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BI501		Gene Expression and Its Control				
Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Autumn	I	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Autumn	I	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Spring	I	15 (7.5)	60% Exam, 40% Coursework	

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Demonstrate an understanding of how genes are organised, expressed and controlled in both prokaryotes and eukaryotes.
Demonstrate an awareness of the contribution of modern molecular and cellular technologies in furthering our understanding of gene expression and its control.
Demonstrate an appreciation of the importance of fundamental research into gene structure and function for future developments in the fields of human genomics and disease.
Analyse data from laboratory experiments that address issues relating to gene structure and/or expression.

The intended generic learning outcomes.
On successfully completing the module students will be able to:
Extract and interpret information at an intermediate level.
Analyse and evaluate experimental data at an intermediate level.
Have acquired skills in written communication and receiving critique.

Method of Assessment

Assignment 1, word limit 750-1000 words (20%)
Assignment 2, word limit 1500-2000 words (20%)
Exam, 2 hr, (60%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Core Texts (one of the following):

Krebs, J.E., Goldstein, E.S. and Kilpatrick, S.T. "Lewin's Genes XII", Jones and Bartlett Learning, Publishers, 2018 [ISBN-978-1-284104493]
Krebs, J.E., Goldstein, E.S., Kilpatrick, S.T. "Lewin's Essential Genes 3rd edition" Jones and Bartlett Learning, 2013, [ISBN: 978-1-4496-4479-6]
Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. & Losick, R. "Molecular Biology of the Gene, 7th Edition", Pearson, 2014 [ISBN: 978-0-321-85149-9]

In addition, the following books are recommended for supplementary/background reading:
Craig, N., Cohen-Fix, O., Green, R., Greider, C., Storz, G., Wolberger, C. 'Molecular Biology: Principles of Genome Function', 2nd edition OUP Oxford; 2014, ISBN-13: 978-0198705970
Latchman, D.S. 'Gene Control'. Garland Science, 2014, ISBN-10: 0815365136

Pre-requisites

BIOS3020 Molecular and Cellular Biology

Restrictions

Stage 2 students only

Synopsis *

The module deals with the molecular mechanisms of gene expression and its regulation in organisms ranging from viruses to man. This involves descriptions of how genetic information is stored in DNA and RNA, how that information is decoded by the cell and how this flow of information is controlled in response to changes in environment or developmental stage. Throughout, the mechanisms in prokaryotes and eukaryotes will be compared and contrasted and will touch on the latest developments in how we can analyse gene expression, and what these developments have revealed.

BI503 Cell Biology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	I	15 (7.5)	65% Exam, 35% Coursework	

Availability

It is required that you have taken all the core modules within one of our Bioscience programmes in order to take this module.

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Demonstrate an understanding of cellular organisation and associated processes.
Demonstrate an understanding of modern procedures for investigating cellular components.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Access and evaluate scientific literature.
Present a concise digest of a research area both orally and in written form.

Method of Assessment

Presentation on scientific literature, 8 min (10%)
Practical Report, 1000 word limit (25%)
Exam, 2 hr (65%)
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

Core texts:
Lodish HF, Berk A, Kaiser CA, Krieger M, Molecular cell biology, 8th Edition, W.H. Freeman, 2016

Optional texts:
Alberts B, Molecular Biology of the Cell, 6th Edition, Garland Science Pub., 2015
Alberts B, Essential Cell Biology, 4th Edition, Garland Science Pub., 2014

Much of the module material is covered at some (usually more introductory) level in Biology and Biochemistry textbooks, as recommended in other modules - examples include Campbell's Biology and Nelson & Cox's (Lehninger's) Principles of Biochemistry

Pre-requisites

None

Restrictions

Stage 2 students only

Synopsis *

The cell is the fundamental structural unit in living organisms. Eukaryotic cells are compartmentalized structures that like prokaryotic cells, must perform several vital functions such as energy production, cell division and DNA replication and also must respond to extracellular environmental cues. In multicellular organisms, certain cells have developed modified structures, allowing them to fulfil highly specialised roles. This module reviews the experimental approaches that have been taken to investigate the biology of the cell and highlights the similarities and differences between cells of complex multicellular organisms and microbial cells. Initially the functions of the cytoskeleton and certain cellular compartments, particularly the nucleus, are considered. Later in the unit, the mechanisms by which newly synthesised proteins are secreted or shuttled to their appropriate cellular compartments are examined.

BI505 Infection and Immunity

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	I	15 (7.5)	100% Exam	
2	Canterbury	Spring	I	15 (7.5)	55% Exam, 45% Coursework	

Contact Hours

Private Study: 124
Contact Hours: 26
Total: 150

Learning Outcomes

1. Demonstrate critical understanding of the major immune system functions and components, how cell-cell communication controls immune responsiveness to infectious agents and immunopathology.
2. Demonstrate detailed knowledge of microorganisms of medical importance and the diseases they cause.
3. Demonstrate thorough understanding of how the spread of disease occurs in the human population.
4. Demonstrate critical understanding of experimental procedures in handling and identifying bacteria in samples provided to the students during the practical class.
5. Demonstrate detailed knowledge of microbiological and immunological techniques used to identify pathogens and immune cells.
6. Demonstrate knowledge of the main methods of data acquisition analysis and presentation as evidenced by the practical report assessment.

Method of Assessment

• Laboratory Practical Report – 45%
• Examination (2 hours) – 55%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices.
The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

Prerequisite: BIOS3070 (Human Physiology and Disease I)

Synopsis *

This module will consider the anatomy and function of the immune system and immunopathology and then consider the diseases and microorganisms that affect the different organs and tissues of the human body. Indicative topics will include inflammation, innate and adaptive immunity to pathogens, immune defence mechanisms against bacterial, viral and parasitic infections, antibody classes and functions, antigen processing and presentation, complement, the generation of antibody diversity, cell communication and immunopathology, including autoimmunity, hypersensitivity and transplant rejection. In the medical microbiology section of the module, indicative topics will include epidemiology, virology, parasitology, fungal infections, skin infections, GI tract infections, CNS infections, respiratory tract infections, UTI and STD infections.

BI513 Human Physiology and Disease 2

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	I	15 (7.5)	60% Exam, 40% Coursework	
2	Canterbury	Autumn	I	15 (7.5)	65% Exam, 35% Coursework	

Contact Hours

Total Contact Hours: 24
Private Study Hours: 126
Total Study Hours: 150

Learning Outcomes

1. Describe the structural organisation and function of specific physiological systems of the body and understand how the body systems act in an integrated manner to maintain homeostasis.
2. Describe how malfunction of physiological systems gives rise to disease, using specific examples.
3. Appreciate the relationship between physiology, anatomy, and medicine.

Method of Assessment

• In-Course Test (90 minutes) – 35%
• Examination (2 hours) – 65%
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

Silverthorn, D.U. (2018). Human Physiology – An Integrated Approach, 8th Edition. New York, NY: Pearson Education.

Restrictions

Not available as an elective module choice.

Synopsis *

This module will consider the anatomy and function of normal tissues, organs and systems and then describe their major pathophysiological conditions. It will consider the aetiology of the condition, its biochemistry and its manifestation at the level of cells, tissues and the whole patient. It may also cover the diagnosis and treatment of the disease condition. Indicative topics will include the reproductive system; muscle; nervous system; and endocrine system.

BI514 Pharmacology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Spring	I	15 (7.5)	60% Exam, 40% Coursework	

Availability

It is required that you have taken all the core modules within stage 1 of one of our Bioscience programmes in order to take this module. It is also recommended that you have taken BI307 Human Physiology and Disease.

Contact Hours

Total contact hours: 29
Private study hours: 121
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate a critical understanding of receptors, ion channels, enzymes and carrier molecules as drug targets.
Describe drug-receptor interactions at the molecular level.
Demonstrate a critical understanding of systems pharmacology – e.g. cardiovascular and central nervous systems – and the action of therapeutic agents in diseased states.
Demonstrate theoretical and applied knowledge of pharmacological techniques.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Extract and interpret information at an intermediate level.
Analyse and evaluate data at an intermediate level.
Have acquired skills in written communication and receiving critique.
Have acquired skills in working as a team to solve problems.

Method of Assessment

Data analysis (one problem question and five short answer questions) – 20%
In-class clinical case study (3 hours) – 20%
Examination (2 hours) – 60%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Neal MJ, Medical Pharmacology at a Glance, 8th Edition, Blackwell Pub., 2015
Rang and Dale's Pharmacology, 8th Edition, Churchill Livingstone, 2015

Pre-requisites

BIOS3070 Human Physiology and Disease

Restrictions

Stage 2 students only

Synopsis *

Introduction and basic principles of drug action: key drug targets including major receptor subtypes, ion channels, transporters, and structure-function relationships
Systems pharmacology: the biological basis of diseases states affecting different physiological systems, therapeutic approaches to treating these diseases, and the cellular/molecular mode of action of drugs used. Indicative diseases may include hypertension, asthma, Parkinson's disease, schizophrenia, infertility, depression and anxiety.

BI520 Metabolism and Metabolic Disease

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	100% Coursework	
1	Canterbury	Autumn	I	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Autumn	I	15 (7.5)	70% Exam, 30% Coursework	

Availability

It is recommended that you have taken core Stage 1 modules in Biochemistry or Biomedical Sciences

Contact Hours

Total Contact Hours: 23
Total Private Study Hours: 127
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes.On successfully completing the module students will be able to:
Demonstrate critical understanding of selected mechanisms that can lead to human metabolic diseases, and their genetic basis.
Recall metabolic maps that relate the main pathways of catabolism and biosynthesis to each other.
Demonstrate significant understanding about how metabolic pathways interact with each other, including those in different tissues.
Demonstrate critical understanding of selected chemical mechanisms that underpin the metabolism studied.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Communicate effectively and confidently using a variety of methods.
Analyse data relating to metabolic defects and report results.
Solve complex problems.

Method of Assessment

Computer Practical Report (2,000 words) – 30%
Examination (2 hours) – 70%
Academic year 2022/23 examined: Time-Bound Online Assessment

The examination is a compulsory sub-element and must be passed to complete the module

Preliminary Reading

Clarke, Joe T. R., (2010). A Clinical Guide to Inherited Metabolic Diseases. 3rd Edition Cambridge: Cambridge University Press.
Nelson DL, Lehninger Principles of Biochemistry. Editions 5 – 7.
Newsholme, E. and Leech, A. (2009). Functional Biochemistry in Health and Disease. Chichester: Wiley.
Osgood M., Ocorr K.A., (2012). The Absolute, Ultimate Guide to Lehninger Principles of Biochemistry: Study Guide and Solutions Manual, 6th edition, New York: W.H. Freeman.

Pre-requisites

None

Restrictions

Stage 2 students only

Synopsis *

This module covers the general principles of metabolic disorders and focuses on pathways, enzyme mechanisms, and diseases associated with defects in metabolism.

BI521 Metabolism and Metabolic Regulation

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

Total Contact Hours: 24
Total Private Study Hours: 126
Total Study Hours: 150

Learning Outcomes

1. Understand key modes of metabolic regulation.
2. Understand key elements of plant and microbial metabolism that are distinct from human metabolism covered elsewhere.
3. Understand the importance of metabolic processes in biotechnological applications.

Method of Assessment

• Practical report (2,000 words) – 30%
• Examination (2 Hours) – 70%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

* Garrett R.H. (2017). Biochemistry (Sixth Edition). Boston, MS: Cenage Learning.
* Nelson D.L., Cox, M.M., and Lehninger A.L. (2017). Lehninger Principles of Biochemistry. (Seventh Edition). New York: W.H. Freeman.

Pre-requisites

Co-requisite: BIOS5200 – Metabolism and Metabolic Disease

Synopsis *

This module will cover the following areas:

* Principles of metabolic regulation: Allostery, cooperativity, phosphorylation, and hormonal control. Metabolic regulation in response to cellular energy status. Transcriptional regulation.
* Plant metabolism: Photosynthesis and carbon fixation.
* Microbial metabolism: Nitrogen metabolism, stress responses, metals, and secondary metabolites.
* Metabolism in biotechnology: Manipulating microbial metabolism for the production of useful compounds. Manipulating mammalian cell metabolism in biotechnology.

BI525 Investigation of Disease

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	I	15 (7.5)	100% Coursework	
2	Canterbury	Autumn	I	15 (7.5)	60% Exam, 40% Coursework	

Contact Hours

Total Contact Hours: 31
Total Private Study Hours: 119
Total Study Hours: 150

Learning Outcomes

1. Demonstrate a cogent understanding of the working practices in the United Kingdom National Health Service and the role of a Biomedical Scientist;
2. Demonstrate critical knowledge and understanding of the general techniques used in Clinical Biochemistry and their use in the assessment of disease;
3. Demonstrate significant knowledge and understanding of the general techniques used in Cellular Pathology and application to the assessment of disease and potential treatment strategies.

Method of Assessment

• Practical Report (1,500 words) – 40%
• Examination (2 hours) – 60%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Both the Practical Report and the examination are compulsory sub-elements and must be passed to complete the module.

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None

Restrictions

Not available as an elective module

Synopsis *

This module introduces students to clinical biochemistry and cellular pathology, and molecular pathology. Students learn about the principles of and procedures for a wide variety of techniques employed in modern laboratory medicine. Students practice integration and practical application of this knowledge throughout the module using diagnostic case study analyses. The clinical biochemistry section is organised anatomically. The cellular and molecular pathology section is organised according to laboratory medicine specialities, with particular emphasis placed on the detection and diagnosis of cancer in the NHS. Quality assurance, governance and regulatory systems relevant to UK laboratory medicine are introduced.

BI530 Biosciences Academic Support, Key Skills and Information II

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	1 (0.5)	Pass/Fail Only	

Contact Hours

Private Study: 2
Contact Hours: 8
Total: 10

Learning Outcomes

1. Students will gain knowledge and critical understanding of the well- established principles of academic skills, and of the way in which those principles have developed and can be used during their studies;
2. Students will gain an ability to apply underlying concepts and principles effectively outside the context including use across other modules;
3. Students will gain knowledge of the main methods of enquiry and ability to evaluate critically the appropriateness of different approaches to solving problems in the field of study;
4. Students will learn how to use a range of established techniques to initiate and undertake critical analysis of information, and to propose solutions to problems arising from that analysis;
5. Students will effectively communicate information, arguments, and analysis, in a variety of forms, to specialist and non-specialist audiences, and deploy key techniques of the discipline effectively;
6. Student will undertake further training, develop existing skills, and acquire new competences that will enable them to assume significant responsibility within organisations.

Method of Assessment

• Formative assessment/feedback only

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None

Restrictions

Not available as an elective module

Synopsis *

One-on-one meetings and small group tutorials focused on academic progression and the development of key skills to support the core curriculum and future study or employment. Students meet with their Academic Advisor individually or in small groups at intervals during the academic year. Individual meetings review academic progress, support career planning etc. Themed tutorials develop transferable skills; indicative topics are essay and report writing, presentation skills, sourcing information, critical analysis etc. The tutorials are informal involving student activity and discussion. Year group events deliver general information e.g. on University resources, 4-year programmes, module selection etc.

BI532 Skills for Bioscientists 2

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	I	15 (7.5)	100% Coursework	

Contact Hours

Private Study: 90
Contact Hours: 60
Total: 150

Learning Outcomes

1. Demonstrate knowledge and understanding of general techniques in spectroscopy, chromatography, electrophoresis and immunochemistry;
2. Demonstrate an understanding and ability to use DNA databases and phylogenetic trees;
3. Plan and execute experimental work using a range of experimental techniques;
4. Report experimental work both orally and written.

Method of Assessment

• Essay Analysis (Group assignment) – 15%
• Presentation (5 min individual contribution to 20 min group presentation) – 25%
• Mini-project Report (2,500 words) – 55%
• Bioinformatics Assignment – 5%

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None

Restrictions

Not available as an elective module

Synopsis *

A. Communication Skills in Biosciences: Essay writing, oral presentations, laboratory reports, the scientific literature and literature reviews. Working in groups.
B. Techniques in Biomolecular Science: Electrophoresis, Immunoblotting, Protein Determination, Activity Assays, Purification.
C. Computing for Biologists: Bioinformatics, phylogenetic trees, database searches for protein/DNA sequences.
D. Mini-project – introduction to research skills: Students will work in groups of eight to undertake directed experimental work (Group Project) before extending the project further through self-directed experiments working as a pair (Mini Project).
E. Careers: The programme will be delivered by the Careers Advisory Service and will review the types of careers available for bioscience students. The sessions will incorporate personal skills, careers for bioscience graduates, records of achievement, curriculum vitae preparation, vacation work, postgraduate study, interview skills and action planning.

BI546 Animal Form and Function

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	100% Coursework	
1	Canterbury	Autumn	I	15 (7.5)	60% Exam, 40% Coursework	

Availability

It is strongly recommended that you have taken the Core stage 1 modules within one of our Bioscience programmes.

Contact Hours

Total contact hours: 31
Private study hours: 119
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Describe body plans and the structural organisation of a range of animals.
Demonstrate an understanding of the physiological role of a range of structures in animals.
Compare physiological systems across the animal kingdom.
Describe how physiological systems adapt to specific environmental conditions.
Demonstrate a practical understanding of classification on the basis of external morphological features in the arthropods.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Analyse and communicate experimental findings.
Demonstrate effective written communication skills.
Integrate information from a variety of sources.

Method of Assessment

Practical report 1 (20%): Word count limit 2500 maximum
Practical report 2 (20%): Word count limit 2000 maximum
Exam, 2 hr (60%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Hickman, C.P., Roberts, L.S., Keen, S.L., Eisenhour, D.J., Larson, A., L'Anson, H. Integrated Principles of Zoology (17th Ed) (2017)

Pre-requisites

None

Synopsis *

You study the diversity of animal life throughout evolution, including elements of functional anatomy and physiology such as circulation and gaseous exchange, the digestive system, the nervous system and reproduction.

Topics:
A. Comparative physiology - in this section the diversity of different physiological systems will be studied including circulation, gaseous exchange, feeding and digestion, excretion, nervous tissue and the senses, reproduction and immunology.
B. Form and Function - in this section a diverse range of taxonomic groups and their characteristics will be studied to understand the relationship between structure and function. How these characteristics equip the animal to survive and succeed in its particular environment will be explored.

BI547 Plant Physiology and Adaptation

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

Total Contact Hours: 30
Total Private Study Hours: 120
Total Study Hours: 150

Learning Outcomes

1. Demonstrate detailed knowledge of plant specific features of cellular organisation and processes.
2. Demonstrate a cogent understanding of the process and regulation of photosynthesis.
3. Demonstrate a critical understanding of plant hormones and their role in the life cycle and responses to the environment.
4. Demonstrate a detailed understanding of how plants respond and adapt to environmental conditions.

Method of Assessment

• Practical Report (2,000 words) – 30%
• Examination (2 hours) – 70%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Both the practical report and the examination are compulsory sub-elements and must be passed to complete the module

Preliminary Reading

* Hopkins, W.G. and Hunter, N.P.A. (2008). Introduction to Plant Physiology (Fourth Edition). Hoboken, NJ: Wiley Publishing.
* Smith, A.M., Coupland, G., Dolan, L., Harberd, N., Jones, J., Martin, C., Sablowski, R., Amery, A. (2010). Plant Biology, New York: Garland Science.
* Taiz, L., Zeiger, E., Møller, I.M., and Murphy, A. (2018). Plant Physiology and Development (Sixth Edition). Sunderland, MA: Sinauer Associates.

Synopsis *

This module will cover the following areas:

* Plant specific features of cellular organisation and processes – cell wall synthesis, cell division, endoreduplication, plasmadesmata.
* Photosynthesis – mechanism and regulation of photosynthesis, photorespiration, C3, C4 and CAM.
* Plant hormones and signalling – e.g. auxins, gibberellins, cytokinins etc. and their roles in tropism, photoperiodism, and flowering.
* Adaptation and stress response – environmental stress, acclimatisation and adaptation.

