close to an MSc with distinction mark or the lowest mark for an MSc or PG Diploma), it may also be looked at by the external examiner for the programme. So what are the assessors of your

dissertation looking for? You will be given the assessment form that we use. We are looking for some or all of:

- Clear and concise presentation of work
- Demonstration of depth of technical understanding
- Coverage of related work; knowledge of the field
- Quality of any product
- Demonstration of ability to critically analyse other work and come up with original analyses and ideas
- Any contribution to knowledge.
- Evidence of initiative and perseverance
- Demonstration of professional conduct, considering ethical, social and legal issues where appropriate, and of course no evidence of plagiarism.

90% of the project mark comes from the assessment of the dissertation and 10% comes from the project poster.

MSc Dissertation Submission Procedures
You should submit your dissertation in PDF format on Vision through the course F21MP. Your dissertation must have the standard front page which is also available on Vision. This PDF will be checked for plagiarism using TurnItIn.

Your document should include a signed and dated declaration that the work is your own. The following form of words should be used:

"I <name> confirm that this work submitted for assessment is my own and is expressed in my own words. Any uses made within it of the words of other authors in any form e.g., ideas, equations, figures, text, tables, programs etc are properly acknowledged. A list of references employed is included."

This is a serious declaration and examiners may refer any dissertations with suspected plagiarism to the University disciplinary committee. Properly acknowledging sources means quoting as well as citing the source of any copied material.

For consistency's sake you should even cite the source of this absence of plagiarism declaration.

APPENDIX C

Assessment Methods and Procedures

Assessment Methods and Procedures

Postgraduate programmes consist of two phases:

♦ A *taught phase*, consisting of a set of 8 taught courses, some mandatory and some optional, defined in the programme structure, which the students will study over two semesters. Assessment of the taught phase is through a variety of methods including coursework and/or examination. Students must submit all elements of assessment before being permitted to progress.

♦ A *dissertation phase*, consisting of two stages: an appropriate research project and project dissertation report, and a poster and demonstration-based presentation.

♦ Students will normally complete the taught phase, at which point progression to the dissertation phase is dependent on assessed performance. To progress students must meet the criteria stipulated in point 9 below in the taught material.

♦ Students meeting the required standards for Masters in the taught phase (set out in point 9 below) will be permitted to progress to the dissertation phase.

♦ Students meeting the required standards for Postgraduate Diploma and Postgraduate Certificate (set out in point 9 below) in the taught phase, but not meeting the Masters standard, will not be permitted to progress to the dissertation phase. Students may be recommended to graduate with a Postgraduate Diploma or a Postgraduate Certificate at this point.

♦ Students failing to meet the required standards for Postgraduate Diploma and Postgraduate Certificate (set out in point 9 below) in coursework and examination in the taught phase will not be permitted to progress to the dissertation phase, nor will they be eligible for any award.

♦ Any student will be able to retake the assessment of up to a maximum of 3 courses at the next opportunity, subject to payment of the appropriate fees to the University, and may be required to do so to obtain the necessary credits for completion of their programme or for progression. Students may only resit courses for which their grade is E or F although they may exceptionally resit ones graded at D if that is necessary to get their taught average high enough to be able to progress. The method of reassessment for each course is specified in the appropriate course descriptor.

♦ In any circumstance which it deems to be exceptional the Exam Board has the discretion to permit student progress or award, irrespective of student performance against required standards and policies.

Award and Progression Rules

1. To obtain an MSc Degree, candidates must gain 180 credits and must satisfy the examiners by achieving the required standards (set out in point 9 below) in two components:
   ♦ Assessed taught material
   ♦ Dissertation (set out in point 9 below)

2. To obtain a Postgraduate Diploma candidates must gain 120 credits and must satisfy the examiners by achieving the required standards (set out in point 9 below) in the assessed taught material.

3. To obtain a Postgraduate Certificate candidates must gain 60 credits and must satisfy the examiners by achieving the required standards (set out in point 9 below) in one component:

- ♦ Assessed taught material
- ♦ The Examiners may specify certain courses as mandatory to achieve the award of Postgraduate Certificate, to reflect the nature of the course.

4. Taught courses will be assessed by a variety of techniques appropriate to the learning outcomes of the specific course.

5. All course work must be submitted before the due date. Late submissions will only be accepted with the prior permission of the Programme Director.

6. In exceptional personal or medical circumstances students may be granted leave by the examiners to redo part or all of the assessment on one occasion only and at a date decided by the examiners, as stated in university regulations 4 and 5. This provision is in addition to the provision that students may retake assessment for courses in which they have achieved a grade less than D.