BI548 Microbial Physiology and Genetics I

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	I	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	I	15 (7.5)	60% Exam, 40% Coursework	

Contact Hours

Private Study: 28
Contact Hours: 122
Total: 150

Learning Outcomes

1. Demonstrate knowledge and critical understanding of the ecological, economic and scientific importance of microorganisms.
2. Demonstrate knowledge and critical understanding of the evolution, taxonomy and biodiversity of microorganisms.
3. Demonstrate knowledge and critical understanding of the structural and metabolic diversity of microorganisms.
4 . Demonstrate knowledge and critical understanding of the synthesis and assembly of macromolecular structures of microorganisms.

Method of Assessment

• Assessed Practical – Data Analysis and Write-up (2,000 words) – 40%
• Examination (2 hours) – 60%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

Prerequisite: BIOS3240 (Genetics and Evolution)

Restrictions

Not available as an elective module

Synopsis *

The module deals with the molecular mechanisms underlying the ecological, medical, scientific and commercial importance of microorganisms (including prokaryotic and eukaryotic microorganisms). This involves descriptions of how microbial genetic information is stored in DNA, how that information is decoded by the cell and how this flow of information is controlled in response to changes in environment. The Module also discusses microbial interaction with humans and the environment. Throughout the module, the mechanisms in prokaryotes and eukaryotes will be compared and contrasted and will touch on the latest tool development in microbiology.

BI549 The Genome

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	100% Coursework	
1	Canterbury	Spring	I	15 (7.5)	50% Coursework, 50% Exam	

Contact Hours

27 Contact hours
123 Hours of private study
Total hours for the module: 150 hours

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module, students will be able to demonstrate:
An understanding of the composition and structure of complex eukaryotic genomes
An understanding of how genes and genomes vary between individuals, the origins of this variation, and the modern molecular technologies used to measure genetic and genomic variation
Technical skills in working with DNA and carrying out basic bioinformatics and genomic analysis of nucleotide sequences
An understanding of the information that can be inferred from genomic sequence data, including identification of individuals, assessment of population structure (ethnic background) and phenotype prediction including medically-relevant information
An understanding of the uses to which this information can be put, such as forensic analysis, medical diagnosis and historical research
An understanding of methods of genome editing and the ethical issues surrounding it

The intended generic learning outcomes. On successfully completing the module students will be able to:
Communicate information, arguments and analysis to specialist and non-specialist audiences
Analyse and communicate experimental findings
Understand the limits of their knowledge and how this influences their analyses and interpretations of data

Method of Assessment

Laboratory practical report (1500 words, 25%)
Computer analysis workshop report (1500 words, 25%)
Exam (2 hours, 50%)
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

Relevant chapters from core undergraduate biology textbooks, e.g. Campbell's Biology
Dudley, J.T. and Karczewski, K.J. (2013) Exploring Personal Genomics, Oxford University Press. ISBN: 9780199644490
Lesk, A. (2017) Introduction to Genomics (3rd edition), Oxford University Press. ISBN: 9780198754831

Additionally selected peer-reviewed research and review papers will be recommended.

Pre-requisites

BIOS3020 (BI302) Molecular & Cellular Biology
BIOS3240 (BI324) Genetics & Evolution

Synopsis *

This module will introduce students to the importance of genome-wide DNA sequence analysis in a range of different fields of study including forensic science, medical diagnosis and historical research. They will acquire a full grounding in the basic biology of how sequence data is acquired and analysed, and engage with up-to-date methods of DNA sequence analysis in the practical sessions. At the broad level, the module will be structured around the following 4 themes:
What is a genome? This addresses genome content and structure, including both functional and non-functional elements of the genome such as the simple "junk" DNA repeats used for forensic identification.

Understanding genomic variation. This addresses the molecular causes of genomic variation between individuals – i.e. what makes us all unique – and the technical methodologies used to detect genomic variation.

What are the implications of being able to read DNA? This covers the extent to which we can infer phenotype from genomic sequence – e.g. how much you can tell about a person once their genome has been sequenced. Specific examples may be drawn from forensic science, medical diagnosis and historical analysis.

What are the implications of being able to write or edit DNA? This addresses nascent and future technology for genome editing – what can it achieve, what are the risks, what are the ethical issues?

BI600 Research Project

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	H	30 (15)	100% Project	

Contact Hours

Total contact hours: 192
Private study hours: 108
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate an in-depth understanding of an advanced research topic within the fields of Biochemistry, Biology, or Biomedical Science through study of the peer-reviewed primary scientific literature.
Appreciate how scientific knowledge advances through research e.g. the timescales, challenges, limitations, impact of technological advances.

Students taking wet/dry (computing-based) laboratory projects will be able to:
Understand how to design and execute a sequence of experiments to address a research question and how to record data.
Enhance their existing and acquire new experimental skills.
Identify and solve practical and theoretical problems.
Show an awareness of the safety implications of laboratory work and knowledge of good laboratory practice (wet lab projects only).

Students taking dissertation/business/communications projects will be able to:
Develop critical analysis skills, design novel experiments to address specific questions within the chosen topic and to appreciate the limitations and the practicability of the experimental process.

Students undertaking business projects will be able to::
Appreciate how scientific research may be translated into business ideas.
Understand the factors that are important in planning and preparing a business plan.

Students taking communication projects will be able to:
Demonstrate an ability to simplify complex scientific information and to adapt it to suit the audience.
Present current scientific research to a general audience making it accessible and interesting.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Appreciate how research leads to knowledge.
Demonstrate a clear and concise style of scientific writing that is both informative and lucid.
Demonstrate skills in the retrieval of scientific information from journals and through electronic searches.
Acquire an understanding of how technologies may be applied/adapted to address a research question.
Develop their abilities to work independently and as part of a team - self-motivation, diplomacy, planning and organisational skills and time management.
Exhibit skills in appraising critically and integrating information.
Show skills in communicating science (oral, written or web formats) and in making and defending scientific arguments.

Method of Assessment

For each project type the project write and performance comprise 90% of the assessment (with different splits depending on the type of the project), with the final 10% assessed by a presentation.
Laboratory reports:
Written Project report – 6000 words maximum 70%
Project Performance – 20%
Presentation (15 minutes) – 10%

Non-laboratory reports (Dissertation and Business):
Written Project report – 11,000 words maximum 80%
Project performance – 10%
Presentation (15 minutes)– 10%

Communication Project:
Written Project report – 6,000 words maximum 60%
Communication element of report – 20%
Project performance – 10%
Presentation (15 minutes)– 10%

Preliminary Reading

Reading is entirely project-specific, to be discussed with academic supervisor.

Pre-requisites

None

Restrictions

Biosciences Stage 3 students only

Synopsis *

Projects are designed by individual members of staff in keeping with their research interests and fall into one of four categories:
• Wet/Dry Laboratory and Computing: practical research undertaken in the teaching laboratories, or on computers followed by preparation of a written report
• Dissertation: library-based research leading to production of a report in the style of a scientific review
• Business: development of a biotechnology business plan
• Communication: similar to dissertation projects but with an emphasis on presenting the scientific topic to a general, non-scientist audience

BI6003 Science Communication and Public Engagement

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	100% Coursework	

Availability

Not available as an elective module

Contact Hours

Private Study: 128
Contact Hours: 22
Total: 150

Learning Outcomes

1. Demonstrate knowledge and understanding in science communication and public engagement;
2. Apply principles of good science communication and public engagement in a practical context;
3. Articulate the significance of science communication and public engagement for society.

Method of Assessment

• Essay (1,000 words) – 30%
• Science Communication Strategy Portfolio (equivalent to 2,500 words) – 70%
The Science Communication Strategy Portfolio is a compulsory sub-element and therefore must be passed in order to complete the module.

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None

Synopsis *

Recent events have illustrated the importance of ensuring that science is communicated effectively to non-scientific audiences. This module considers best practice in science communication, making use of case studies that illustrate its importance in developing an informed and empowered public, while developing skills in different modes of communication that enhance future employability.

BI602 Cell Signalling

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	H	15 (7.5)	60% Exam, 40% Coursework	
2	Canterbury	Autumn	H	15 (7.5)	65% Exam, 35% Coursework	
2	Canterbury	Spring	H	15 (7.5)	100% Coursework	

Availability

It is required that you have taken all the core modules within stage 2 of one of our Bioscience programmes in order to take this module.

Contact Hours

Total Contact Hours: 32
Total Private Study Hours: 118
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate thorough knowledge of the major classes of signalling molecules, their receptors and intracellular signalling pathways.
Demonstrate confident and professional practical and data handling skills associated with monitoring intracellular signalling.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Interpret and retrieve information confidently and accurately.
Analyse and evaluate data with a high degree of accuracy.
Demonstrate effective communication skills.

Method of Assessment

Practical Report (2,000 words) – 35%
Examination (2 hours) – 65%
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

Hancock JT, Cell Signalling, Fourth Edition. Oxford: Oxford University Press.
Lim, W., Mayer, B., and Pawson, T. (2015). Cell Signalling – Principles and Mechanisms, New York: Garland Science.
Lodish H et al. (2016). Molecular Cell Biology, Eighth Edition. New York: WH Freeman & Co
Nelson, J, (2008). Structure and Function in Cell Signalling, New York: Wiley Blackwell

Pre-requisites

None

Restrictions

Biosciences Stage 3 students only

Synopsis *

The module begins by overviewing the diverse mechanisms used by cells to communicate, considering the main modes of cell-cell communication, the major classes of signalling molecules and the receptor types upon which they act. It then focuses on nuclear, G-protein coupled, and enzyme linked receptors covering in molecular detail these receptors and their associated signal transduction pathways.

BI604 Biological Membranes

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	65% Exam, 35% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Spring	H	15 (7.5)	65% Exam, 35% Coursework	
1	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

Total contact hours: 38
Private study hours: 112
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate an understanding of membrane structure, traffic and transport, and understand the molecular basis of several common genetic diseases in this area.
Demonstrate ability to integrate data from laboratory and computer-based analyses.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate a range of computer skills important to final year projects and to scientific research.
Demonstrate the ability to solve honours level problems using scientific data.

Method of Assessment

Practical (30%) 2500 word limit based on combined computer and wet lab investigation
Exam, 2 hr (70%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Core texts:
Lehninger Principles of Biochemistry. D.L. Nelson and M. M. Cox. 7th edition, W.H. Freeman (Macmillan), 2017; and Membrane Structural Biology: with Biochemical and Biophysical Foundations. M. Luckey, 2nd edition, Cambridge University Press, 2014
In addition, students will be given references to articles in a number of key review and to primary research papers

Pre-requisites

None

Restrictions

Stage 3 students only

Synopsis *

Cells and subcellular compartments are separated from the external milieu by lipid membranes with protein molecules inserted into the lipid layer. The aim of this module is to develop understanding of both the lipid and protein components of membranes as dynamic structures whose functions are integrated in cellular processes.

BI606 Pathogens & Pathogenicity

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	65% Exam, 35% Coursework	

Contact Hours

Total contact hours: 20
Private study hours: 130
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate an understanding and knowledge of the molecular basis of microbial pathogenesis in relation to bacterial, viral, parasitic and fungal pathogens.
Comprehend, assimilate and present data and concepts on a pathogenesis-related topic.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate the ability to understand, analyse and assess published scientific data.
Assess presented scientific data and concepts, providing constructive feedback.
Demonstrate written communication skills.

Method of Assessment

Written assessment (2000 - 2500 words): 35%:
Exam (2h): 65%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Mims, CA, The Pathogenesis of Infectious Diseases, 6th ed. (Academic Press, 2015)
Fields, BN, Knipe DM, Howley PM, Fundamental Virology, 5th ed. (Lippincott-Raven, 2007)
Wilson BA, Salyers, AA, Whitt, DD, Bacterial Pathogenesis, A Molecular Approach, 3rd ed. (ASM Press, 2011)
Wilson M, The Human Microbiota in Health and Disease: An Ecological and Community-based Approach, 1st ed. (CRC press, 2018)
NB: The rest of the suggested reading will consist of review articles and primary research publications.

Pre-requisites

BI505 Infection and Immunity

Restrictions

Biosciences Stage 3 students only

Synopsis *

Eukaryotic pathogens; mechanisms of pathogenesis; transmission and diversity
Bacterial pathogens: virulence factors including toxins and adhesins.
Viral pathogens: mechanisms of pathogenesis and avoidance mechanisms; viruses and cancer.
Human fungal pathogens: mechanisms of transmission and epidemiology; virulence factors; host resistance mechanisms

BI610 The Cell Cycle

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	H	15 (7.5)	65% Exam, 35% Coursework	
2	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

Total Contact Hours: 20
Total Private Study Hours: 130
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate detailed knowledge of the Cell Cycle and its control.
Explain changes to the cytoskeleton through the cell cycle and its control.
Demonstrate a detailed understanding of apoptosis and its control.
Demonstrate a detailed knowledge of cell cycle checkpoints.
Analyse and interpret microscopy data, and present in an appropriate manner.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Retrieve, analyse and evaluate information from textbooks, primary research papers and review articles.
Demonstrate effect communication skills.

Method of Assessment

• Practical Report (2,000 words) – 30%
• Examination (2 hours) – 70%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Both the practical report and the examination are compulsory sub-elements and must be passed to complete the module

Preliminary Reading

Alberts, B. et al. (2014). Molecular Biology of the Cell (Sixth Edition). New York: Garland Science
Morgan, D.O. (2006). The Cell Cycle - Principles of Control. Oxford: OUP
Murray, A. & Hunt, T. (1994). The Cell Cycle – An Introduction. Oxford: OUP

Pre-requisites

None

Restrictions

Stage 3 Biosciences students only

Synopsis *

The module introduces the student to cell cycle and teaches how its precise regulation is essential for all life. The course will introduce to the students the current understanding of cellular reproduction and how it emerged. The initial lectures will describe the important breakthroughs in cell cycle research in their historical and experimental context. The course will go on to give the students a detailed understanding of the key events that occur and how they are regulated by mechanisms conserved from yeast to man. Key topics that will be discussed include:
Mitotic kinases (including Cdks, Polo, aurora).
Microtubule reorganisation (including spindle formation and regulation).
Actin reorganisation (including regulation of cell growth, endocytosis, and cell division)
Checkpoints (including Spindle assembly checkpoint, DNA damage checkpoint).
Meiosis.
Apoptosis.
Organelle reorganisation (e.g. nuclear and golgi reorganisation).
Cancer and the cell cycle.
Cell cycle related pathologies.
The final lectures will then introduce the students to how generating computer models of the cell cycle are playing a crucial role in defining novel avenues for research into therapies for cell cycle related diseases.

BI620 Virology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	100% Coursework	
2	Canterbury	Autumn	H	15 (7.5)	100% Coursework	

Contact Hours

Contact hours: 24
Self-Study hours: 126
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate an understanding of selected fields and the leading issues/hot topics in the field of virology and the limitations of our current knowledge about viruses and their biology.
Understand the concepts and functions behind standard cell biological, biochemical, and molecular biological assays used to study viruses.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate an ability to understand, analyse and assess published scientific data.
Assess orally-presented scientific data and concepts, providing constructive feedback.
Design and conceptualise experiments to address specific scientific questions.
Communicate effectively to a variety of audiences and/or using a variety of methods
Demonstrate problem solving skills.

Method of Assessment

• Critical Analysis Worksheets (x7) – Pass/Fail
• Technical Summary (750 words) – 65%
• Presentation (10 minutes) – 35%

Preliminary Reading

Core Text: Selected articles from scientific journals will be provided from Templeman Library electronic journal collections.

Pre-requisites

None

Synopsis *

The module will develop understanding and analytical skills in virology, based around interactive seminars wherein students will analyse, present, and discuss the relevant research literature. The students will gain experience in scientific design, literature analysis, scientific communication, and the analysis of experimental data.

BI622 Advanced Immunology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	65% Exam, 35% Coursework	

Contact Hours

Total Contact Hours: 24
Total Private Study Hours: 126
Total Study Hours: 150

Learning Outcomes

1. Demonstrate the ability to comprehend the importance of regulation of immune function, with reference to disease states which result when regulation is defective.
2. Demonstrate an ability to critically evaluate current theories of immunological function and processes.

Method of Assessment

• Essay (2,000 words) – 35%
• Examination (2 hours) – 65%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

• Murphy, K. and Weaver, C. (2017). Janeway's Immunobiology (Nineth Edition). New York: Garland Science.
• Owen J, Punt J and Stranford, S. (2019). Kuby Immunology (Eighth Edition). New York: Macmillan Publishing.

Synopsis *

The aim of this Advanced Immunology module is to review topical aspects of advanced immunology with emphasis on the regulation of the immune response, and the role of dysfunctional immune systems in the aetiology of a variety of disease states. Indicative topics include antigen processing and presentation, transplant rejection, autoimmunity, hypersensitivity, cell migration homing and extravasation, cytokines, tumour immunology, mucosal immunology and autophagy.

BI626 Integrated Endocrinology and Metabolism

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	65% Exam, 35% Coursework	
1	Canterbury	Spring	H	15 (7.5)	65% Exam, 35% Coursework	

Contact Hours

Total contact hours: 27
Private study hours: 123
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
An understanding of the underlying principles of endocrinology at the cellular, biochemical and physiological level.
The ability to describe, using illustrative examples, the different control mechanisms at work within the endocrine system both in the maintenance of whole body homeostasis and in disease.
An understanding of the methods available for the diagnosis of specific endocrine diseases including the measurement of electrolyte and hormone levels, and the role of dynamic testing.
The ability to integrate clinical and biochemical data to evaluate the most probable cause of key endocrine disorders, including a rationale for the most appropriate treatment regimes.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Interpretation and retrieval of information (knowledge management).
Analysis and evaluation of data (problem solving).
Communication of understanding and analysis through a variety of approaches (group work, tests and written report).

Method of Assessment

Test (10.5%) (1h)
Case Study (24.5%) (2500 words maximum)
Exam (65%) (2 hr)

Preliminary Reading

Clinical Biochemistry Gaw, A., Cowan, R.A., O'Reilly, D.St. J.,et al (2013)
Clinical Biochemistry (2nd Edition) Churchill Livingstone. Ahmed, N (Ed) Clinical Biochemistry (2016) OUP
Endocrinology. Essential Endocrinology and Diabetes (2012), Holt, R.I.G & Hanley, NA (6th Edition), Blackwell Science

General Physiology Core Physiology texts recommended for first and second year modules, for example, Silverthorn.
Integrated metabolism Core Biochemistry texts recommended for second year modules, for example, Lehninger.

Pre-requisites

BIOS5130 Physiology

Restrictions

Stage 3 Biosciences students only

Synopsis *

This module focuses on the endocrine system, which in conjunction with the nervous system, is responsible for monitoring changes in an animal's internal and external environments, and directing the body to make any necessary adjustments to its activities so that it adapts itself to these environmental changes.

The emphasis will be on understanding the underlying principles of endocrinology, the mechanisms involved in regulating hormone levels within tight parameters in an integrated manner and the central importance of the hypothalamic-pituitary axis.

During the lectures each major endocrine gland or functional group of glands will be explored in turn and specific clinical disorders will be used to illustrate the role of the endocrine organs in the maintenance of whole body homeostasis. The systems studied will include the following: thyroid gland, parathyroid gland and bone metabolism, adrenal gland, renal hormones (water and salt balance), pancreatic hormones, gut hormones and multiple endocrine neoplasia, gonadal function and infertility.

Consideration will be given to the methods available for the diagnosis of specific endocrine diseases, including the measurement of electrolyte and hormone levels, and the role of dynamic testing.

The role of the endocrine system in integrating metabolic pathways will be emphasised throughout the module and particular scenarios such as infertility, diabetes mellitus.

BI627 Haematology and Blood Transfusion

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Spring	H	15 (7.5)	60% Exam, 40% Coursework	

Availability

Not available as an elective module

Contact Hours

Private Study: 29
Contact Hours: 123
Total: 150

Learning Outcomes

1. Show a detailed understanding of the factors affecting the production and development of red and white blood cells;
2. Demonstrate complex knowledge of the processes involved in disease of both red and white blood cells;
3. Recognise the features of a variety of pathological conditions encountered in haematology;
4. Demonstrate a critical understanding of the factors involved in the maintenance of haemostasis and how they interact;
5. Demonstrate a detailed understanding of the principles of blood component replacement therapy and the associated risks;
6. Recognise the characteristic changes of blood parameters in selected disease states;
7. Experimental approaches used to investigate haematological disease.

Method of Assessment

• Practical Report (1,500 words) – 40%
• Examination (2 hours) – 60%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Both the Practical Report and the Examination are compulsory elements and must therefore be passed in order to complete the module.

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Synopsis *

This module describes the anatomy, physiology, pathology of the blood and blood forming tissues. It covers a wide range of disorders including haematological malignancies. Blood transfusion theory and practice are introduced. Roles for haematopoietic stem cells during blood cell development and as therapeutic agents are discussed. Students will be exposed to ethical and regulatory concerns with regard to transfusion and blood cell therapies.

BI628 Microbial Physiology and Genetics II

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	H	15 (7.5)	60% Exam, 40% Coursework	

Contact Hours

Total Contact Hours: 30
Total Private Study Hours: 120
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate comprehensive knowledge and understanding of the structural and metabolic diversity of microorganisms.
Demonstrate critical understanding of genetic and physiological regulation in microorganisms.
Demonstrate thorough knowledge and understanding of the experimental approaches used to investigate physiological and genetic control in microorganisms.
Demonstrate the ability to work individually to solve biological problems.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate effective communication skills in a variety of ways.
Analyse and evaluate complex experimental data confidently.

Method of Assessment

Practical Assessment (10 questions) – 40%
Examination (2 hours) – 60%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Milo, R. and Phillips, R. (2015). Cell Biology by the Numbers (First Edition). New York: Garland Science (Taylor & Francis Group).
Slonczewski J. and Foster J. (2020). Microbiology an Evolving Science. (Fifth Edition). New York and London: W.W. Norton & Co.

Pre-requisites

BIOS5480 Microbial Physiology and Genetics I

Restrictions

Stage 3 Biosciences students only

Synopsis *

This module will cover the following:
• Outline of microbial physiology and genetics
• Microbial metabolism and homeostasis
• Control of microbial physiology through gene expression regulation – Transcriptional and post-transcriptional regulation of gene expression
• Experimental approaches used to study microbial genomes and gene expression
• Microbial biodiversity and complex signalling in the environment

BI629 Proteins: Structure and Function

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	30 (15)	60% Exam, 40% Coursework	

Contact Hours

Total contact hours: 70
Private study hours: 230
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Demonstrate an understanding of the structural organisation and biophysical properties of proteins together with their physiological function in terms of catalysis, ligand binding and as components of molecular machines.
Demonstrate an understanding of how the structure and function of proteins are studied and characterised using current biophysical methods such as mass spectroscopy, x-ray diffraction, nuclear magnetic resonance, fluorescence, circular dichroism, electron microscopy, atomic force microscopy and rapid mixing apparatus.
Use web-based tools to retrieve and manipulate protein-related data from international repositories, and the use of molecular graphics software to analyse protein structure in relation to topology and function.
Demonstrate knowledge and understanding of the instrumentation and the type of data generated by the techniques listed above using modern research equipment in the Research Facilities and Research Labs of the School of Biosciences.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Communicate effectively using writing.
Handle and analyse experimental data (including numerical data).
Problem solve.
Use web tools, data repositories, and computer software.

Method of Assessment

Course work assignments (x3). Handling, analysis and interpretation of experimental data. (13.3% each)
Exam 1 (2h) Essay (30%)
Exam 2 (2h) Problem solving (30%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam - two papers)

Preliminary Reading

Williamson, M. (2011) How Proteins Work. Garland Science
Lesk, A.M. (2016, 3nd ed.) Introduction to Protein Science. Architecture, function and genomics. Oxford University Press
Price & Nairn (2009) Exploring Proteins. Oxford University Press
Rhodes G (2006, 3rd ed.) Crystallography Made Crystal Clear. Academic Press
Steven, Baumeister, Johnson & Perham (2016) Molecular Biology of Assemblies and Machines.

Pre-requisites

BIOS3000 Introduction to Biochemistry
BIOS5320 Skills for Bioscientists 2

Restrictions

Stage 3 Biosciences students only

Synopsis *

The module will cover the structural analysis of proteins and protein assemblies using techniques such as fluorescence, circular dichroism, mass spectrometry, atomic-force microscopy, cryo-EM, X-ray crystallography and NMR. It will also look at protein folding, molecular processing, de novo design, engineering and modelling. The module will also investigate the relationship between protein structure and function and cover the principles and practice of enzymology, ligand binding, and enzyme catalysis.

BI638 Bioinformatics and Genomics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	100% Coursework	

Contact Hours

Total contact hours: 32
Private study hours: 118
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Use DNA/protein databases, sequence searching methods, generate multiple sequence alignments, analyse residue conservation.
Use bioinformatics methods to analyse and model protein structure, function and interactions with small ligands and with other proteins.
Understand genomics approaches including – genome sequencing, comparative and functional genomics.

The intended generic learning outcomes. On successfully completing the module students will be able to use:
Bioinformatics skills for data retrieval and analysis across the biosciences' disciplines. Data retrieval/analysis are generic to all numerate subjects.
Transferable skills including written communication (technical reports and a coursework project).
Analytical skills including analysis and presentation of data, writing of reports and a project (coursework).

Method of Assessment

Workshop (20% - short answer questions)
Assignment (80% - 2000 words)

Preliminary Reading

a. Lesk A, Introduction to Bioinformatics, 5th Edition, Oxford University Press, 2019
b. Lesk A, Introduction to Genomics, 3rd Edition, OUP, 2017

Additionally selected peer-reviewed research and review papers will be recommended.

Pre-requisites

BIOS3000 Introduction to Biochemistry
BIOS5320 Skills for Bioscientists 2

Synopsis *

Bioinformatics Data sources & Sequence analysis: Databases and data availability. Using sequence data for analysis – sequence searching methods, multiple sequence alignments, residue conservation, Protein domains and families.

Protein Bioinformatics Methods: Protein structure and function prediction. Prediction of binding sites/interfaces with small ligands and with other proteins. Bioinformatics analyses using protein data.

Genomics: An introduction to the analysis of genomic data, primarily focussing on the data available from genome sequencing – how it can be used to study genetic variants and compare genomes (i.e. comparative and functional genomics).

BI639 Frontiers in Oncology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	100% Coursework	

Availability

It is strongly recommended that you have taken core stage 1 and 3 modules within one of our Biosciences programmes

Contact Hours

Contact hours: 23
Self-Study hours: 127
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will have:
An understanding of selected fields and the leading issues/hot topics in the field of oncology and the limitations of our current knowledge about oncology.
An understanding of the concepts and functions behind standard cell biological, biochemical, and molecular biological assays used in oncological research.

The intended generic learning outcomes. On successfully completing the module students will have developed:
The ability to understand, analyse and assess published scientific data.
The ability to assess presented scientific data and concepts, providing constructive feedback.
The ability to design and conceptualise experiments to address specific scientific questions.
The ability to communicate effectively to a variety of audiences and/or using a variety of methods.
Problem solving skills.

Method of Assessment

Critical analysis worksheets (7x 350words) 10%
Technical summary (750 words) 60%
Oral presentation (10 min) 30%

Preliminary Reading

Core Text: Selected articles from scientific journals will be provided from Templeman Library electronic journal collections.

Pre-requisites

None

Restrictions

Stage 3 Biosciences students only

Synopsis *

The module aims to develop understanding and analytical skills in oncology, based around interactive seminars wherein students will analyse, present, and discuss the relevant research literature. The students will gain experience in scientific design, literature analysis, scientific communication, and the analysis of experimental data.

BI642 Cancer Biology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Spring	H	15 (7.5)	100% Exam	
1	Canterbury	Spring	H	15 (7.5)	60% Exam, 40% Coursework	

Contact Hours

Total contact hours: 24
Private study hours: 126
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Understand the nature of cancer and the (molecular) processes underlying cancer formation and progression.
Demonstrate knowledge of the principles underlying anti-cancer therapies.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate written communication skills at a standard appropriate for level 6 study
Acquire information from a wide range of information resources, including journals, books, electronic databases); maintenance of an effective information retrieval strategy
Understand, analyse and critically assess published scientific data

Method of Assessment

Continuous assessment (40%)
Critical analysis (word limit 750)
Examination (60%), 2 hours
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

Core text
Pecorino, L. Molecular Biology of Cancer: Mechanisms, Targets and Therapeutics (3rd edition) Oxford University Press. 2012.

Supplementary materials

Selected articles from scientific journals will be provided from the Templeman Library electronic journal collections.

Weinberg, R.A. The Biology of Cancer. New York; Abingdon: Garland Science, 2007
Alberts, B., Essential Cell Biology. New York; London: Garland Science 2011.

Pre-requisites

None

Restrictions

Stage 3 students only

Synopsis *

Cancer formation and progression; underlying factors, cancer cell heterogeneity, uncontrolled cell division, invasive growth/metastasis formation.

The Molecular Biology of Cancer: (Proto-)oncogenes, tumour suppressor genes, cell cycle control, cell death.

Cancer therapies

BI643 Neuroscience

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	60% Exam, 40% Coursework	

Contact Hours

Total contact hours: 26
Private study hours: 124
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate a systematic understanding of the cellular and molecular functions of the nervous system gained through knowledge of how nerve cells communicate at synapses.
Demonstrate a systematic understanding of sensory and cognitive processes.
Demonstrate a systematic understanding of acquired and inherited neurological diseases.
Demonstrate an appreciation of the significant achievements of research in neuroscience and the many unanswered questions (limits of our knowledge).

The intended generic learning outcomes. On successfully completing the module students will be able to:
Comprehend complex scientific topics.
Source, read and evaluate scientific literature.
Analyse and evaluate data
Communicate effectively in writing.

Method of Assessment

Data analysis exercise (20%), max 1500 words
Test with multiple choice questions, 45 min (20%)
Exam, 2 h (60%)
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

Principles of Neural Science, Kandel, Schwartz, Jessel, Siegelbaum, Hudspeth, 5th ed (2012)
Fundamental Neuroscience, Squire, Berg, Bloom, du Lac, Ghosh, Spitzer, 4th ed (2012)
Neuroscience, Purves, Augustine, Fitzpatrick, Hall, La Mantia, White, 5th ed (2011)
Research articles available from Templeman Library journal collections.

Pre-requisites

BIOS5130 Human Physiology and Disease II

Restrictions

Stage 3 Biosciences students only

Synopsis *

The module deals with basic neuroanatomy and molecular and cellular neurobiology, such as transmission of signals within the nervous system and sensory perception. It explores more complex functions of the nervous system, e.g. behavioural and cognitive functions including learning, memory, emotions and appetite control. Throughout the module both the normal nervous system and disorders that arise as a consequence of abnormalities will be covered.

BI644 Biology of Ageing

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	60% Exam, 40% Coursework	

Availability

It is required that you have taken all the core modules within stage 1 and 2 of one of our Bioscience programmes in order to take this module.

Contact Hours

Total Contact Hours: 26
Independent Study Hours: 124
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate knowledge of the major processes underlying the ageing process.
Demonstrate practical and data handling skills associated with analysing lifespan and age-related decline data sets.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Interpret and retrieve information
Analyse and evaluate data
Demonstrate written communication skills

Method of Assessment

Assignment 1: Data analysis and interpretation, 40%, Maximum 1500 words.

Examination, 2 hr, 60%
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

Suggested reading will consist of review articles and primary research publications. The emphasis of this course will be to read and interpret the scientific literature first hand.
Some extracts or reading will also be recommended from "Biology of Aging" first edition CRC press by Roger B McDonald.

Pre-requisites

Compulsory Stage 1 and 2 Biosciences modules as well as BI501 Gene expression and control and/or BI549 The Genome (optional modules).

Restrictions

Stage 3 Biosciences students only

Synopsis *

The module provides a detailed molecular basis for the ageing process. It reviews the organisms and experimental methods used to study ageing, and discusses the findings of this work to provide both knowledge and context to the process of ageing.

Topics may include: Importance and principles of ageing research
Why do organisms age and theories of ageing
Overview of processes and pathways controlling ageing

How ageing and lifespan is measured.

Signalling pathways that control ageing

Diseases of ageing

Ethics of ageing research
There will be two workshops: Workshop 1: Data analysis session (whole class or 2-3 groups).
Workshop 2: Group discussion of key ageing research paper(s) (small groups).

BI650 Advances in Eukaryotic Diversity and Evolution

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	100% Coursework	
2	Canterbury	Autumn	H	15 (7.5)	60% Exam, 40% Coursework	

Availability

Not available as an elective module

Contact Hours

Private Study: 24
Contact Hours: 126
Total: 150

Learning Outcomes

1. Demonstrate detailed knowledge of the major processes underlying eukaryotic diversity and evolution;
2. Demonstrate confident practical skills and data handling methods associated with taxonomy, diversity and evolution of eukaryotes;
3. Demonstrate complex understanding of the genetic basis of biodiversity;
4. Confidently integrate knowledge of eukaryotic diversity and evolution with the genetic basis of biodiversity.

Method of Assessment

• Practical Report (1,500 words) – 40%
• Examination (2 hours) – 60%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

The practical report is a compulsory sub-element and must be passed to complete the module

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None

Synopsis *

This module will introduce the students to the taxonomy and diversity of eukaryotic organisms in the various domains of the tree of life. Students will become familiarised with the various theories on the evolution and adaptations of both unicellular and multicellular eukaryotes. It will also teach the techniques and skills required to analyse the diversity and evolution of these organisms at the genomic level.

BI652 Biosciences Academic Support, Key Skills and Information III

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	1 (0.5)	Pass/Fail Only	

Availability

Not available as an elective module

Contact Hours

Private Study: 2
Contact Hours: 8
Total: 10

Learning Outcomes

1. Students will gain a systematic understanding of key aspects of academic skills, including acquisition of coherent and detailed knowledge, which is informed by the forefront of the defined aspects of a discipline;
2. Student will have an ability to deploy accurately established techniques of analysis and enquiry within essential academic skills;
3. Student will have the ability to manage their own learning, and to make use of scholarly reviews and primary sources (e.g. refereed research articles and/or original materials appropriate to the discipline);
4. Students will be able to apply the methods and techniques that they have learned to review, consolidate, extend and apply their knowledge and understanding, and to initiate and carry out projects;
5. Students will be able to communicate information, ideas, problems, and solutions to both specialist and non-specialist audiences;
6. Student will gain the qualities and transferable skills necessary for employment requiring: the exercise of initiative and personal responsibility; decision-making in complex and unpredictable contexts; and the learning ability needed to undertake appropriate further training of a professional or equivalent nature.

Method of Assessment

• Formative assessment/feedback only

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None

Synopsis *

One-on-one meetings and small group tutorials focused on academic progression and the development of key skills to support the core curriculum and future study or employment. Students meet with their Academic Advisor individually or in small groups at intervals during the academic year. Individual meetings review academic progress, support career planning etc. Themed tutorials develop transferable skills; indicative topics are essay and report writing, presentation skills, sourcing information, critical analysis etc. The tutorials are informal involving student activity and discussion. Year group events deliver general information e.g. on University resources, 4-year programmes, module selection etc.

BI797 Sandwich Year Assessment

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	H	120 (60)	100% Coursework	

Contact Hours

Students will spend between 9-12 months working at the organisation hosting their placement.

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate an awareness of the application of, and ability to apply, degree level scientific knowledge to the workplace.
Record, analyse and interpret data, and use graphical and statistical methods for presentation, in accordance with scientific convention.
Perform an independent research project, under supervision, which enhances existing practical and/or theoretical scientific knowledge and skills.
Structure, develop and defend complex scientific arguments by understanding and applying expanding knowledge base and critically appraising own and published work.
Develop ability to present and communicate scientific work in various formats.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Apply their developing scientific knowledge productively for understanding their work.
Make informed and effective use of available resources (e.g. information technology, library) in acquiring, analysing, managing and presenting data, information and knowledge necessary for the planning and execution of work/study activities.
Understand the notion of professional ethics and responsibilities.
Understand the role of the individual within an organisation.
Appreciate and evaluate both individual and teamwork contributions to work place activities and projects through work experience.
Work effectively independently and within a team developing planning, organisational time management, communication, negotiation and interpersonal skills.
Exploit feedback from peers, supervisors and colleagues to enhance any or all aspects of performance.
Demonstrate an awareness of career opportunities for bioscience graduates, and an appreciation of the wider application of degree studies, and hence be in a position to make better informed judgements about career plans and the role of further post-graduate training.

Method of Assessment

Supervisor performance (30%)
Written report – max 6000 words (50%)
Oral presentation – 10-15 minutes (20%)

Preliminary Reading

Research papers, reports, technical etc. Literature relevant to the work placement and associated project(s).

Pre-requisites

Registration for any Biosciences BSc degree
Approval by the School (based on grades achieved at Stage 1 and general performance)

Restrictions

To continue on, or transfer onto, a degree programme with a sandwich year students must achieve an overall average mark of 60% in stage 1 modules.

Synopsis *

A placement typically is a 9-12 month internship with a commercial or public sector or charity organisation which provides opportunities for the student to develop graduate level subject-specific and generic employability skills. Choice of placement by student will be guided and facilitated at UoK with the learning outcomes listed above in mind. It is requested by UoK that the student be closely guided in work (usually with a named supervisor) involving specialist training. Placements are expected to have a scientific research focus and incorporate a project element that may be written up as a scientific report, however, the specific type of work undertaken may vary significantly from placement to placement. The research project should occupy not less than thirty percent of the sandwich year.

BI798 Professional Year

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	120 (60)	Pass/Fail Only	

Contact Hours

Students will spend between 9-12 months working at the organisation hosting their placement.

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate an awareness of the application of, and ability to apply, knowledge and skills gained during a biosciences degree in the workplace.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Perform independent work under supervision, which enhances generic graduate level employability skills
Develop ability to record, analyse, interpret and communicate information in various formats in accordance with the norms of the business.
Make informed and effective use of available resources (e.g. information technology, library) in acquiring, analysing, managing and presenting data, information and knowledge necessary for the planning and execution of work/study activities.
Understand the notion of professional ethics and responsibilities.
Understand the role of the individual within an organisation.
Appreciate and evaluate both individual and teamwork contributions to work place activities and projects through work experience.
Work effectively independently and within a team, developing planning, organisational, time management, communication, negotiation and interpersonal skills.
Exploit feedback from peers, supervisors and colleagues to enhance any or all aspects of performance.
Demonstrate an awareness of career opportunities for bioscience graduates, and an appreciation of the wider application of degree studies, and hence be in a position to make better informed judgments about career plans and the role of further post-graduate training.

Method of Assessment

Module is assessed on a Pass/Fail basis made up of the following elements of assessment:

Supervisor performance (30%)
Written report – max 6000 words (50%)
Oral presentation – 10-15 minutes (20%)

Preliminary Reading

Papers, reports, technical etc. literature relevant to the work placement and associated project(s).

Pre-requisites

Registration for any Biosciences BSc degree programme
Approval by the School (based on grades achieved at Stage 1 and general performance)

Progression

The programmes of study to which the module contributes to:

Biochemistry with a Professional Year
Biomedical Science with a Professional Year
Biology with a Professional Year

Synopsis *

A placement will normally be a 9-12 month internship with a commercial, public sector or charity organisation which provides opportunities for the student to develop graduate level employability skills. Choice of placement by the student will be guided and facilitated at UoK with the learning outcomes listed above in mind. It is requested by UoK that the student be closely guided in work (usually with a named supervisor). The specific type of work undertaken may vary significantly from placement to placement. The work may have a scientific or non-scientific focus. Indicative examples are marketing and sales, manufacturing, business and management.