7. Dissertations must be submitted on or before the publicised submission date; dissertations submitted after that date and without the prior consent of the Programme Director may be assessed at a penalty.

8. Allowance for poor performance in or non-submission of a component on medical grounds is normally made only where supported by written testimony from a professional health practitioner. Such testimony must be lodged with the Programme Director prior to the Examination Board meeting.

9. The level of achievement expected in each component is an average of:
   - ♦ 40% for the Postgraduate Diploma and Certificate
   - ♦ 50% for the MSc Degree

   MSc candidates displaying exceptional merit by obtaining a credit weighted average of 70% or more (at the first attempt) over 8 courses and the dissertation at grade A may be recommended for the award of MSc with Distinction. Postgraduate Diploma candidates displaying exceptional merit by obtaining a credit weighted average of 70% or more (at the first attempt) over 8 courses at grades A-C may be recommended for the award of Postgraduate Diploma with Distinction. Both distinction awards are at the discretion of the Exam Board.

Required Standards
Candidates must achieve the following minimum levels of performance in:

Assessed Taught Material
- ♦ A credit weighted average across the 8 courses of 50% or better for Masters, with F21RP Research Methods at 45% or above and all others at grade D or above.
- ♦ A credit weighted average across the 8 courses of 40% or better for Postgraduate Diploma (120 credits) or a credit weighted average across 4 courses of 40% or better for Postgraduate Certificate (60 credits), with no course returning a result of less than grade E.
- ♦ All elements of assessment for each course must be completed to a satisfactory level (grade E)

Dissertation
- ♦ An average of 50% or better for Masters
- ♦ The Dissertation is conducted in two stages, these being:
  - • Stage 1: A write up in a dissertation report (90%)
  - • Stage 2: A poster presentation and demonstration of the project work and results (10%)

Notes:

Exam scripts, coursework and dissertations could be seen by third parties for quality assurance purposes – e.g. External Examiners.

PART B: UNIVERSITY INFORMATION

The Academic Registry is responsible for producing Part B of the handbook to provide information and assistance on University policies and support services.

Please note that the following sections are standard sources of information provided to all students. However, certain aspects are programme-specific and you should refer to Part A where directed. Students are advised that the University will make changes to study programmes and progression requirements from time to time in accordance with strategic developments and it is therefore important to ensure that you check the most recent version of the handbook for up-to-date information.

B1.   Our Values

At Heriot-Watt, we have an established set of values that help up to nurture innovation and leadership and show our commitment to continuous development in all our activities. They are:

- Value and Respecting Everyone
- Pursuing Excellence
- Pride and Belonging
- Shaping the Future
- Outward Looking

Find out more about the Heriot-Watt values and what they mean to us.

B2.   Student Learning Code of Practice

The Student Learning Code of Practice outlines information about the University, its culture, policies, regulations and the expectation for students and staff. Please familiarise yourself with the relevant Code that is located within the Learning and Teaching Policy Bank.

B3.   University Policies and Support Services

Heriot-Watt University has a detailed set of rules that governs the operation and management of University business. These are referred to as Ordinances and these Ordinances are set by the Court, which is the governing body of the University. The Ordinances provide a regulatory framework for corporate governance. The University Ordinances are supported by University Regulations which provide a regulatory framework for the governance of academic-related matters which staff and student must adhere to for all academic matters.   Wherever practicable, University policy is designed to include all members of the University's community, both within and outwith the main campus environments.

Read more about the University Policies, Ordinances and Regulations.

As part of your University enrolment, you signed the Student Declaration and agreed to abide by the regulations of the University and conform to its policies, procedures, ordinances and regulations that underpin the Ordinances and Regulations. During your time at Heriot-Watt, the following policies, procedures, reference information and support services may be relevant and useful guidance for you.

B4. **Your Student Portal**

The Student Portal brings together your services and relevant information in one place. Below is a summary of the services available to you via the portal:

- Office 365 suite: through single sign-on, all of your Office 365 services will be accessible through the Portal.

- Library: whether you want to search for books or view your loans & reservations, the Portal allows you to do this on your phone or desktop.

- Vision: your Portal will present you with announcements and tasks related to this course.

- Student Information: all university-level regulations and policies relating to your studies can be found on the Portal.

- Heriot-Watt PGR News: the Portal enables the University to promote events and experiences which will help you develop your skills.