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CH504 Organic Reaction Mechanisms

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Whole Year	I	15 (7.5)	75% Exam, 25% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total Contact Hours: 70
Total Private Study Hours: 180
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate knowledge and understanding of core and foundation scientific physical and chemical concepts, terminology, theory, units and conventions to chemistry and forensic science.
Demonstrate knowledge and understanding of areas of organic chemistry (organic functional groups, organic materials and compounds, synthetic pathways) as applied to chemistry and forensic science.
Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to organic reaction mechanisms and to apply such knowledge and understanding to the solution of qualitative and quantitative problems.
Recognise and analyse novel problems related to organic reactions and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data.
Recognise and implement good measurement science and practice and commonly used chemistry and forensic laboratory techniques.
Demonstrate confident skills in the safe handling of chemical materials, taking into account their physical and chemical properties, including any specific hazards associated with their use and to risk assess such hazards.
Demonstrate skills required for the conduct of standard laboratory procedures involved in synthetic and analytical work in relation to organic systems. The systematic and reliable documentation of the above. The operation of standard instrumentation used in the chemical and forensic sciences in relation to organic systems.
Interpret data derived from laboratory observations and measurements in terms of their underlying significance and the theory underpinning them.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate confident problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information.
Demonstrate information-retrieval skills, in relation to primary and secondary information sources, including information retrieval through on-line computer searches.
Demonstrate confident interpersonal skills, relating to the ability to interact with other people and to engage in team working within a professional environment.
Demonstrate assured time-management and organisational skills, as evidenced by the ability to plan and implement efficient and effective modes of working. Self-management and organisational skills with the capacity to support life-long learning.
Demonstrate study skills needed for continuing professional development and professional employment.

Method of Assessment

Assignment 1 (2.5 hours) – 3%
Assignment 2 (2.5 hours) – 3%
Lab Write-ups (2.5 hours each) – 24%
Examination (2 hours) – 70%

The lab write-ups are compulsory sub-elements and must be passed to complete the module.

Preliminary Reading

Clayden, J., Greeves, N., and Warren, S.G. (2012). Organic Chemistry, Second Edition. Oxford: Oxford University Press.
Smith, M. (2013). March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, Seventh Edition. London: Wiley
Warren, S.G. and Wyatt, P. (2008). Organic Synthesis: The Disconnection Approach, Second Edition. London: Wiley
Willis, C.L. and Wills, M. (1995). Organic Synthesis. Oxford: Oxford University Press.

Pre-requisites

None

Synopsis *

You will study organic reactions and compounds encountered in organic chemistry in depth. In particular, you will look at the organic chemical reaction mechanisms (including aspects of physical organic chemistry) and the reactions of a variety of organic compounds. You will also look at carbon-carbon forming reactions and strategies for synthesising target molecules.

CH506 Chemical Identification Techniques

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	15 (7.5)	65% Exam, 35% Coursework	
1	Canterbury	Whole Year	I	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Whole Year	I	15 (7.5)	75% Exam, 25% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 44
Private study hours: 104
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
Knowledge and understanding of core and foundation scientific physical and chemical concepts, terminology, theory, units and conventions to chemistry and forensic science. FS/FC A1. Chem A1.
Knowledge and understanding of areas of analytical, physical, organic and inorganic chemistry as applied to chemistry and forensic science. FS/FC A3. Chem A3.
An ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to chemical identification techniques and to apply such knowledge and understanding to the solution of qualitative and quantitative problems. FS/FC B1. Chem B5.
An ability to recognise and analyse novel problems related to chemical identification and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data. FS/FC B2. Chem B6.
Ability to recognise and implement good measurement science and practice and commonly used chemistry and forensic laboratory techniques. FS/FC B4. Chem B4.
Ability to interpret data derived from laboratory observations and measurements in terms of their underlying significance and the theory underpinning them. FS/FC C6. Chem C11.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have:
Interpersonal skills, relating to the ability to interact with other people and to engage in team working within a professional environment. FS/FC C6. Chem C19.
Time-management and organisational skills, as evidenced by the ability to plan and implement efficient and effective modes of working. Self-management and organisational skills with the capacity to support life-long learning. FS/FC C6. Chem C20.
Problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information. FS/FC D2. Chem D15.
Information-retrieval skills, in relation to primary and secondary information sources, including information retrieval through on-line computer searches. FS/FC D4. Chem D17.
Study skills needed for continuing professional development and professional employment. FS/FC D9. Chem D21.

Method of Assessment

Assignment 1 – 17.5%
Assignment 2 – 17.5%
Examination (2 hours) – 65%

Preliminary Reading

Core (Compulsory) Text for all students taking CH506
Spectroscopic methods in organic chemistry - Dudley H. Williams, Ian Fleming, 6th edition 2008

Pre-requisites

Prerequisites:
CHEM3080 Molecules, Matter and Energy
CHEM3090 Fundamental Chemistry for Physical Scientists
CHEM3140 Introduction to Biochemistry and Drug Chemistry
PSCI3810 Chemical Skills for Forensic Scientists
or
CHEM3820 Chemical Skills

Synopsis *

You will develop an understanding of the theory and application of common techniques for the chemical identification of molecular species. Techniques studied will include nuclear magnetic resonance (NMR), mass spectrometry (MS), infrared and Raman spectroscopy and UV-vs spectrophotometry / fluorimetry.

CH530 Polymeric and Organic Materials

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	15 (7.5)	60% Exam, 40% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total Contact Hours: 45
Total Private Study Hours: 105
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate detailed knowledge and understanding of the fundamental concepts relating to polymer chemistry.
Demonstrate thorough knowledge and understanding of the operating instruments and interpreting spectra from spectroscopic data.
Demonstrate detailed knowledge and understanding of the structure-property relationships liquid-crystal (LC) materials.
Demonstrate in-depth knowledge and understanding of the synthetic approaches to polymers, LCs, and light emitting organics.
Demonstrate through knowledge and understanding of the concepts relating to spectroscopy and organic light emitting devices.
Confidently interpret spectroscopic data.
Demonstrate an assured ability to link chemical structure to experimental observables.
Display the skills to perform practical experiments to gain spectroscopic information.
Display the skills to accurately operate standard chemical instrumentation, record data, evaluate observations and errors.
Display the skills to accurately operate standard chemical instrumentation, record data, evaluate observations and errors.
Demonstrate a thorough understanding of how polymers are synthesised and analysed.
Demonstrate a detailed understanding of small molecule synthesis approaches.
Display knowledge of LC behaviour and how it relates to observable properties.
Demonstrate a thorough understanding of OLED device compositions.
Make use of appropriate subject-specific texts, or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate the ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems.
Demonstrate assured analytical skills associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Work independently, use initiative, organise oneself to meet deadlines, and interact constructively with other people.

Method of Assessment

Assignment 1 (14%)
Assignment 2 (8%)
Laboratory Practical Reports – 18%
Examination (2 hours) – 60%

The lab practical reports are compulsory sub-elements and must be passed to complete the module.

Preliminary Reading

Collins, P.J. and Hird, M. (1997). Introduction to Liquid Crystals: Chemistry and Physics. Boca Raton, FL: CRC Press
Cowie, J.M.G., and Arrghi, V. (2007). Polymers: Chemistry and Physics of Modern Materials. Third Edition. Boca Raton, FL: CRC Press
Jean, Y., Volatron, F. and Burdett, J. (1993). An Introduction to Molecular Orbitals. Oxford: Oxford University Press.
Solomons, G., Fryhle, C.B., and Snyder, S.A. (2012). Organic Chemistry, Eleventh Edition. London: Wiley
Sun, S-S. and Dalton, L.R. (2016). Introduction to Organic Electronic and Optoelectronic Materials and Devices, Second Edition. Boca Raton, FL: CRC Press

Pre-requisites

None.

Synopsis *

Plastics, Liquid Crystals and Organic LEDs are ubiquitous in everyday life; your smartphone, tablet or television screen is likely an Organic LED. Here, the chemistry of these common materials is explored. Specifically, the structure and nomenclature of organic and inorganic macromolecules are covered, as well as polymer syntheses. The physical, chemical and mechanical properties of polymers, liquid crystals and light emitting materials are dissected and device structure of organic LEDs is deconvoluted.

CH531 Thermodynamics and Kinetics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	15 (7.5)	60% Exam, 40% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 60
Private study hours: 90
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Understand and apply basic concepts in chemical thermodynamics.
Predict the feasibility of a chemical reaction.
Recognise the links between the macroscopic thermodynamic and microscopic statistical viewpoints.
Understand electrochemical reactions and processing.
Understand molecular reaction dynamics.
Perform calculations using thermodynamic data.
Perform practical experiments to gain thermodynamic information.
Operate standard chemical instrumentation, record data, evaluate observations and errors.
Present and interpret information graphically.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.

Method of Assessment

Assignment 1 (3 hours) – 9%
Assignment 2 (3 hours) – 6%
Laboratory Report (3 hours) – 25%
Examination (2 hours) – 60%

Preliminary Reading

P.W Atkins, Physical Chemistry
R. Chang, Physical Chemistry for the Chemical and Biological Sciences

Pre-requisites

Prerequisites:
CHEM3080 Molecules Matter & Energy
CHEM3820 Chemical Skills
CHEM3200 Chemical Reactions

Synopsis *

The speed (kinetics) and energetics (thermodynamics) of a reaction are of central importance in chemistry. Here, we use thermodynamics and kinetics to predict whether a particular reaction would take place and its likely product yield. We also cover equilibrium constants, electrochemical cells, colligative properties, including elevation and depression of melting and boiling points, zero, first, second and third order reaction kinetics and statistical thermodynamics. Experiments are included to help to cement understanding. (Lab component.)

CH532 Spectroscopy and Bonding

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	15 (7.5)	60% Exam, 40% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 56
Private study hours: 94
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have the knowledge and critical understanding of:
Basic quantum mechanical concepts
Basic concepts of molecular symmetry and group theory.
How to obtain and interpret spectra to calculate molecular parameters from spectroscopic data.

Intellectual skills:
Link quantum mechanical theories to experimental observables.
Interpret spectroscopic data.
Perform practical experiments to gain spectroscopic information.
Operate standard chemical instrumentation, record data and evaluate observations and errors.

Subject-specific skills:
Demonstrate knowledge of basic spectroscopy; microwave, infrared, UV-VIS, Raman.
Perform calculations on molecular parameters from spectroscopic data.
Understand quantum mechanical concepts underlying bonding and energy transitions experimentally observed in spectroscopy.
Understand symmetry of molecules to determine spectroscopic data.
Make use of appropriate texts, or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.

Method of Assessment

Assessment 1 (2 hours) – 5%
Assessment 2 (2 hours) – 5%
Assessment 3 (2 hours) – 5%
Practicals (equivalent to 16 pages) – 25%
Examination (2 hours) – 60%

Preliminary Reading

P.W Atkins, Physical Chemistry (2014)
C. N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy (1994)
Y. Jean, F. Volatron and J. Burdett, An Introduction to Molecular Orbitals (1993)

Pre-requisites

Prerequisites:
CHEM3080 Molecules Matter & Energy
CHEM3200 Chemical Reactions
CHEM3820 Chemical Skills

Synopsis *

This module will deepen your understanding of the fascinating world of quantum mechanics and symmetry. We explore how this gives rise to quantisation and selection rules, and go on to apply this to spectroscopic methods to understand structure and bonding including: rotational (microwave) spectroscopy, vibrational (IR and Raman) spectroscopy and electronic transitions (UV-vis). The lab course will give you hands on experience of some of these quite abstract concepts, and will allow you to apply your spectroscopic skills to real chemical problems. (Lab component.)

CH533 Materials and Solid State Chemistry

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	15 (7.5)	60% Exam, 40% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total Contact Hours: 82
Total Private Study Hours: 68
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate an ability to describe, with confidence, the features of the most common crystalline structures.
Demonstrate the ability to identify different bonding contributions in the solid state.
Demonstrate the ability to relate the crystalline structure with the bonding to predict materials properties.
Demonstrate assured ability to describe different defect structures in the solid state and how they affect the materials properties.
Demonstrate an assured ability to interpret and draw phase diagrams.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate the ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems.
Demonstrate thorough analytical skills associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Demonstrate the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.

Method of Assessment

Assignment 1 (3 hours) – 7.5%
Assignment 2 (3 hours) – 7.5%
Practical Lab Reports (3 hours each) – 25%
Examination (2 hours) – 60%
The assignments are compulsory sub-elements and must be passed to complete the module.

Preliminary Reading

Smart, L. E. and Moore, E. A. (2020). Solid State Chemistry: An Introduction, Fifth Edition Boca Raton, FL: CRC Press
West, A. (2014). Solid State Chemistry and its Applications, Second Edition. London: Wiley

Pre-requisites

None

Synopsis *

The arrangement of atoms and defects in a solid governs its properties. Here, we cover the crystal structures and phase diagrams of solid materials. Bonding in solids is discussed, including metallic, ionic, and molecular crystals, band theory, defects and non-stoichiometry. You will be introduced to the synthesis, properties and applications of a wide range of materials and their solid-state reactions. Applications covered include catalysis, energy materials such as fuel-cells and Li-ion batteries and nanomedicine.

CH604 Analytical Chemistry

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	15 (7.5)	100% Exam	
1	Canterbury	Whole Year	H	15 (7.5)	75% Exam, 25% Coursework	
1	Canterbury	Whole Year	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Whole Year	H	15 (7.5)	90% Exam, 10% Coursework	

Availability

Not available as an elective module

Contact Hours

Private Study: 128
Contact Hours: 22
Total: 150

Learning Outcomes

1. Demonstrate knowledge and understanding of core and foundation scientific physical, chemical concepts, terminology, theory, units, conventions, and laboratory methods in relation to the chemical and forensic sciences.
2. Demonstrate knowledge and understanding of areas of chemistry including analytical chemistry, including as applied to forensic analysis.
3. Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to analytical chemistry and to apply such knowledge and understanding to the solution of qualitative and quantitative problems.
4. Recognise and analyse problems involving analytical chemistry and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data by a variety of computational methods.
5. Collate, interpret and explain the significance and underlying theory of experimental data, including an assessment of limits of accuracy.
6. Interpret data derived from laboratory observations and measurements in terms of their underlying significance and the theory underpinning them.

Method of Assessment

• Assignment 1 (4 hours) – 12.5%
• Assignment 2 (4 hours) – 12.5%
• Examination (3 hours) – 75%
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None

Synopsis *

In this module you will be introduced to a variety of modern techniques used to understand the structure, properties and potential applications of materials. An illustrative list of potential analytical techniques covered include: atomic emission/absorption spectrometry, high-performance liquid chromatography (HPLC), mass spectrometry and optical microscopy, electron microscopy.

CH620 Chemistry Research Project

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	30 (15)	100% Project	

Availability

Not available as an elective module

Contact Hours

Private Study: 274
Contact Hours: 26
Total: 300

Learning Outcomes

1. Demonstrate extensive knowledge and understanding of the principles and theories relating to Chemical Skills in presenting scientific material and arguments clearly and correctly, in writing and orally, to a range of audiences.
2. Demonstrate extensive knowledge and understanding of the core and foundation scientific physical, biological and chemical concepts, terminology, theory, units, conventions and methods. Also as applied to and in relation to forensic analysis.
3. Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to the subject and to apply such knowledge and understanding to the solution of qualitative and quantitative problems.
4. Recognise and analyse problems and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data.
5. Demonstrate competence in the planning, design and execution of investigations, from the problem-recognition stage through to the evaluation and appraisal of results and findings; this to include the ability to select appropriate techniques and procedures.
6. Interpret data derived from laboratory observations and measurements in terms of their underlying significance and the theory underpinning them, and to present such data in a professional environment.

Method of Assessment

• Project Report (20-25 pages) – 50%
• Progress Report (2 pages) – 10%
• Presentation (15 minutes) – 20%
• Supervisor Mark – 20%

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None.

Synopsis *

During this module students will choose a research project from one of four areas: Computational Chemistry, Solid-State Chemistry, Synthetic (Organic) Chemistry, or Chemical Pedagogy. They will then independently plan and execute their experiments, simulations (computational chemistry) or pedagogical research with guidance from an academic supervisor. The module provides framework research training.

PH500 Physics Laboratory

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	I	30 (15)	100% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 57
Private study hours: 243
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
An ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions.
An ability to execute and analyse critically the results of an experiment or investigation and draw valid conclusions. To evaluate the level of uncertainty in these results and compare them with expected outcomes, theoretical predictions or with published data; thereby to evaluate the significance of their results in this context.
An ability to use mathematical techniques and analysis to model physical behaviour.
Competent use of appropriate C&IT packages/systems for the analysis of data and the retrieval of appropriate information.
An ability to present and interpret information graphically.
An ability to communicate scientific information, in particular to produce clear and accurate scientific reports.
A familiarity with laboratory apparatus and techniques, including relevant aspects of Health & Safety.
The systematic and reliable recording of experimental data.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Investigative skills in the context of independent investigation including the use of textbooks and other available literature, databases, and the interaction with colleagues to extract important information.
Communication skills in the area of dealing with surprising ideas and difficult concepts, including listening carefully, reading demanding texts and presenting complex information in a clear and concise manner. C&IT skills are an important element to this.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.

Method of Assessment

Assessment 1: (Laboratory book and 3000 word report, 12.50 %)
Assessment 2: (Laboratory book and 3000 word report, 12.50 %)
Assessment 3: (Laboratory book and 3000 word report, 12.50 %)
Written Communication: (2 pages + reference list, 6.25%)
Oral Communication: 6.25%
Assessment 4: (Laboratory book and 3000 word report, 16.60%)
Assessment 5: (Laboratory book and 3000 word report, 16.70%)
Assessment 6: (Laboratory book and 3000 word report, 16.70%)

Preliminary Reading

Core Text:
Kirkup L., Experimental Methods (John Wiley and Sons, 1994, ISBN 0471335797, paperback)

Recommended:
Taylor J.R., An Introduction to Error Analysis (1997)

Pre-requisites

None.

Synopsis *

Most practicing physicists at some point will be required to perform experiments and take measurements. This module, through a series of experiments, seeks to allow students to become familiar with some more complex apparatus and give them the opportunity to learn the art of accurate recording and analysis of data. This data has to be put in the context of the theoretical background and an estimate of the accuracy made. Keeping of an accurate, intelligible laboratory notebook is most important. Each term 3 three week experiments are performed. The additional period is allocated to some further activities to develop experimental and communications skills including communication to a non-specialist audience.

PH502 Quantum Physics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	15 (7.5)	100% Exam	
1	Canterbury	Whole Year	I	15 (7.5)	64% Exam, 36% Coursework	
1	Canterbury	Whole Year	I	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Whole Year	I	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Whole Year	I	15 (7.5)	90% Exam, 10% Coursework	

Availability

This not available as a wild module.

Contact Hours

Total contact hours: 40
Private study hours: 110
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Display knowledge and understanding of physical laws and principles in Quantum Physics, and their application to diverse areas of physics.
Display an ability to identify relevant principles and laws when dealing with problems in Quantum Physics, and to make approximations necessary to obtain solutions.
Display an ability to solve problems in Quantum Physics using appropriate mathematical tools.
Display an ability to use mathematical techniques and analysis to model physical behaviour in Quantum Physics.
Display an ability to present and interpret information graphically.
Display an ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Display problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems. Numeracy is subsumed within this area.
Display analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Problem sheet 1 (10 hours, 15%)
Problem sheet 2 (10 hours, 15%)
Exam 70% - 2 hours
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Quantum Mechanics – Bransden, B. H., Joachain, C. J., 2000
Quantum Mechanics: Concepts and Applications – Zettili, Nouredine, 2009
Introduction to the Structure of Matter – Brehm, John J., Mullin, William J., 1989
Quantum Mechanics – Rae, Alastair I. M., c2008
Feynman Lectures in Physics – Vol. 3
The Theoretical Minimum: Quantum Mechanics – Leonard Susskind & Art Friedman (Penguin Books 2014)

Pre-requisites

None.

Synopsis *

This module provides an introduction to quantum mechanics, developing knowledge of wave-functions, the Schrodinger equation, solutions and quantum numbers for important physical properties. Topics include: 2-state systems. Bras and kets. Eigenstates and Eigenvalues; Superposition Principle; Probability Amplitudes; Change of Basis; Operators. The Schrodinger equation. Stationary states. Completeness. Expectation values. Collapse of the wave function. Probability density. Solutions of the Schrodinger equation for simple physical systems with constant potentials: Free particles. Particles in a box. Classically allowed and forbidden regions. Reflection and transmission of particles incident onto a potential barrier. Probability flux. Tunnelling of particles. The simple harmonic oscillator. Atomic vibrations.

PH503 Atomic and Nuclear Physics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Autumn	I	15 (7.5)	90% Exam, 10% Coursework	
1	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	
2	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 32
Private study hours: 118
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate knowledge and understanding of physical laws and principles in Quantum and Atomic Physics, and their application to diverse areas of physics
Identify relevant principles and laws when dealing with problems in Quantum and Atomic Physics, and to make approximations necessary to obtain solutions.
Solve problems in Quantum and Atomic Physics using appropriate mathematical tools.
Use mathematical techniques and analysis to model physical behaviour in Quantum and Atomic Physics.
To present and interpret information graphically.
To make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Use problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems. Numeracy is subsumed within this area.
Demonstrate Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Coursework (30 hrs) 30%, consisting of
Homework 1 (10 hours, 15%)
Homework 2 (10 hours, 15%)
Exam (2 hours) 70%
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

Quantum mechanics - Bransden, B. H., Joachain, C. J. 2000
Introduction to the Structure of Matter – Brehm, J.J. and Mullin, W.J. 1989
Atomic Physics – Jones, D.G.C. 1997

Pre-requisites

PH502 – Quantum Mechanics
PH588 – Maths
PH504 - Electromagnetism

Synopsis *

This module will build on the general principles of quantum mechanics introduced earlier in the degree and applied them to the description of atoms, starting by the description of the hydrogen atom and covering other topics such as the effect of magnetic fields on an atom or X-ray spectra.

PH504 Electromagnetism and Optics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	I	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 36
Private study hours: 114
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate knowledge and understanding of physical laws and principles in Electromagnetism and Optics, and their application to diverse areas of physics.
Demonstrate an ability to identify relevant principles and laws when dealing with problems in Electromagnetism and Optics, and to make approximations necessary to obtain solutions.
Demonstrate an ability to solve problems in Electromagnetism and Optics using appropriate mathematical tools.
Demonstrate an ability to use mathematical techniques and analysis to model physical behaviour in Electromagnetism and Optics.
Demonstrate an ability to present and interpret information graphically.
Demonstrate an ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate a knowledge and understanding of problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Demonstrate a knowledge and understanding of Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Coursework (20 hrs) 30%, consisting of
Homework 1 (10 hours, 15%)
Homework 2 (10 hours, 15%)
Exam (2 hours) 70%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

D.J. Griffiths, Introduction to Electrodynamics, 3rd Ed. (1999), Prentice Hall
Tipler, P. A., Physics, 4th Ed., W.E. Freeman
E Hecht, Optics, 2nd Ed. (1987), Addison-Wesley

Pre-requisites

Prerequisite:
PHYS3210 Mechanics
PHYS3220 Electricity and Light
PHYS3230 Thermodynamics and Matter

Synopsis *

This module looks to introduce a range of important laws and principles relating to the physics of electromagnetism and optics. Students will also learn mathematical techniques to enable the modelling of physical behaviour and apply important theory to a range of electromagnetism and optics scenarios.

PH507 The Multiwavelength Universe Exoplanets

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	
2	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

1. Apply fundamental principles of physics to particular areas, such as atomics physics and spectroscopy.
2. Demonstrate knowledge and understanding of physical quantities, their units, and typical values, for observational astronomy and exoplanets.
3. Demonstrate knowledge and understanding of physical phenomena, the terminology used to describe them, and typical circumstances in which they are found to occur, for observational astronomy and exoplanets.
4. Demonstrate knowledge and understanding of the application of physical principles to astrophysics (generally including but need not be limited to): the structure, formation and evolution of stars and galaxies, planetary systems, and cosmology.
5. Formulate and solve problems about observational astronomy and exoplanets.
6. Quantitatively describe and predict astronomy problems in the area of observational astronomy and exoplanets using mathematics.
7. Demonstrate an awareness of, and ability to apply, cross-cutting principles in different areas of physics
8. Comment critically on how telescopes operating at various wavelengths are used in astronomy and astrophysics research.

Method of Assessment

Problem set 1 (10 hours) 15%
Problem set 2 (10 hours) 15%
Examination (2 hours) 70%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

- Carroll, B. and Ostlie, D.; 2013; An Introduction to Modern Astrophysics;
- Berry, M.; 1989; Principles of Cosmology and Gravitation; Adam Hilger
- Roos, M.; 2015; Introduction to Cosmology; Wiley
- Peacock, J.; 1999; Cosmological Physics; Cambridge University Press

Pre-requisites

PHYS3040 - Introduction to Astronomy and Light

Synopsis *

This module builds on the brief introduction to astronomy previously taught in earlier stages. Students enhance their knowledge of astrophysics through the study of the theory, formalism and fundamental principles developing a rigorous grounding in observational, computational and theoretical aspects of astrophysics. In particular they study topics such as properties of galaxies and stars and the detection of planets outside the solar system.

PH508 Spacecraft Design and Operations

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 32
Private study hours: 118
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate knowledge and understanding of physical laws and principles, and their application to diverse areas of physics focussed on spacecraft design and operations.
Demonstrate knowledge and understanding of aspects of the theory and practice of astronomy, astrophysics and space science, and of those aspects upon which astronomy, astrophysics and space science depends.
Demonstrate an ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions relevant to spacecraft science.
Demonstrate an ability to solve problems in physics using appropriate mathematical tools.
Demonstrate an ability to use mathematical techniques and analysis to model physical behaviour.
Demonstrate an ability to comment critically on how spacecraft are designed, their principles of operation, and their use to access and explore space. Also, on how they are used in astronomy and astrophysics research.
Demonstrate an ability to use mathematical techniques and analysis to model physical behaviour.
Demonstrate an ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Demonstrate analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Test 1 (10hours, 15%)
Test 2 (10hours, 15%)
Examination (70% - 2 hours)
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

Recommended texts:
Fortescue, Stark and Swinerd, Spacecraft Systems Engineering, Wiley (2003). [TL875, 6 copies]
Roy, Orbital Motion, Adam Hilger, [QB355] (6 copies, 3rd edition)

Other useful texts:
Griffin and French, Space Vehicle Design, AIAA [TL875]
Wertz and Larson, Space Mission Analysis and Design, 2nd ed. Kluwer [TL790]
Chetty, Satellite Technology and its Applications, TAB Books, Inc. [TL796]
Wertz, Spacecraft Attitude Determination and Control, Reidel Publishing Co. [TL3260]
Turner, Rocket and Spacecraft Propulsion, pub. Praxis [TL782]

Pre-requisites

None.

Synopsis *

This module aims to provide a basic understanding of the major subsystems of a spacecraft system and the frameworks for understanding spacecraft trajectory and orbits, including interplanetary orbits, launch phase and altitude control. Students will also gain an awareness of ideas on how space is a business/commercial opportunity and some of the management tools required in business.

PH512 Multimedia for astronomy, astrophysics and planetary science

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	100% Coursework	

2	Canterbury	Spring	I	15 (7.5)	100% Coursework

Availability

This is not available as a wild module.

Contact Hours

Total contact hours (Presentation and workshop-style tutoring during scheduled sessions: not including office contact hours): 33
Private study hours: 117
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
Knowledge and understanding of aspects of the theory and practice of astronomy, and of those aspects upon which astronomy depends.
Competent use of appropriate C&IT packages/systems for the analysis of data and the retrieval of appropriate information.
An ability to present and interpret astronomical information graphically.
An ability to communicate scientific information, in particular to produce clear and accurate scientific reports.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

Other more specific learning outcomes:
Students will become able to: use the web to access and process astronomical data available on the internet, enhance digital and astronomical images, learn how to use astronomical image processing packages, carry out searches of astronomical databases on the web, and develop familiarity with the topics covered in the course by use of computer exercises to illustrate them.
Develop key skills for employment, learning to access data, the internet and data libraries, and development of practical skills in data collection and processing. The course is also aimed in part at promoting independent thinking when handling practical problems with astronomy data.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Investigative skills in the context of independent investigation including the use of textbooks and other available literature, databases, and the interaction with colleagues to extract important information.
Communication skills in the area of dealing with surprising ideas and difficult concepts, including listening carefully, reading demanding texts and presenting complex information in a clear and concise manner. C&IT skills are an important element to this.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines.

Method of Assessment

Assignment 1 (1,400-1,600 words) – 25%
Assignment 2 (1,400-1,600 words) – 25%
Assignment 3 (1,400-1,600 words) – 25%
Assignment 4 (1,400-1,600 words) – 25%

Preliminary Reading

The Handbook of Astronomical Image Processing [with cd-rom] (2nd Edition); Berry, R. & Burnell, J. (2005)

Pre-requisites

None

Synopsis *

This module focuses on the use of data processing and analysis techniques as applied to astronomical data from telescopes. Students will learn how telescopes and CCD cameras work, to process astronomical images and spectra and apply a range of data analysis techniques using multiple software packages. Students will also engage in the scientific interpretation of images and spectra of astronomical objects.

Use of Virtual Observatories for accessing astronomical databases and applying analysis tools to the data files retrieved (with particular emphasis on the Aladdin system); astronomical image formats.
Astrometry: Measuring coordinates of celestial objects from images.
Photometry: Determining magnitudes of variable stars and/or solar system bodies.
Spectroscopy: Determining spectral properties of variable stars and/or solar system bodies.
Image Analysis and Enhancement with AIP: Quantifying digital imagery in more detail than Aladdin, and applying a range of techniques (primarily through the use of image operators and convolution kernels).

PH513 Medical Physics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 36
Private study hours: 114
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
Knowledge and understanding of physical laws and principles, and their applications in medical physics.
Knowledge and understanding of ionising radiations, with special reference to adverse health effects, to principles relating to radiation dose, and to measures necessary to protect people from the effects of ionising radiations.
Knowledge of medical imaging principles, techniques and applications using X-rays, radionuclides, ultrasound and optical radiation.
Knowledge of therapeutic principles using unsealed sources of radiation in vivo and external radiation sources.
An ability to identify relevant principles and laws when dealing with problems involving measurements or tasks medical physics, with the ability to make assumptions or approximations in order to obtain solutions.
An ability to solve problems in medical physics using appropriate mathematical tools.
An ability to use mathematical techniques and analysis to model physical behaviour.
An ability to present and interpret information graphically within a medical physics context.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes.On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems of applications of physics laws to health sciences, an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Analytical skills - associated with the need to pay attention to detail, to construct logical arguments and to use technical language correctly and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Assignment 1 (25%) on non optics techniques in two stages: a Moodle quiz of 20 minutes (10%), and a Moodle quiz of 30 minutes (15%), with access to the lecture notes;
Assignment 2 on optics techniques (5%), Moodle quiz, 10 minutes, access to the lecture notes
Examination (70%), 2 hours
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Physics for Medical Imaging, R.F. Farr and P.J. Allisy-Roberts; with contributions from J. Weir, London: Saunders, 1998 (repr. 2006), ID: 705044; R 895
Hendee, William R., Medical Imaging Physics, William R. Hendee, E. Russell Ritenour, 4th ed., New York: Wiley-Liss, 2002, ID: 633023, q RC 78.7.D53
Physics in Nuclear Medicine, Simon R. Cherry, James A. Sorenson, Michael E. Phelps., 3rd ed, Philadelphia, Pa: Saunders, c2003, ID 690435, R 895
A Practical Approach to Medical Image Processing [with cd-rom] / Elizabeth Berry, New York; London: Taylor & Francis, 2008, Series in medical physics and biomedical engineering, ID 723882, R 857.O6
Confocal Microscopy, edited by T. Wilson, London: Academic Press, 1990. ID 8092, QH 224
Handbook of Biological Confocal Microscopy/edited by James B. Pawley, New York; London: Plenum Press, 1990, Based on papers given at the Confocal Microscopy Workshop held at the Electron Microscopy Society of America Meeting, August 8-9, 1989, in San Antonio, Texas, ID 308784, qQH 224
Handbook of Optical Coherence Tomography, edited by Brett E. Bouma, Guillermo J. Tearney, New York: Marcel Dekker, 2002, ID 649237, R 857.O6
Optical Coherence Tomography, Technology and Applications, Wolfgang Drexler, James G. Fujimoto, (eds.), Berlin; London: Springer, c2008, Biological and medical physics, biomedical engineering, ID 737786, E-Book

Pre-requisites

PHYS3210 Mechanics
PHYS3220 Electricity and Light
PHYS3230 Thermodynamics and Matter
PHYS5040 Electromagnetism and Optics

Synopsis *

The aim of the module in Medical Physics is to provide a primer into this important physics specialisation. The range of subjects covered is intended to give a balanced introduction to Medical Physics, with emphasis on the core principles of medical imaging, radiation therapy and radiation safety. A small number of lectures is also allocated to the growing field of optical techniques. The module involves a major contribution from the professional medical physicist.

Syllabus:
Radiation protection (radiology, generic); Radiation hazards and dosimetry, radiation protection science and standards, doses and risks in radiology; Radiology; (Fundamental radiological science, general radiology, fluoroscopy and special procedures); Mammography (Imaging techniques and applications to health screening); Computed Tomography (Principles, system design and physical assessment); Diagnostic ultrasound (Pulse echo principles, ultrasound imaging, Doppler techniques); Tissue optics (Absorption, scattering of light in the tissue); The eye (The eye as an optical instrument); Confocal Microscopy (Principles and resolutions); Optical Coherence Tomography (OCT) and applications; Nuclear Medicine (Radionuclide production, radiochemistry, imaging techniques, radiation detectors); In vitro techniques (Radiation counting techniques and applications); Positron Emission Tomography (Principles, imaging and clinical applications); Radiation therapies (Fundamentals of beam therapy, brachytherapy, and 131I thyroid therapy); Radiation Protection (unsealed sources); Dose from in-vivo radionuclides, contamination, safety considerations.

PH520 Physics Laboratory A

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	100% Coursework	

Availability

This is not available as an elective module.

Contact Hours

Total contact hours: 33
Private study hours: 117
Total study hours: 150

Learning Outcomes

1. Demonstrate knowledge and understanding of physical quantities, their units, and typical values, for a range of areas of experimental physics.
2. Demonstrate knowledge and understanding of physical phenomena, the terminology used to describe them, and typical circumstances in which they are found to occur, for a range of areas of experimental physics.
3. Formulate and solve problems in laboratory physics.
4. Quantitatively describe and predict phenomena in the real-world using mathematics.
5. Demonstrate the skills necessary to plan, execute, analyse data, and report the result of an experiment. Including analysis of uncertainties and related results to relevant theory.
6. Understand the need for a safe working environment, and safe working practices.
7. Demonstrate experience of the practical nature of physics and a range of practical skills (including common physics apparatus).
8. Demonstrate skills in computer programming (i.e. skills to write a piece of code to solve a physics-based problem).

Method of Assessment

• Lab Report 1 (3000 words) – 20%
• Lab Report 2 (3000 words) – 20%
• Lab Report 3 (3000 words) – 20%
• Written Communication (2 sides A4) – 20%
• Media Communication (20 hours) – 20%

Preliminary Reading

Core Text:
Kirkup L., Experimental Methods (John Wiley and Sons, 1994, ISBN 0471335797, paperback)

Recommended:
Taylor J.R., An Introduction to Error Analysis (1997).

Pre-requisites

None.

Synopsis *

In this module students develop their experience of the practical nature of physics, including developing their ability to execute an experiment, and to use programming scripts to process data. Students also develop their skill in analysis of uncertainties, and comparison with theory. The module strengthens students' communication skills and knowledge of, and ability to write, all components of laboratory reports.

PH588 Mathematical Techniques for Physical Sciences

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 36
Private study hours: 114
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Solve problems in physics using appropriate mathematical tools.
Present and interpret information graphically.
Make use of appropriate texts, or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Formulate problems in precise terms and to identify key issues, and have the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Pay attention to detail and manipulate precise and intricate ideas.
Construct logical arguments and use technical language and demonstrate numeracy.

Method of Assessment

Problem Solving 1 (10 hour 15%)
Problem Solving 2 (10 hour 15%)
Exam (2 hours 70%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Core Text:
M Boas Mathematical Methods in the Physical Sciences (3rd ed., Wiley, 2005) ISBN: 978-0-471-36580-8

Suggested additional reading:
Introduction to Mathematical Physics by Chun Wa Wong, Oxford University Press (2013)
Mathematics for Physics by M M Woolfson and M S Woolfson, Oxford University Press (2007)
E. Kreyszig, Advanced Engineering Mathematics, John Wiley and sons (2011)
W. Bolton, Fourier Series, Longman Technical (1994)

Pre-requisites

Prerequisites:
PHYS3110 Mathematics I
PHYS3120 Mathematics II

Synopsis *

The module will provide a firm grounding in mathematical methods: both for solving differential equations and, through the study of special functions and asymptotic analysis, to determine the properties of solutions.

PH600 Physics Project

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	15 (7.5)	100% Project	

Availability

This is not available as a wild module.

Contact Hours

15 laboratory days.
This module is expected to occupy 150 total study hours, including the contact hours above.

Learning Outcomes

An ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions for a project.
An ability to execute and analyse critically the results of an experiment or investigation and draw valid conclusions. To evaluate the level of uncertainty in these results and compare them with expected outcomes, theoretical predictions or with published data; thereby to evaluate the significance of their results in this context.
An ability to use mathematical techniques and analysis to model physical behaviour.
An ability to plan an experiment or investigation under supervision and to understand the significance of error analysis.
A working knowledge of a variety of experimental, mathematical and/or computational techniques applicable to current research within physics.
Competent use of appropriate C&IT packages/systems for the analysis of data and the retrieval of appropriate information.
An ability to present and interpret information graphically within a physics project.
An ability to communicate scientific information, in particular to produce clear and accurate scientific reports.
A familiarity with laboratory apparatus and techniques, including relevant aspects of Health & Safety.
The systematic and reliable recording of experimental data.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.
C&IT skills which show fluency at the level and range needed for project work such as familiarity with a programming language, simulation software or the use of mathematical packages for manipulation and numerical solution of equations.
An ability to communicate complex scientific ideas, the conclusion of an experiment, investigation or project concisely, accurately and informatively.
Experimental skills showing the competent use of specialised equipment, the ability to identify appropriate pieces of equipment and to master new techniques and equipment.
An ability to make use of research articles and other primary sources within a project.
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Investigative skills in the context of independent investigation including the use of textbooks and other available literature, databases, and the interaction with colleagues to extract important information.
Communication skills in the area of dealing with surprising ideas and difficult concepts, including listening carefully, reading demanding texts and presenting complex information in a clear and concise manner. C&IT skills are an important element to this.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.

Preliminary Reading

Appropriate background reading will depend on the topic of the project and will be suggested by individual project supervisors.

Pre-requisites

None.