- Personalised: You can hide, add and move tiles on your dashboard.

You can access your student portal here.

B5. **Quick Finder Guide to Academic and Support Services**

The following provides an A-Z guide on the academic and support services available to you during your studies.

By clicking on the subject heading you will link to the relevant information in the student portal/website. Please ensure that you check the portal/web at the regular times throughout the year for the most up-to-date information:

A	- Academic Appeals - Academic Registry - Academic Skills Development - Accommodation Services: - Accommodation (Dubai Campus) - Accommodation (Edinburgh Campus) - Accommodation (Malaysia Campus) - Accommodation (Orkney Campus) - Accommodation (Scottish Borders Campus) - Alumni - Amendment to Enrolment - Assessment - Feedback on Assessment - Assessment Results - Assistive Software - Attendance & Absence
C	- Career Mentoring - Careers Service - Change of Address

	• Complaints • Counselling
D	• Data Protection (or email foi@hw.ac.uk) • Disability Support • Discipline • Discretionary Credits (please refer to the appropriate Regulation(s) for your level of study)

E	• Enrolment
	• Equality and Diversity Services
	• Erasmus+
	• Exchanges
	• Examinations & Examination Diets
	   ↓ Exam Diets
	   ↓ Exam Conduct and Identity Checks
	   ↓ Exams in Different Time Zones
	   ↓ Exam Timetables
	• Exit Awards
	• External Examiners Information

F	• Failing a Course
	• Faith and Belief:
	   ↓ Edinburgh Campus
	   ↓ Dubai Campus *(There are prayer rooms for students within the Dubai Campus)*
	   ↓ Malaysia Campus *(There are prayer rooms for students at the Malaysia Campus)*
	• Financial Services

G	• Go Global
	• Guide to Student Life/New Student Guide:
	   ↓ Edinburgh and Scottish Borders Campuses available here
	   ↓ Dubai Campus available here
	   ↓ Malaysia Campus available here
	• Graduate Attributes
	• Graduation

H	• Heriot-Watt Assessment & Progression System (HAPS) • Health and Wellbeing
I	• Ill Health & Mitigating Circumstances • Inter-Campus Transfer • Intermediate Awards • International Student Support • IT Skills & Resources
L	• Learning and Teaching Matters

	• Library Facilities
O	• Oriam (Scotland's Sport Performance Centre)
P	• People Finder • Periods of Study (please refer to the appropriate Regulation(s) for your level of study) • Personal Tutors • Plagiarism • Professional Development Planning
R	• Re-Assessment • Requirements for Awards (please refer to the appropriate Regulation(s) for your level of study) • Recognition of Prior Learning & Credit Transfer

S	• Sport and Exercise (Edinburgh campus)
	• Student Council (Dubai Campus)
	• Student Feedback
	• Student Fees & Charges
	• Student Policies and Guidance
	• Student Service Centre:
	    ↓ Dubai Campus (please contact dubaienquiries@hw.ac.uk)
	    ↓ Edinburgh Campus
	    ↓ Malaysia Campus
	• Student Services & Student Support Services
	• Study Spaces
	• Student Union (Edinburgh, Orkney and Scottish Borders Campuses)

T	• Teaching Timetables • Temporary Suspension of Studies • Thinking of Leaving
U	• Use of Calculators in Examinations • Use of Dictionaries in Examinations
V	• Visas & Immigration • Vision

STUDENT GUIDE TO PLAGIARISM [1]

Plagiarism is intellectual theft and is a major offence which the University takes seriously in all cases. Students must therefore avoid committing acts of plagiarism by following these guidelines and speaking to academic staff if they are uncertain about what plagiarism means. Those who are found to have plagiarised will be subject to the University's disciplinary procedures, which may result in penalties ranging from the deduction of credits and modules already achieved by students to compulsory termination of studies. Students are advised to refer to Regulation 50 at http://www.hw.ac.uk/ordinances/regulations.pdf and to the Guidelines for Staff and Students on Discipline at http://www.hw.ac.uk/students/studies/examinations/plagiarism.htm for further details of how the University deals with all acts of plagiarism.

Introduction

1.1.   This guide is intended to provide students at Heriot-Watt University with a clear definition of plagiarism and examples of how to avoid it.

1.2.   The guide may also be of use to members of staff who seek to advise students on the various issues outlined below.

Definition

1.3.   Plagiarism involves the act of taking the ideas, writings or inventions of another person and using these as if they were one's own, whether intentionally or not. Plagiarism occurs where there is no acknowledgement that the writings or ideas belong to or have come from another source.