Restrictions

School of Physical Sciences
Procedures for Projects Involving Human Participation

It is a University requirement that any final year project undergraduate, postgraduate or staff research project involving human participants should be subject to a procedure to determine whether ethics approval is needed. The procedure employed by SPS and the Faculty of Science are described here:
http://www.kent.ac.uk/stms/faculty/adminprocedures/research-ethics/index.html

Undergraduate projects PH600, PH603, PS620, CH620, PS720, PS740 and PH700
Each project proposal collected from academics will include an ethics approval checklist designed to determine if ethical approval is required from the faculty i.e. does the project involve human participants. It is the responsibility of convenors to ask supervisors to fill in these checklists with students. If the answer to any of the questions on the checklist is yes please see below;

The following text will be introduced into the information pack or the handbooks of the module:

“Before you commence any work, it is important that the ethics of that work be considered; for example, taking fingerprints or collecting images of faces of your colleagues etc. Your supervisor will discuss any ethics issues with you and you should keep a copy of the documentation”

For projects involving human participants other than those conducting the project itself, students and their supervisors are required to read, note and act upon the guidelines available at
http://www.kent.ac.uk/stms/faculty/adminprocedures/research-ethics/index.html to obtain approval from the Sciences Research Ethics (Human Participation) Advisory Group.

Further information on Ethics can be obtained from Dr Donna Arnold, SPS representative on the Sciences Research Ethics Advisory Group.

Synopsis *

Aims:
To provide either
i) experimental or theoretical projects to give an introduction to scientific research procedures, or
ii) experience of the process of critical scientific review, or
iii) experience of the development of teaching or Public Understanding of Science material.
To deepen knowledge in a specialised field and be able to communicate that knowledge orally and in writing.

A choice of projects will be made available at the start of the Autumn term, to include such activities as experimental measurement and observation, the analysis of scientific information, the design and construction of electronic devices, the implementation and development of computational methods, the review of topics of current scientific interest, and the development and evaluation of new teaching aids.

PH602 Physics Problem Solving

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 20
Private study hours: 130
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Demonstrate an assured ability to identify relevant principles and laws when dealing with physics problems, and to make approximations necessary to obtain solutions.
Confidently solve problems in physics using appropriate mathematical tools.
Demonstrate competent use of appropriate C&IT packages/systems for the analysis of data and the retrieval of appropriate information for problem solving.
Present and interpret scientific information graphically to solve complex problems.
Communicate scientific information about problem solving, in particular to produce clear and accurate scientific reports.
Demonstrate an ability to make use of appropriate physics-based texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate comprehensive problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Demonstrate analytical skills, associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Demonstrate the ability to work independently, to use initiative, to organise oneself to meet deadlines.

Method of Assessment

Assignment 1 (10 hours) – 20%
Assignment 2 (10 hours) – 20%
Examination (3 hours) – 60%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Oman and Oman, Physics for the Utterly Confused, McGraw Hill [QC23]
3000 Solved Problems in Physics, Alvin Halpern (ISBN 978-0-07-176346-2

Pre-requisites

None

Synopsis *

After taking the classes students should be more fluent and adept at solving and discussing general problems in Physics (and its related disciplines of mathematics and engineering).
There is no formal curriculum for this course, which uses and demands only physical and mathematical concepts with which the students at this level are already familiar.
Problems are presented and solutions discussed in topics spanning several topics in the undergraduate physics curriculum (Mechanics and statics, thermodynamics, and optics, etc).
Problems are also discussed that primarily involve the application of formal logic and reasoning, simple probability, statistics, estimation and linear mathematics.

PH603 Physics Group Project

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	15 (7.5)	100% Project	

1	Canterbury	Spring	H	15 (7.5)	100% Project

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 56
Private study hours: 94
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate an ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions.
Demonstrate an ability to present and interpret information graphically.
Demonstrate an ability to communicate scientific information, in particular to produce clear and accurate scientific reports.
Demonstrate an ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate knowledge and understanding of problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Demonstrate knowledge and understanding of investigative skills in the context of independent investigation including the use of textbooks and other available literature, databases, and the interaction with colleagues to extract important information.
Show communication skills in the area of dealing with surprising ideas and difficult concepts, including listening carefully, reading demanding texts and presenting complex information in a clear and concise manner. C&IT skills are an important element to this.
Demonstrate knowledge and understanding of analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Show personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.

Method of Assessment

Assignment – report, 10,000 words (50%)
Assignment – poster (10%)
Presentation – 30 minutes (30%)
Performance – intra-group peer assessment (10%)

Preliminary Reading

None - as this will depend entirely on the research needed to conduct the individual projects.

Pre-requisites

None

Restrictions

School of Physical Sciences
Procedures for Projects Involving Human Participation

It is a University requirement that any final year project undergraduate, postgraduate or staff research project involving human participants should be subject to a procedure to determine whether ethics approval is needed. The procedure employed by SPS and the Faculty of Science are described here:
http://www.kent.ac.uk/stms/faculty/adminprocedures/research-ethics/index.html

Undergraduate projects PH600, PH603, PS620, CH620, PS720, PS740 and PH700
Each project proposal collected from academics will include an ethics approval checklist designed to determine if ethical approval is required from the faculty i.e. does the project involve human participants. It is the responsibility of convenors to ask supervisors to fill in these checklists with students. If the answer to any of the questions on the checklist is yes please see below;

The following text will be introduced into the information pack or the handbooks of the module:

“Before you commence any work, it is important that the ethics of that work be considered; for example, taking fingerprints or collecting images of faces of your colleagues etc. Your supervisor will discuss any ethics issues with you and you should keep a copy of the documentation”

For projects involving human participants other than those conducting the project itself, students and their supervisors are required to read, note and act upon the guidelines available at
http://www.kent.ac.uk/stms/faculty/adminprocedures/research-ethics/index.html to obtain approval from the Sciences Research Ethics (Human Participation) Advisory Group.

Further information on Ethics can be obtained from Dr Donna Arnold, SPS representative on the Sciences Research Ethics Advisory Group.

Synopsis *

This module provides an opportunity for students to work in groups to tackle open ended research problems. Project themes vary from industry linked projects to academic research and education/outreach projects. Students develop a variety of presentation skills and team work within the module as well as open ended project work.

PH604 Relativity Optics and Maxwell's Equations

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	H	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
Knowledge and understanding of electromagnetic and relativistic laws and principles, and their application to diverse areas of physics.
An ability to identify relevant principles and laws when dealing with problems in electromagnetism and relativity, and to make approximations necessary to obtain solutions.
An ability to solve problems in electromagnetism and relativity using appropriate mathematical tools.
An ability to use mathematical techniques and analysis to model physical behaviour in electromagnetism and relativity.
An ability to present and interpret information graphically.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Take-home Test 1 (45 mins, 15 %)
Take-home Test 2 (45 mins, 15 %)
Examination (70%)
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

D.J. Griffiths, Introduction to Electrodynamics, 3rd Ed. (1999), Prentice Hall
E. Hecht, Optics 3rd Edn., Addison Wesley, [QC375.2]
J. Wilson and J.F.B. Hawks, Optoelectronics: An Introduction, Prentice-Hall International, 1983. [QC 447]
A.Yariv, Optical electronics, Holt-Saunders International, 1985. [QC 447]
G. Barton, Introduction to the Relativity Principle, J. Wiley & Sons, 1999
Edwin F. Taylor and John Archibald Wheeler, Spacetime Physics: Introduction to Special Relativity, 2nd ed. W. H. Freeman & Company, 1992.

Pre-requisites

PHYS3010 Physics
Or replacement modules
PHYS3210 Mechanics
PHYS3220 Electricity and Light
PHYS3230 Thermodynamics and Matter
And
PHYS5040 Electromagnetism and Optics

Synopsis *

Special Relativity: Limits of Newtonian Mechanics, Inertial frames of reference, the Galilean and Lorentz transformations, time dilation and length contraction, invariant quantities under Lorentz transformation, energy momentum 4-vector.
Maxwell's equations: operators of vector calculus, Gauss law of electrostatics and magnetostatics, Faraday's law and Ampere's law, physical meanings and integral and differential forms, dielectrics, the wave equation and solutions, Poynting vector, the Fresnel relations, transmission and reflection at dielectric boundaries.
Modern Optics: Resonant cavities and the laser, optical modes, Polarisation and Jones vector formulation.

PH605 Thermal and Statistical Physics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
Knowledge and understanding of physical laws and principles in Thermal and Statistical Physics, and their application to diverse areas of physics.
An ability to identify relevant principles and laws when dealing with problems in Thermal and Statistical Physics, and to make approximations necessary to obtain solutions.
An ability to solve problems in Thermal and Statistical Physics using appropriate mathematical tools.
An ability to use mathematical techniques and analysis to model physical behaviour in Thermal and Statistical Physics.
An ability to present and interpret information graphically.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems. Numeracy is subsumed within this area.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Take-home test 1 (10 hour, 15%)
Take-home test 2 (10 hour, 15%)
Examination (2 hours 70%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Statistical Physics - A. M. Gue´nault
Statistical Physics - F. Mandl
Thermal physics - Baierlein, Ralph

Pre-requisites

Prerequisites:
PHYS3000 Mathematics
PHYS3010 Physics
PHYS5020 Quantum Physics
PHYS5030 Atomic Physics

Synopsis *

Thermodynamics
Review of zeroth, first, second laws. Quasistatic processes. Functions of state. Extensive and intensive properties. Exact and inexact differentials. Concept of entropy. Heat capacities. Thermodynamic potentials: internal energy, enthalpy, Helmholtz and Gibbs functions. The Maxwell relations. Concept of chemical potential. Applications to simple systems. Joule free expansion. Joule-Kelvin effect. Equilibrium conditions. Phase equilibria, Clausius-Clapeyron equation. The third law of thermodynamics and its consequences – inaccessibility of the absolute zero.

Statistical Concepts and Statistical Basis of Thermodynamics
Basic statistical concepts. Microscopic and macroscopic descriptions of thermodynamic systems. Statistical basis of Thermodynamics. Boltzmann entropy formula. Temperature and pressure. Statistical properties of molecules in a gas. Basic concepts of probability and probability distributions. Counting the number of ways to place objects in boxes. Distinguishable and indistinguishable objects. Stirling approximation(s). Schottkly defect, Spin 1/2 systems. System of harmonic oscillators. Gibbsian Ensembles. Canonical Ensemble. Gibbs entropy formula. Boltzmann distribution. Partition function. Semi-classical approach. Partition function of a single particle. Partition function of N non-interacting particles. Helmholtz free energy. Pauli paramagnetism. Semi Classical Perfect Gas. Equation of state. Entropy of a monatomic gas, Sackur-Tetrode equation. Density of states. Maxwell velocity distribution. Equipartition of Energy. Heat capacities. Grand Canonical Ensemble.

Quantum Statistics
Classical and Quantum Counting of Microstates. Average occupation numbers: Fermi Dirac and Bose Einstein statistics. The Classical Limit. Black Body radiation and perfect photon gas. Planck's law. Einstein theory of solids. Debye theory of solids.

PH606 Solid State Physics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 27
Private study hours: 123
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
Knowledge and understanding of physical laws and principles in Solid State Physics, and their application to diverse areas of physics.
An ability to identify relevant principles and laws when dealing with problems in Solid State Physics, and to make approximations necessary to obtain solutions.
An ability to solve problems in Solid State Physics using appropriate mathematical tools.
An ability to use mathematical techniques and analysis to model physical behaviour in Solid State Physics.
An ability to present and interpret information graphically.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems. Numeracy is subsumed within this area.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Assignment 1: (10hours, 15%)
Assignment 2: (10hours, 15%)
Examination (2 hour, 70%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Recommended Text:
Hook & Hall, Solid State Physics, Wiley [QC176]

Additional texts:
Kittel, Solid State Physics (7th Ed), Wiley, 1996 [QC176]
Ashcroft & Mermin, Solid State Physics, Holt-Saunders [QC176]

Pre-requisites

Prerequisites:
PHYS3210 Mechanics
PHYS3230 Thermodynamics and Matter
PHYS5020 Quantum Physics

Synopsis *

To provide an introduction to solid state physics. To provide foundations for the further study of materials and condensed matter, and details of solid state electronic and opto-electronic devices.
Structure:
Interaction potential for atoms and ions. Definitions, crystal types. Miller indices. Reciprocal lattice. Diffraction methods. Dynamics of Vibrations.
Lattice dynamics, phonon dispersion curves, experimental techniques.
Electrons in k-space: metals.
Free electron theory of metals. Density of states. Fermi-Dirac distribution. Band theory of solids - Bloch's theorem. Distinction between metals and insulators. Electrical conductivity according to classical and quantum theory. Hall effect.
Semiconductors.
Band structure of ideal semiconductor. Density of states and electronic/hole densities in conduction/valence band. Intrinsic carrier density. Doped semiconductors.
Magnetism.
Definitions of dia, para, ferromagnetism. Magnetic moments. General treatment of paramagnetism, Curie's law. Introduction to ferromagnetism.

PH607 Stars, Galaxies and the Universe

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate knowledge and understanding of physical laws and principles of astrophysics, and their application to diverse areas of physics.
Identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions.
Solve problems in physics involving stars and galaxies using appropriate mathematical tools.
Use mathematical techniques and analysis to model physical behaviour of stars and galaxies and the universe.
Present and interpret information about stars and galaxies graphically.
Make use of appropriate texts, research-based materials or other learning resources about astrophysics as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Solve problems, in the context of both problems with well-defined solutions and open-ended problems. Numeracy is subsumed within this area.
Use analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Test 1 (3 hours,15%)
Test 2 (3 hours,15%)
Examination (2 hours, 70%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Carroll & Ostlie, Modern Astrophysics, Addison Wesley, 2013
Bohm-Vitense, Volume 3; Stellar Structure and Evolution, Cambridge University Press, 1992
Taylor, The stars: Their structure and Evolution, Cambridge University Press, 2010
Berry, Principles of Cosmology and Gravitation, Adam Hilger, 1989
Roos, Introduction to Cosmology, Wiley, 2015
Peacock, Cosmological Physics, Cambridge University Press, (1999)
Rowan-Robinson, Cosmology, OUP, 2004

Pre-requisites

None.

Synopsis *

Aims: To provide, in combination with PH507, a balanced and rigorous course in Astrophysics for B.Sc. Physics with Astrophysics students, while forming a basis of the more extensive M.Phys modules.

Physics of Stars
equations of state for an ideal multiple chemical component star; degenerated stars, Nuclear reactions: PPI, PPII, PPIII chains; CNO cycle, Triple-alpha process; elemental abundances; energy transportation inside a star; derivation of the approximate opacity and energy generation models as function of density, temperature and chemical components; Solar neutrino problem; polytropic models applied to the equations of stars; Lane-Emden equation; Chandrasekhar mass; the Eddington Luminosity and the upper limit of mass; detailed stellar models; Post main sequence evolution of solar mass stars; Red Giants; White Dwarfs; Neutron Stars; Degenerate matter; properties of white dwarfs; Chandrasekhar limit; neutron stars; pulsars; Supernovae

General Relativity and Cosmology
Inadequacy of Newton's Laws of Gravitation, principle of Equivalence, non-Euclidian geometry. Curved surfaces. Schwarzschild solution; Gravitational redshift, the bending of light and gravitational lenses; Einstein Rings, black holes, gravitational waves; Brief survey of the universe; Olbers paradox, Cosmology, principles, FRW Metric, Laws of Motion & Distances, Friedmann equation, Scale Factor, Fluid equation, The Hubble Parameter, Critical Density parameter, Cosmological Constant parameter, Radiation-Matter-Dark Energy phases; The CMB, Temperature Horizons. Monopoles. Flatness problem. Hubble sphere, Inflation, Anisotropies, Polarisation Baryon Acoustic Oscillations, Secondary anisotropies; Baryosynthesis, Nucleosynthesis, Dark Matter observations, Lensing, Bullet Cluster, Dark Matter candidates, Cosmic Distance Ladder, Redshifts Galaxy surveys; Acceleration equation, Deceleration equation, Supernova as standard candles, Dark Energy, Einstein Field equations, Coincidence problem, The Cosmic Dark Ages & AGN Reionisation, High-z galaxies

PH608 The Sun, The Earth and Mars

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	90% Exam, 10% Coursework	
1	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
Knowledge and understanding of physical laws and principles in Solar System Science, and their application to diverse areas of physics.
Aspects of the theory and practice of astronomy, astrophysics and space science, and of those aspects upon which astronomy, astrophysics and space science depends.
An ability to identify relevant principles and laws when dealing with problems in Solar System Science, and to make approximations necessary to obtain solutions.
An ability to solve problems in Solar System Science using appropriate mathematical tools.
An ability to use mathematical techniques and analysis to model physical behaviour in Solar System Science.
An ability to comment critically on how spacecraft are designed, their principles of operation, and their use to access and explore space, and on how telescopes (operating at various wavelengths) are designed, their principles of operation, and their use in astronomy and astrophysics research.
An ability to present and interpret astronomy, astrophysics and space science information graphically.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems. Numeracy is subsumed within this area.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Assessment 1 - 15% (10 hours)
Assessment 2 - 15% (10 hours)
Examination - 70% (2 hours)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Core:
Physical Principles of Remote Sensing; Rees, Gareth 2001
Terrestrial Physics; 2013
The Scientific Exploration of Mars; Taylor, F. W. 2010

Recommended:
Physics of the Sun: A First Course; Mullan, Dermott J. 2010
Mars: A Warmer, Wetter Planet; Kargel, J. S. 2004
Introduction to the physics and techniques of remote sensing, Elachi, 2nd Edition, 2006

Pre-requisites

Prerequisites:
PHYS5080 Spacecraft Design and Operations

Synopsis *

Aims:
To understand the nature of the solar activities, emissions and its properties, and its effects on the Earth's atmosphere and the near-Earth space within which spacecraft operate.
To have a familiarity with the modes of operation of remote sensing and communications satellites, understanding their function and how their instruments work.
To be familiar with the current space missions to Mars and their impact on our understanding of that planet.

Solar Terrestrial physics
The sun: Overall structure, magnetic field and solar activities.
Interactions with Earth: plasma physics, solar wind, Earth's magnetic field.
Ionospheric physics. Terrestrial physics: Earth's energy balance, Atmosphere. Environmental effects.

Remote Sensing
Modes of operation of remote sensing satellite instruments: radio, microwave, visual and infrared instruments. Basic uses of the instruments. Digital image processing, structure of digital images, image-processing overview, information extraction, environmental applications: UV radiation and Ozone concentration, climate and weather.

Martian Science
An overview of recent and future Mars space missions and their scientific aims. Discussions of the new data concerning Mars and the changing picture of Mars that is currently emerging.

PH611 Numerical and Computational Methods

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	100% Coursework	
1	Canterbury	Spring	H	15 (7.5)	60% Exam, 40% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total Contact Hours: 32
Total Private Study Hours: 118
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate the ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions.
Demonstrate a systematic ability to solve problems in physics using appropriate mathematical tools.
Demonstrate a confident ability to use mathematical techniques and analysis to model physical behaviour.
Demonstrate an assured ability to solve advanced problems in physics using appropriate mathematical tools, to translate problems into mathematical statements and apply their knowledge to obtain order of magnitude or more precise solutions as appropriate.
Demonstrate the ability to accurately interpret mathematical descriptions of physical phenomena.
Display a working knowledge of a variety of mathematical and/or computational techniques applicable to current research within physics.
Demonstrate complete competence in the use of appropriate C&IT packages/systems for the analysis of data and the retrieval of appropriate information.
Present and interpret information graphically accurately and confidently.
Demonstrate the ability to make use of appropriate texts, or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate extensive problem-solving skills in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Demonstrate professional analytical skills associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Problem Sheet 1 (3 hours) – 20%
Problem Sheet 2 (3 hours) – 20%
Problem Sheet 3 (3 hours) – 20%
Problem Sheet 4 (3 hours) – 20%
Problem Sheet 5 (3 hours) – 20%

Preliminary Reading

Chapra, S. (2008). Applied Numerical Methods with MATLAB for Engineers and Scientists. New York: McGraw-Hill.
Moler, C. (2004). Numerical Computing with MATLAB, Society for Industrial and Applied Mathematics, Philadelphia: SIAM.

Pre-requisites

None

Synopsis *

This module provides a foundation in numerical approximations to analytical methods – these techniques are essential for solving problems by computer. An indicative list of methods is: Linear equations, zeros and roots, least squares & linear regression, eigenvalues and eigenvectors, errors and finite differences, linear programming, interpolation and plotting functions, numerical integration, numerical differentiation, solutions to ordinary differential equations using numerical methods.

PH617 Physics Project Laboratory

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	15 (7.5)	100% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 55
Private study hours: 95
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
An ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions for laboratory projects.
An ability to execute and analyse critically the results of an experiment or investigation and draw valid conclusions. To evaluate the level of uncertainty in these results and compare them with expected outcomes, theoretical predictions or with published data; thereby to evaluate the significance of their results in this context.
An ability to use mathematical techniques and analysis to model physical behaviour.
Competent use of appropriate C&IT packages/systems for the analysis of data and the retrieval of appropriate information.
An ability to present and interpret information graphically for project reports.
An ability to communicate scientific information, in particular to produce clear and accurate scientific reports.
A familiarity with laboratory apparatus and techniques, including relevant aspects of Health & Safety.
The systematic and reliable recording of experimental data.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Investigative skills in the context of independent investigation including the use of textbooks and other available literature, databases, and the interaction with colleagues to extract important information.
Communication skills in the area of dealing with surprising ideas and difficult concepts, including listening carefully, reading demanding texts and presenting complex information in a clear and concise manner. C&IT skills are an important element to this.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.

Method of Assessment

Practical (16.7% - max. 10 pages)
Practical (16.7% - max. 10 pages)
Practical (16.6% - max. 10 pages)
Assignment (50% - max. 25 pages)

Preliminary Reading

An Introduction to Error Analysis; Taylor, J.R. (1997)
Writing for Science and Engineering: Papers, Presentations and Reports; Silyn-Roberts, H. (2013)
Scientists Must Write; Barrass, R. (2002)

Pre-requisites

None.

Synopsis *

Aims:
To provide experience in laboratory based experimentation, data recording and analysis and drawing of conclusions.
To develop report writing skills for scientific material.
To develop the ability to undertake investigations where, as part of the exercise, the goals and methods have to be defined by the investigator.
To develop skills in literature searches and reviews.

The module has two parts: Laboratory experiments and a mini-project. For half the term the students will work in pairs on a series of 3 two-week experiments. A report will be written by each student for each experiment.

Experiments include:
Solar cells.
NMR.
Hall effect.
Gamma ray spectroscopy.
X-ray diffraction.
Optical spectroscopy.

Mini-projects. For half the term, the students will work in pairs on a mini-project. These will be more open-ended tasks than the experiments, with only brief introductions stating the topic to be investigated with an emphasis on independent learning. A report will be written by each student on their project.

PH618 Image Processing

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
Knowledge and understanding of laws and principles of imaging processing, and their application to diverse areas of physics.
An ability to solve problems in image processing using appropriate mathematical tools.
Competent use of appropriate C&IT packages/systems for the analysis of images and the retrieval of appropriate information.
An ability to present, process and interpret information graphically.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Take Home Test 1 (2 Hours, 15%)
Take Home Test 2 (2 Hours, 15%)
Examination (2 hours, 70%)

Preliminary Reading

Fundamentals of digital image processing: a practical approach with examples in Matlab, Solomon, Chris, Breckon, Toby 2011, Wiley Blackwell, ISBN 0470844736
Gonzalez and Woods, Digital Image Processing, Addison-Wesley, 1992, ISBN 0-201-50803-6
John C. Russ, The Image Processing Handbook, CRC Press, 1995
Matlab: A Practical Introduction to Programming and Problem Solving, Stormy Attaway, Elsevier, 2018, ISBN: 9780128154793

Pre-requisites

None.

Synopsis *

Introduction to Matlab
Image representation
Image formation
Grey-scale transformation
Enhancement and extraction of image content
Fourier transforms and the frequency domain
Image restoration, geometrical transformations
Morphology and morphological transformations
Feature extraction
Segmentation

PH700 Physics Research Project

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	M	60 (30)	100% Project	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 40
Private study hours: 560
Total study hours: 600

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
An ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions.
An ability to solve problems in physics using appropriate mathematical tools.
An ability to execute and analyse critically the results of an experiment or investigation and draw valid conclusions. To evaluate the level of uncertainty in these results and compare them with expected outcomes, theoretical predictions or with published data; thereby to evaluate the significance of their results in this context.
An ability to interpret mathematical descriptions of physical phenomena.
An ability to plan an experiment or investigation under supervision and to understand the significance of error analysis.
A working knowledge of a variety of experimental, mathematical and/or computational techniques applicable to current research within physics.
An ability to present and interpret information graphically.
An ability to communicate scientific information, in particular to produce clear and accurate scientific reports.
A familiarity with laboratory apparatus (including relevant aspects of Health & Safety), theories and techniques.
The systematic and reliable recording of experimental data or derivation of theoretical results.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.
C&IT skills which show fluency at the level and range needed for project work such as familiarity with a programming language, simulation software or the use of mathematical packages for manipulation and numerical solution of equations.
An ability to communicate complex scientific ideas, the conclusion of an experiment, investigation or project concisely, accurately and informatively.
Experimental skills showing the competent use of specialised equipment, the ability to identify appropriate pieces of equipment and to master new techniques and equipment.
An ability to make use of research articles and other primary sources.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Investigative skills in the context of independent investigation including the use of textbooks and other available literature, databases, and the interaction with colleagues to extract important information.
Communication skills in the area of dealing with surprising ideas and difficult concepts, including listening carefully, reading demanding texts and presenting complex information in a clear and concise manner. C&IT skills are an important element to this.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.

Method of Assessment

Project progress (i.e. supervisor assessment of performance) (15%)
Project report (55%), max. 12,000 words
Viva voce (15%)
Presentation (15%), duration 15 minutes

Preliminary Reading

None; appropriate background reading will be suggested by individual project supervisors

Pre-requisites

None.

Restrictions

School of Physical Sciences
Procedures for Projects Involving Human Participation

It is a University requirement that any final year project undergraduate, postgraduate or staff research project involving human participants should be subject to a procedure to determine whether ethics approval is needed. The procedure employed by SPS and the Faculty of Science are described here:
http://www.kent.ac.uk/stms/faculty/adminprocedures/research-ethics/index.html

Undergraduate projects PH600, PH603, PS620, CH620, PS720, PS740 and PH700
Each project proposal collected from academics will include an ethics approval checklist designed to determine if ethical approval is required from the faculty i.e. does the project involve human participants. It is the responsibility of convenors to ask supervisors to fill in these checklists with students. If the answer to any of the questions on the checklist is yes please see below;

The following text will be introduced into the information pack or the handbooks of the module:

“Before you commence any work, it is important that the ethics of that work be considered; for example, taking fingerprints or collecting images of faces of your colleagues etc. Your supervisor will discuss any ethics issues with you and you should keep a copy of the documentation”

For projects involving human participants other than those conducting the project itself, students and their supervisors are required to read, note and act upon the guidelines available at
http://www.kent.ac.uk/stms/faculty/adminprocedures/research-ethics/index.html to obtain approval from the Sciences Research Ethics (Human Participation) Advisory Group.

Further information on Ethics can be obtained from Dr Donna Arnold, SPS representative on the Sciences Research Ethics Advisory Group.

Synopsis *

Aims:
To provide an experience of open-ended research work.
To begin to prepare students for postgraduate work towards degrees by research or for careers in R&D in industrial or government/national laboratories.
To deepen knowledge in a specialised field and be able to communicate that knowledge orally and in writing.

Syllabus

All MPhys students undertake a laboratory, theoretical or computationally-based project related to their degree specialism. These projects may also be undertaken by Diploma students. A list of available project areas is made available during Stage 3, but may be augmented/revised at any time up to and including Week 1 of Stage 4. As far as possible, projects will be assigned on the basis of students' preferences – but this is not always possible: however, the project abstracts are regarded as 'flexible' in the sense that significant modification is possible (subject only to mutual consent between student and supervisor). The projects involve a combination of some or all of: literature search and critique, laboratory work, theoretical work, computational physics and data reduction/analysis. The majority of the projects are directly related to the research conducted in the department and are undertaken within the various SPS research teams.

PH709 Space Astronomy and Solar System Science

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	M	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours (Lectures and workshop sessions – does not include office contact hours): 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
An ability to identify relevant principles and laws when dealing with problems in Space Astronomy and Solar System Science, and to make approximations necessary to obtain solutions.
An ability to solve problems in astronomy, astrophysics and space science using appropriate mathematical tools.
An ability to use mathematical techniques and analysis to model physical behaviour in Space Astronomy and Solar System Science.
An ability to comment critically on how spacecraft and space telescopes (operating at various wavelengths) are designed, their principles of operation, and their use in solar system exploration and astronomy & astrophysics research.
An ability to solve advanced problems in astronomy, astrophysics and space science using appropriate mathematical tools.
An ability to interpret mathematical descriptions of physical phenomena in Space Astronomy and Solar System Science.
An ability to work within the space sciences area that is well matched to the frontiers of knowledge, the science drivers that underpin government funded research and the commercial activity that provides hardware or software solutions to challenging scientific problems in these fields.
An ability to present and interpret information graphically.
An ability to make use of appropriate texts, research-based materials, other primary sources or other learning resources as part of managing their own learning.

Other more specific learning outcomes:
An ability to discuss coherently the origin and evolution of Solar Systems and be able to evaluate claims for evidence of Solar Systems other than our own.
Ability to identify relevant principles, make relevant approximations and solve problems using a mathematical approach.
Students should become fluent in current trends and methods as regards to space astronomy and Solar System exploration.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Investigative skills in the context of independent investigation including the use of textbooks and other available literature and databases, to extract important information.
Communication skills in the area of dealing with surprising ideas and difficult concepts, including listening carefully, reading demanding texts.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Two homework assignments (15% each) (10 hours each)
Examination (2 hours, 70%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Wertz and Larson, Space Mission Analysis and Design, 3rd Edition, 1992 [TL 790]
Jones, Discovering the Solar System, 2nd Edition, 1999 [q QB501]
Taylor, Solar System Evolution, 2nd Edition, 2001 [q QB501]
Fortescue, Stark and Swinerd, Spacecraft Systems Engineering, 3rd ed, Wiley, 2003 [TL875]

Other reading:
Davies; Astronomy from Space: The Design and Operation of Orbiting Observatories, Wiley,1997 [QB136]
Encrenaz, Bibring and Blanc; The Solar System, Springer, 2010 [QB 501]
Jakosky: The Search for Life on Other Planets, 1998 [QB 54]
Gilmour & Sephton: Introduction to Astrobiology, 2004 [qQB 501]
Carroll and Ostlie, Modern Astrophysics, 2nd Edition, 2007 (copies of the 1st edition are in the library at QB461)

Pre-requisites

None.

Synopsis *

Space Astronomy:
Why use space telescopes; other platforms for non-ground-based astronomical observatories (sounding rockets, balloons, satellites); mission case study; what wavelengths benefit by being in space; measurements astronomers make in space using UV, x-ray and infra-red, and examples of some recent scientific missions.

Exploration of the Solar System:
Mission types from flybys to sample returns: scientific aims and instrumentation: design requirements for a spacecraft-exploration mission; how to study planetary atmospheres and surfaces: properties of and how to explore minor bodies (e.g. asteroids and comets): current and future missions: mission case study; how space agencies liaise with the scientific community; how to perform calculations related to the orbital transfer of spacecraft.

Solar System Formation and Evolution:
The composition of the Sun and planets will be placed in the context of the current understanding of the evolution of the Solar System. Topics include: Solar system formation and evolution; structure of the solar system; physical and orbital evolution of asteroids.

Extra Solar Planets:
The evidence for extra Solar planets will be presented and reviewed. The implications for the development and evolution of Solar Systems will be discussed.

Life in Space:
Introduction to the issue of what life is, where it may exist in the Solar System and how to look for it.

PH711 Rocketry and Human Spaceflight

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	M	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours (Lectures and workshop sessions – does not include office contact hours): 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Aspects of the theory and practice of space science, and of those aspects upon which space science depends in relation to rocketry and Human Space Flight (a knowledge of key physics, especially for rocketry).
An understanding of relevant fundamental laws and principles of physics, along with their application to rocketry and human spaceflight.
An ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions.
An ability to solve problems in rocketry and human spaceflight using appropriate mathematical tools.
An ability to use mathematical techniques and analysis to model physical behaviour.
An ability to solve advanced problems in rocketry and human spaceflight using appropriate mathematical tools, to translate problems into mathematical statements and apply their knowledge to obtain order of magnitude or more precise solutions as appropriate.
An ability to interpret mathematical descriptions of physical phenomena.
An ability to present and interpret information graphically.
An ability to make use of appropriate texts, research-based materials, other primary sources or other learning resources as part of managing their own learning.

Other more specific learning outcomes:
To develop an appreciation of the design, construction and testing of space vehicles and their operation.
To understand the basic physiological changes the human body is subject to in space.
To develop an appreciation of the uses of space for science and by astronauts.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems; an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems. Numeracy is subsumed within this area.
Investigative skills in the context of independent investigation including the use of textbooks and other available literature and databases to extract important information.
Communication skills in the area of dealing with surprising ideas and difficult concepts, including listening carefully, reading demanding texts.
Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.

Method of Assessment

Two homework assignments (15% each, 10 hours each)
Examination (2 hours, 70%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

Recommended Text:
Fortescue, Stark and Swinerd, Spacecraft Systems Engineering, 3rd ed, Wiley, 2003 [TL875, 6 copies]
Wertz and Larson, Space Mission Analysis and Design, 3rd Edition, 1999 [TL 790]
Sutton, Rocket Propulsion Elements, 1992 [TL 782]
Sidi, Spacecraft Dynamics and Control, 1997 [TL 1050]

Background reading (In addition, a fuller reading list will be distributed in the lectures):
McNamara: Into the Final frontier, Harcourt, 2000 [qTL873]
Nicogossian, Huntoon and Pool: Space Physiology and Medicine, Lea & Febiger, 1994 [RC1150]
Turner: Rocket and Spacecraft Propulsion, Praxis, 2000 [TL782]

Pre-requisites

Prerequisite:
PHYS5080 Spacecraft Design and Operations

Synopsis *

Flight Operations: Control of spacecraft from the ground, including aspects of telecommunications theory.
Propulsion and attitude control: Physics of combustion in rockets, review of classical mechanics of rotation and its application to spacecraft attitude determination and control.
Impact Damage: The mechanisms by which space vehicles are damaged by high speed impact will be discussed along with protection strategies.
Human spaceflight: A review of human spaceflight programs (past and present). Life-support systems. An introduction to some major topics in space medicine; acceleration, pressurisation, radiation, etc.
International Space Station: Status of this project/mission will be covered.

PH722 Particle and Quantum Physics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	M	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
Ability to identify relevant physical principles, make mathematical descriptions or approximations and solve problems using a mathematical approach.
Familiarity with how particle physics experiments work.
Ability to discuss particle physics in the language of particles and fields.
An understanding of the formalism of quantum mechanics and the ability to cast physical problems into it and solve them.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have the knowledge and understanding of:
Enhancement of problem solving abilities, particularly mathematical approaches to problem solving.
To use appropriate sources as part of directed self-learning.
Enhancement of the ability to interpret theory.
An improved ability to manipulate precise and complex ideas and to construct logical arguments.

Method of Assessment

Assignment 1 (10hour, 15%)
Assignment 2 (10hour, 15%)
Examination (70%)

Preliminary Reading

B. R. Martin, Nuclear and Particle Physics, Wiley (2006)
Bettini, Introduction to Elementary Particle Physics (QC794.6.575)
S. McMurry, Quantum Mechanics, Prentice-Hall (1993)
M. Thomson, Modern Particle Physics (2013)
F. Mandl, Quantum Mechanics, Wiley (1992)

Pre-requisites

Prerequisites:
PHYS5020 Quantum Physics
PHYS5030 Atomic Physics

Synopsis *

• Approximation Methods, perturbation theory, variational methods.
• Classical/Quantum Mechanics, measurement and the correspondence principle.
• Uncertainty Principle and Spin precession.
• Key Experiments in Modern Quantum Mechanics (Aharonov-Bohm, neutron diffraction in a gravitational field, EPR paradox).
• Experimental methods in Particle Physics (Accelerators, targets and colliders, particle interactions with matter, detectors, the LHC).
• Feynman Diagrams, particle exchange, leptons, hadrons and quarks.
• Symmetries and Conservation Laws.
• Hadron flavours, isospin, strangeness and the quark model.
• Weak Interactions, W and Z bosons.

PH751 Research Review

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	M	15 (7.5)	100% Coursework	

Contact Hours

Total contact hours: 0
Private study hours: 150
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
An appreciation of the "state of the art" in a chosen focussed area of Physics.
An ability to explain complex physical arguments to an audience of experts.
An ability to make a critical analysis of specialist literature.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have:
An understanding at the frontier of knowledge in a subject.
An ability to make a critical analysis of published scientific literature.
Enhancement of the ability to interpret theory.
An ability to present information graphically and textually at an advanced intellectual level.
An ability to explain complex physical arguments to a scientifically literate, but non-specialist audience.
An ability to produce a substantial piece of independent work.

Method of Assessment

Assignment (80%)
Presentation (20%)

Preliminary Reading

Journal: Reviews of Modern Physics (American Physical Society)
Journal: Reports on Progress in Physics (Institute of Physics)
Journal: Condensed Matter Physics: Eds Seitz, Turnbull and Ehrenreich (Academic Press)
Journal: Astronomy and Astrophysics Review (Springer)

Pre-requisites

None.

Synopsis *

In consultation with a member of staff the student will choose a topic within any branch of physics for which appropriate supervision is available and write an article on that topic that would be suitable for publication in the scientific literature as a review article.

PH752 Magnetism and Superconductivity

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	M	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
An understanding of the underlying physics of magnets and superconductors.
An appreciation of the rich variety of physics dependent correlated electrons.
An ability to solve problems in the science of magnetism and superconductivity.
An appreciation of the role of magnets and superconductors in devices and industry.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Enhancement of problem solving abilities, particularly mathematical approaches to problem solving.
To use appropriate sources as part of directed self-learning.
Enhancement of the ability to interpret theory.
A deeper appreciation of the connection of the role played by fundamental science in society generally.

Method of Assessment

Assignment (15%)
Assignment (15%)
Examination (70%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

S. Blundell; Magnetism in Condensed Matter (2001).
J. F. Annett; Superconductivity, Superfluids and Condensates (2004).
R. M. White; Quantum theory of magnetism: magnetic properties of materials (2010).
P. G. de Gennes; Superconductivity of Metals and Alloys (1999).

Pre-requisites

Prerequisite: PHYS6060 Solid State Physics.

Synopsis *

Introduction. Magnetism, magnetometry and measuring techniques, Localised magnetic moments, spin and orbital moments, magnetic moments in solids. Paramagnetism. Exchange interactions, direct, indirect and superexchange, Magnetic structures, ferro, ferri, antiferromagnetism. Neutron and X-ray scattering. Spin waves, magnons. Magnetic phase transitions. Superconductivity: Introduction to properties of superconductors, Thermodynamics and electrodynamics of superconductors, Type I and Type II superconductors, the flux lattice Superconducting phase transitions. Microscopic superconductivity, correlations lengths, isotope effect, Cooper pairs, Froehlich Interaction, BCS theory. High Tc superconductors, superfluids, liquid helium.

PS501 Forensic Physical Methods

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	15 (7.5)	100% Coursework	
1	Canterbury	Whole Year	I	15 (7.5)	50% Coursework, 50% Exam	

Availability

This is not available as a wild module.

Contact Hours

Total Contact Hours: 50
Total Private Study Hours: 100
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Understand the role of physical forensic methods in forensic practice.
Demonstrate knowledge and critical awareness of the major physical forensic methods.
Display understanding of emerging developments in forensic science.
Assess, manage, and investigate a range of incident scenes
Recover, preserve, package and document evidential samples from a range of incident scenes to professional standards.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Understand the key areas of science and law that underpin forensic practice and methodology.
Understand the science and scientific methods underpinning forensic investigation and recovery of evidence.
Communicate complex scientific and forensic findings to a lay audience in written form.
Use problem solving, and information retrieval and handling.
Use team working and time management skills, and skills relevant to further study.