1.4.   Most academic writing involves building on the work of others and this is acceptable as long as their contribution is identified and fully acknowledged. It is not wrong in itself to use the ideas, writings or inventions of others, provided that whoever does so is honest about acknowledging the source of that information. Many aspects of plagiarism can be simply avoided through proper referencing. However, plagiarism extends beyond minor errors in referencing the work of others and also includes the reproduction of an entire paper or passage of work or of the ideas and views contained in such pieces of work.

Good Practice

1.5.   Academic work is almost always drawn from other published information supplemented by the writer's own ideas, results or findings. Thus drawing from other work is entirely acceptable, but it is unacceptable not to acknowledge such work. Conventions or methods for making acknowledgements can vary slightly from subject to subject, and students should seek the advice of staff in their own School about ways of doing this. Generally, referencing systems fall into the Harvard (where the text citation is by author and date) and numeric (where the text citation is by using a number). Both systems refer readers to a list at the end of the piece of work where sufficient information is provided to enable the reader to locate the source for themselves.

1.6.   When a student undertakes a piece of work that involves drawing on the writings or ideas of others, they must ensure that they acknowledge each contribution in the following manner:

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[1] The author acknowledges the following sources of information used in preparing this guide to Plagiarism:
"Plagiarism – A Good Practice Guide", Carroll, J and Appleton, J (2001) and various extracts from Student/Course Handbooks 2004/2005, Schools at Heriot-Watt University

- **Citations**: when a direct quotation, a figure, a general idea or other piece of information is taken from another source, the work and its source must be acknowledged and identified where it occurs in the text;

- **Quotations**: inverted commas must always be used to identify direct quotations, and the source of the quotation must be cited;

- **References**: the full details of all references and other sources must be listed in a section at the end of any piece of work, such as an essay, together with the full publication details. This is normally referred to as a "List of References" and it must include details of any and all sources of information that the student has referred to in producing their work. (This is slightly different to a Bibliography, which may also contain references and sources which, although not directly referred to in your work, you consulted in producing your work).

1.7.   Students may wish to refer to the following examples which illustrate the basic principles of plagiarism and how students might avoid it in their work by using some very simple techniques:

1.7.1. Example 1: A Clear Case of Plagiarism

Examine the following example in which a student has simply inserted a passage of text (*in italics)* into their work directly from a book they have read:

University and college managers should consider implementing strategic frameworks if they wish to embrace good management standards. *One of the key problems in setting a strategic framework for a college or university is that the individual institution has both positive and negative constraints placed upon its freedom of action.* Managers are employed to resolve these issues effectively.

This is an example of bad practice as the student makes no attempt to distinguish the passage they have inserted from their own work. Thus, this constitutes a clear case of plagiarism. Simply changing a few key words in such a passage of text (e.g. replace '*problems'* with '*difficulties'*) does not make it the student's work and it is still considered to be an act of plagiarism.

1.7.2. Common Mistakes

Students may also find the following examples[2] of common plagiarism mistakes made by other students useful when reflecting on their own work:

- "I thought it would be okay as long as I included the source in my bibliography" [without indicating a quotation had been used in the text]
- "I made lots of notes for my essay and couldn't remember where I found the information"
- "I thought it would be okay to use material that I had purchased online"
- "I thought it would be okay to copy the text if I changed some of the words into my own"
- "I thought that plagiarism only applied to essays, I didn't know that it also applies to oral presentations/group projects etc"

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[2] Extract from 'Plagiarism at the University of Essex' advice copyrighted and published by the Learning, Teaching and Quality Unit at the University of Essex (http://www.essex.ac.uk/plagiarism/reasons.html), reproduced with kind permission.

- "I thought it would be okay just to use my tutor's notes"
- "I didn't think that you needed to reference material found on the web"
- "I left it too late and just didn't have time to reference my sources"

None of the above are acceptable reasons for failing to acknowledge the use of others' work and thereby constitute plagiarism.

1.8. What follows are examples of the measures that students should employ in order to correctly cite the words, thought or ideas of others that have influenced their work:

1.8.1.Example 2: Quoting the work of others

If a student wishes to cite a passage of text in order to support their own work, the correct way of doing so is to use quotation marks (e.g. " ") to show that the passage is someone else's work, as follows:

"One of the key problems in setting a strategic framework for a college or university is that the individual institution has both positive and negative constraints placed upon its freedom of action".

1.8.2.Example 3: Referencing the work of others

In addition to using quotation marks as above, students must also use a text citation. If the work being cited is a book, page numbers would also normally be required. Thus, using the Harvard system for a book:

"One of the key problems in setting a strategic framework for a college or university is that the individual institution has both positive and negative constraints placed upon its freedom of action" (Jones, 2001, p121).

The same reference could also be made to a book using the numeric system:

"One of the key problems in setting a strategic framework for a college or university is that the individual institution has both positive and negative constraints placed upon its freedom of action" (Ref.1, p121).

More often, a piece of work will have multiple references and this serves to show an examiner that the student is drawing from a number of sources. For example, articles by Brown and by Smith may be cited as follows in the Harvard system

"It has been asserted that Higher Education in the United Kingdom continued to be poorly funded during the 1980's [Brown, 1991]*, whereas more modern writers* [Smith, 2002] *argue that the HE sector actually received, in real terms, more funding during this period than the thirty year period immediately preceding it".*

or as follows using the numeric system:

"It has been asserted that Higher Education in the United Kingdom continued to be poorly funded during the 1980's [Ref 1]*, whereas more modern writers* [Ref 2] *argue that the HE sector actually received, in real terms, more funding during this period than the thirty year period immediately preceding it".*

Example 4: Use of reference lists

Whichever system is used, a list must be included at the end, which allows the reader to locate the works cited for themselves. The Internet is also an increasingly popular source of information for students and details must again be provided. You should adhere to the following guidelines in all cases where you reference the work of others:

If the source is a book, the required information is as follows:

- Author's name(s)
- Year of Publication
- Title of Book
- Place of Publication
- Publishers Name
- All Page Numbers cited
- Edition (if more than one, e.g. 3rd edition, 2001)

If the source is an article in a journal or periodical, the required information is as follows:

- Author's name(s)
- Year of Publication
- Title of Journal
- Volume and part number
- Page numbers for the article

If the source is from the Internet, the required information is as follows:

- Author's or Institution's name ("Anon", if not known)
- Title of Document
- Date last accessed by student
- Full URL (e.g. http://www.lib.utk.edu /instruction/plagiarism/)
- Affiliation of author, if given (e.g. University of Tennessee)

The way in which the information is organised can vary, and there are some types of work (for example edited volumes and conference proceedings) where the required information is slightly different. Essentially, though, it is your responsibility to make it clear where you are citing references within your work and what the source is within your reference list. **Failure to do so is an act of plagiarism.**

1.9. Students are encouraged to use a style of acknowledgement that is appropriate to their own academic discipline and should seek advice from their personal tutor, course leader or other appropriate member of academic staff. There are also many reference sources available in the University Library which will provide useful guidance on referencing styles.

Managing Plagiarism

1.10. Students, supervisors and institutions have a joint role in ensuring that plagiarism is avoided in all areas of academic activity. Each role is outlined below as follows:

How you can ensure that you avoid plagiarism in your work:

- Take responsibility for applying the above principles of best practice and integrity within all of your work
- Be aware that your written work will be checked for plagiarism and that all incidents of plagiarism, if found, are likely to result in severe disciplinary action by the University. The standard penalty is to annul all assessments taken in the same diet of examinations (for details please refer to Regulation 50 at http://www.hw.ac.uk/staff/policies-

governance/procedures/charter-statutes-ordinances-regulations.htm and to the Guidelines for Staff and Students on Discipline at http://www.hw.ac.uk/students/studies/record/discipline.htm).

How your School will help you to avoid plagiarism:

- Highlight written guidance on how you can avoid plagiarism and provide you with supplementary, verbal guidance wherever appropriate
- Regularly check student work to ensure that plagiarism has not taken place. This may involve both manual and electronic methods of checking. A number of plagiarism detection packages are in use at Heriot-Watt University, one example being the Joint Information Systems Committee (JISC) "TurnitIn" plagiarism detection software.
- Alert you to the procedures that will apply should you be found to have committed or be suspected of having committed an act of plagiarism and explain how further action will be taken in accordance with University policy and procedures.

How the University will endeavour to reduce student plagiarism:

- Provide clear written guidance on what constitutes plagiarism and how to avoid it directly to your School and to you
- Alert you and staff in your School to the penalties employed when dealing with plagiarism cases
- Take steps to ensure that a consistent approach is applied when dealing with cases of suspected plagiarism across the institution
- Take the issue of academic dishonesty very seriously and routinely investigate cases where students have plagiarised and apply appropriate penalties in all proven cases.