Method of Assessment

Online Quiz 1 (1 hour) – 15%
Online Quiz 2 (1 hour) – 15%
Case File – 70%
The online quizzes are compulsory sub-components and at least one must be passed in order to pass the module.

Preliminary Reading

Bevel, T. and Gardner, R.M. (2008). Bloodstain Pattern Analysis (Third Edition).CRC Press
Dutelle, A.W. (2013). Introduction to Crime Scene Investigation. Jones & Bartlett
Fraser, J. and Williams, R. (2009). Handbook of Forensic Science. London: Routledge
Saferstein, R. (2017). Criminalistics (An Introduction to Forensic Science). Harlow: Person Education, Prentice Hall.
White, P. (2004). Crime Scene to Court. Royal Society of Chemistry

Pre-requisites

None.

Synopsis *

This module will cover the following topics:
Evidential practice and law in relation to location, recovery, preservation, and interpretation of a wide range of forensic samples.
Statement and report writing to evidential standard.
Incident assessment and management in a wide variety of forensic environments.
Location, recovery and preservation of a range of forensic samples.
Incident mapping and photography.
Document and forgery analysis.
Modern and emerging forensic techniques

PS502 Forensic Archaeology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 22
Private study hours: 128
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate knowledge of the principle areas of forensic archaeology including dating, detection and osteology.
Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to forensic archaeology.
Apply such knowledge and understanding to the solution of problems.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Use problem-solving skills, relating to qualitative and quantitative information.
Apply numeracy and computational skills.

Method of Assessment

Assignment 1 (5 hours, 5%)
Assignment 2 (5 hours, 5%)
Assignment 3 (5 hours, 5%)
Assignment 4 (5 hours, 5%)
Exam (2 hours, 70%)

Preliminary Reading

Zumdahl, Chemical Principles
Byers, S. 2005. Introduction to Forensic Anthropology. London: Pearson/Allyn and Bacon
White, T.D. 2000. Human Osteology. San Diego, California, London: Academic Press Inc.
J. Hunter & M. Cox, 2005. Forensic Archaeology. Routledge, London, 2005 - chapter 3
E.W. Killam. 2004. The Detection of Human Remains. Charles Thomas, Springfield - chapters 5-8
T.L. Dupras, J.J. Schultz, S.M. Wheeler & L.J. Williams. 2006. Forensic Recovery of Human Remains
Taylor and Francis, Boca Raton - chapter 4
Clark. 1990. Seeing Beneath the Soil. Batsford, London
White, T.D., Black, M.T., Folkens, P.A. 2011. Human Osteology. San Diego, California, London: Academic Press Inc.

Pre-requisites

None.

Synopsis *

Dating: Radioactive decay and detection of radiation, radiocarbon dating and related methods, accelerator mass spectrometry, uranium series dating, potassium-argon dating, radioactive tracers, isotope dilution, neutron activation, stable isotope techniques with forensic applications, electron spin resonance spectroscopy, thermoluminescence dating and thermal history.
Detection: Magnetometry, metal detectors, resistivity surveys, ground penetrating radar, aerial photography, and remote sensing.
Osteology: The study of human osteology is fundamental to the discipline of forensic anthropology. This series of lectures begins by examining the structure, growth, and function of bones and teeth. Methods of skeletal analysis in forensic anthropology are then examined, including age, sex, stature, trauma, disease, and race. Applications in biological anthropology will also be reviewed.

PS511 Digital Forensics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	15 (7.5)	60% Exam, 40% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 40
Private study hours: 110
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Association of Chief Police Officer's guidelines for 'National Working Practices in Facial Imaging'
The main facial identification techniques used in criminal investigations
Practical experience of b) using facial composite software
Methods used in digital image forensics and their implementation in computer software
Aspects of digital forensics including: legislation to enforce appropriate computer use, cryptography for secret communication, network forensics and methods used to hide data on computer hardware and methods for retrieving it

The intended generic learning outcomes. On successfully completing the module students will be able to:
To use forensic software in relation to mock criminal investigations
To enhance skills in a laboratory environment
Ability to demonstrate knowledge and understanding of the essential facts, and concepts, relating to the subject area

Method of Assessment

Assignment 1 (6.6%) 2hr
Assignment 2 (6.6%) 2hr
Assignment 3 (6.7%) 2hr
Lab assignment 4 (6.7%) 2hr
Lab assignment 5 (6.7%) 2hr
Lab assignment 6 (6.7%) 2hr
Examination (60%) 2hr

Preliminary Reading

Crime Scene to Court, The Essentials of Forensic Science, 2nd edition, ed. P. White. Royal Society of Chemistry, 2004. ISBN: 0854046569
Digital Image Processing using Matlab, Gonzalez, Woods and Eddins, Pearson Prentice Hall, 2004
Handbook of Computer Crime Investigation, E. Casey, Academic Press, 2002

Pre-requisites

Prerequisite:
Successful completion of Stage 1 of a Forensic Science degree programme or equivalent experience.

Synopsis *

Facial Identification
Indicative topics are: Facial reconstruction, facial composites, description by witness – cognitive interview - Turnbull's rules (R v Turnbull, 1976), identity parades – psychology of facial identification – video identity parades, facial mapping, automated recognition technologies, age progression.

Digital Image Analysis
Indicative topics are: Image formation, image storage, image distortion, image restoration methods, the digital image in crime detection, steganography (implementation and detection).

Digital Forensics
Indicative topics are: Encryption, fallacies about hiding and destroying data, where to find data and methods for retrieving it, disk imaging, file integrity, cryptographic hashing, privacy vs need for investigation. Legislation relating to computer misuse.

PS512 Numerical, Statistical and Analytical Skills

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Whole Year	I	15 (7.5)	60% Exam, 40% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 47
Private study hours: 103
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Core and foundation scientific physical and chemical concepts, terminology, theory, units, conventions, and laboratory methods in relation to forensic science and the chemical sciences.
Areas of chemistry as applied to forensic analysis.
Numeracy (including data analysis and statistics).

Intellectual skills:
Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to the subject and to apply such knowledge and understanding to the solution of qualitative and quantitative problems.
Ability to recognise and analyse problems and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data.
Ability to recognise and implement good measurement science and practice and commonly used forensic laboratory techniques.

Subject-specific skills:
Skills in the safe handling of chemical materials, taking into account their physical and chemical properties, including any specific hazards associated with their use and to risk assess such hazards.
Skills required for the conduct of standard laboratory procedures involved in analytical work, and in the operation of standard instrumentation used in analysis and separation in forensic and chemical sciences.
Ability to interpret and explain data derived from laboratory observations and measurements in terms of their underlying significance and the theory underpinning them, including an assessment of limits of accuracy.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information.
Numeracy and computational skills, including such aspects as error analysis, order-of-magnitude estimations, correct use of units and modes of data presentation.
Information-retrieval skills, in relation to primary and secondary information sources, including information retrieval through on-line computer searches.
Information-technology skills such as word-processing and spreadsheet use, data-logging and storage, Internet communication, etc.
Time-management and organisational skills, as evidenced by the ability to plan and implement efficient and effective modes of working.
Generic skills needed for students to undertake further training of a professional nature.
Study skills needed for continuing professional development and preparation for employment.

Method of Assessment

Statistics Assignment – 10.0%
Analytical Skills Assignment – 9.6%
Lab 1 (3 hours) – 3.4%
Lab 2 (3 hours) – 3.4%
Lab 3 (3 hours) – 3.4%
Lab 4 (3 hours) – 3.4%
Lab 5 (3 hours) – 3.4%
Lab 6 (3 hours) – 3.4%
Examination (2 hours) – 60%

Preliminary Reading

Lucy, D. (2005). Introduction to Statistics for Forensic Scientists. Wiley.
Miller, J.N. and Miller, J.C. (2010). Statistics and Chemometrics for Analytical Chemistry, Sixth Edition. Pearson Prentice Hall
Monk, P. and Munro, L.J. (2010). Maths for Chemistry, Second Edition. OUP.
Rowntree, D. (2000). Statistics Without Tears. Penguin.
Scott, S.K. (1995). Workbooks in Chemistry Beginning Mathematics for Chemistry. OUP.
Spiegel, M.R. (2013). Schaum's Outline of Probability and Statistics, Fourth Edition. McGraw Hill.

Pre-requisites

Prerequisite:
Successful completion of Stage 1 of the Forensic Science or Chemistry degree programme, or equivalent.

Synopsis *

This module will cover the following topics:

Trace analysis: definitions, methods and problems. Sampling, storage and contamination. Quality control. Random and systematic errors; statistical treatment of data. Accuracy and precision. Signal/noise ratio. Sensitivity and detection limits. Choice of methods for trace analysis.
Units, dimensions, exponentials and logarithms: Decimal places and significant figures. Units and dimensions: SI units, dimensional analysis. Manipulation of exponentials and logarithms. Power laws. Exponential decay and half-life. Beer-Lambert law, Arrhenius equation, Boltzmann distribution, Gaussian functions.

Chemical Arithmetic: Balancing chemical equations. Amount of substance, molar quantities, concentration and volumetric calculations, gravimetric analysis, gas pressures and volumes.
Equilibrium calculations, strong and weak electrolytes pH, acid-base equilibria, buffer solutions. Solubility. Chemical kinetics: reaction rates, rate constants and orders of reaction.

Probability and Statistics: Elementary probability, probability spaces, Venn diagrams, independence, mutual exclusion, expectation. Quantitative treatment of the effect of evidence: Bayes' Theorem and conditional probability Samples and populations, mean, standard deviation, moments, standard error. Probability distributions: binomial, normal, poisson. Limiting cases. Use of normal tables. Significance testing and confidence limits. Hypothesis testing. The chi-squared test. A brief look at probability-based arguments used by expert witnesses, recent controversies and challenged convictions. Regression and correlation.

Laboratory work: Analysis of alkaloids by HPLC. Accelerant analysis by gas chromatography. Analysis of metal cartridge cases and counterfeit coins using X-ray fluorescence spectroscopy. Determination of copper by atomic absorption spectroscopy. Quantifying substances in a mixture using UV-visible spectroscopy. Isolation & purification of caffeine from tea leaves.

PS556 Firearms & Ballistics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	I	15 (7.5)	60% Exam, 40% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 51
Private study hours: 99
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
The internal working of a range of firearms.
Heat transfer within firearms.
How firearms can fail and why.
How sound and flash moderators operate.
In depth analyses of cartridge cases and bullets.
The different methods utilised for gunshot residue analyses.
Methods employed for serial number restoration of tampered with firearms.
The reconstruction of bullet trajectories from crime scene evidence.
Extrapolation of useful information from ballistic trauma.
The consideration of all evidence at a shooting scene to reconstruct possible scenarios.
The effect of fragments from Improvised Explosive Devices (IEDs) on the body and structures.
A consideration of how to take a multidisciplinary approach to ballistics.
Up-to-date research in the field of ballistics.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Have a knowledge and understanding of:
Building on the ballistics knowledge learned in PS324 – Introduction to Ballistics.
Increasing of students' general mathematical abilities.
The application of law to ballistics.
Develop practical skills in ballistics.
Writing of reports for different audiences.
To develop the skills required for employment in the ballistics field.

Method of Assessment

Assignment 1 (8%) - 3 hours
Assignment 2 (16%) - 1000 words
Assignment 3 (16%) - 1000 words
Examination (60%) - 2 hours

Preliminary Reading

Criminalistics (An introduction to Forensic Science), Richard Saferstein (2015), Prentice Hall. ISBN 0-13-013827-4
Understanding Firearm Ballistics, R.A. Rinker (2005). Mullberry Hs, USAISBN 0-9645598-4-6
Practical Skills in Forensic Science (2005), Pearson Press ISBN 0-131-14400-6
Wounds Ballistics and the Scientific Background (2011), Karl G. Sellier, Beat P. Kneubuehl, ISBN 0444815112
Wound Ballistics: Basics and Applications: Robin M Coupland, Beat P. Kneubuehl, Markus A Rothschild, Michael J Thali (2011), ISBN 3642203558

Pre-requisites

Prerequisite:
PSCI3240 Introduction to Ballistics

Synopsis *

Internal ballistics
Weapon failure
Suppressors
Cartridge case and bullet analyses
Gunshot residue analyses
Serial number restoration
Trajectory analyses
Wound ballistics
Shooting scene reconstruction
The effect of Improvised Explosive Devices (IEDs)
A multidisciplinary approach to ballistics
Modern Ballistics research

PS591 Industrial Placements Experience

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	90 (45)	Pass/Fail Only	

Availability

This is not available as a wild module.

Contact Hours

Students will spend between 9-12 months working at the organisation hosting their placement
Total study hours: 900

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Gain knowledge and understanding of aspects of the core subject areas from the perspective of a commercial or industrial organisation.
Apply intellectual skills specified for the programme and developed during the earlier stages of the programme from the perspective of a commercial or industrial organisation.
Apply subject-specific skills specified for the programme and developed during the earlier stages of the programme from the perspective of a commercial or industrial organisation.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Work effectively as a member of a professional team.
Make succinct presentations (in any form) to a range of audiences about technical problems and their solutions.
Make effective use of general IT facilities including information retrieval skills.
Depending on the requirements of the placement, understand and explain the quantitative dimensions of a problem.
Manage personal learning and development, including time management and organisational skills.
Appreciate the need for, and have engaged in, continuing professional development.

Method of Assessment

Assignment – Pass/Fail
Assignment – Pass/Fail

Preliminary Reading

None

Pre-requisites

Co-requisite:
PSCI5920 Industrial Placement Assessment

Progression

Passing of both PS591 and PS592 is required to progress on the relevant year in industry programme, otherwise, students will be continue on the relevant BSc programme without a year in industry.

Synopsis *

Students spend a year (minimum 9 months) working in an industrial or commercial setting, applying and enhancing the skills and techniques they have developed and studied in the earlier stages of their degree programme. The work they do is entirely under the direction of their industrial supervisor, but support is provided via a dedicated Placement Support Officer within the School. This support includes ensuring that the work they are being expected to do is such that they can meet the learning outcomes of the module.

PS592 Industrial Placement Assessment

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	30 (15)	100% Project	

Availability

This is not available as a wild module.

Contact Hours

Students will spend between 9-12 months working at the organisation hosting their placement
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Gain knowledge and understanding of aspects of the core subject areas from the perspective of a commercial or industrial organisation.
Apply intellectual skills specified for the programme and developed during the earlier stages of the programme from the perspective of a commercial or industrial organisation.
Apply subject-specific skills specified for the programme and developed during the earlier stages of the programme from the perspective of a commercial or industrial organisation.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Work effectively as a member of a professional team.
Make succinct presentations (in any form) to a range of audiences about technical problems and their solutions.
Make effective use of general IT facilities including information retrieval skills.
Depending on the requirements of the placement, understand and explain the quantitative dimensions of a problem.
Manage personal learning and development, including time management and organisational skills.
Appreciate the need for, and have engaged in, continuing professional development.
Reflect on the industrial placement experience and what they have learnt.

Method of Assessment

Assignment (approx 30 pages, 70%)
Presentation (20 mins, 30%)

Preliminary Reading

None

Pre-requisites

Co-requisite:
PSCI5910 Industrial Placement Experience

Progression

Passing of both PS591 and PS592 is required to progress on the relevant year in industry programme, otherwise, students will be continue on the relevant BSc programme without a year in industry.

Synopsis *

Students spend a year (minimum 9 months) working in an industrial or commercial setting, applying and enhancing the skills and techniques they have developed and studied in the earlier stages of their degree programme.
The report required for this module should provide evidence of the subject specific and generic learning outcomes, and of reflection by the student on them as an independent learner.

PS601 Fires and Explosions

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	15 (7.5)	80% Exam, 20% Coursework	

Availability

Not available as an elective module.

Contact Hours

Private Study: 128
Contact Hours: 22
Total: 150

Learning Outcomes

On successfully completing the module students will be able to:

1. Demonstrate broad knowledge and understanding of the physics and chemistry of fires and explosions.
2. Demonstrate wide-ranging knowledge and understanding of the principal areas of forensic investigation of fires and explosions.
3. Demonstrate extensive knowledge and understanding of the analysis and identification of accelerants, incendiary devices, explosives and explosive residues.
4. Safely and confidently manage fire and explosion scenes.
5. Demonstrate expansive knowledge and understanding of the observation and assessment of damage to buildings and vehicles, and injury to persons.
6. Accurately identify of the causes of fires and explosions, and their classification as natural, accidental, negligent or deliberate.

Method of Assessment

• Assignment 1 (4 hours) – 10%
• Assignment 2 (4 hours) – 10%
• Examination (3 hours) – 80%
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None.

Synopsis *

This module covers a range of core chemical science that relates to fire and explosive events. The applied investigation of such events is also discussed to give students a wider appreciation of previous case studies and the complexities of post-fire and post-blast investigations.

PS602 Forensic Expert Witness Skills

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	H	15 (7.5)	100% Coursework	

Availability

Not available as an elective module.

Contact Hours

Private Study: 138
Contact Hours: 12
Total: 150

Learning Outcomes

On successfully completing the module students will be able to:

1. Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to Forensic Science.
2. Present scientific material and arguments clearly and correctly, in writing and orally, to a range of audiences.

Method of Assessment

• Writing an Expert Witness Report (25 pages) – 40%
• Poster (1 page) – 20%
• Defending an Expert Witness Report (10 minutes) – 40%

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None.

Synopsis *

This module focuses on various aspects of science communication to the public, including the creation of general interest posters, before guiding students through the processes associated with the presentation of evidence to the courts as an expert witness. This concludes with a cross-examination process in a realistic courtroom environment.

PS620 Forensic Science Project

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	30 (15)	100% Project	

Availability

Not available as an elective module.

Contact Hours

Private Study: 180
Contact Hours: 120
Total: 300

Learning Outcomes

On successfully completing the module students will be able to:

1. Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to Forensic Science.
2. Demonstrate skills in presenting scientific material and arguments clearly and correctly, to a range of audiences.
3. Demonstrate competence in the planning, design and execution of research investigations, from the problem-recognition stage through to the evaluation and appraisal of results and findings; this to include the ability to select appropriate techniques and procedures.

Method of Assessment

- Supervisor Mark – 20%
- Progress Report (2 pages)
- Presentation (10 minutes) – 20%
- Dissertation (6,000 words) – 50%

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None.

Synopsis *

This module will include the following:

- Development of a project topic and carrying out independent research.
- Complete management of the project.
- Writing a literature review of the selected area of investigation.
- Writing a progress report.
- Performing an investigation in a group setting with minimal supervision.
- Giving a presentation.
- Writing a project report.

PS637 DNA Analysis & Interpretation

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	15 (7.5)	60% Exam, 40% Coursework with Compulsory Numeric Elements	
1	Canterbury	Whole Year	H	15 (7.5)	80% Exam, 20% Coursework with Compulsory Numeric Elements	

Availability

Not available as an elective module.

Contact Hours

Private Study: 122
Contact Hours: 28
Total: 150

Learning Outcomes

On successfully completing the module students will be able to:

1. Demonstrate knowledge and understanding of core biological concepts, terminology, theory, units, conventions, and methods, including knowledge of cells, biochemistry and human DNA;
2. Demonstrate knowledge and understanding of concepts, principles & theories of DNA & forensic genetics, and ability to apply such knowledge and understanding to the solution of qualitative and quantitative problems in the area of DNA;
3. Use skills required for, and knowledge of, the analysis of forensic DNA;
4. Interpret data derived from laboratory observations and measurements in terms of their underlying significance and the theory underpinning them;
5. Display skills in the safe handling of chemicals, taking into account their physical and chemical properties, including any hazards associated with their use and to risk assess such hazards.

Method of Assessment

• Genotyping Exercise (2 pages) – 10%
• Lab Write-up (2 pages) – 10%
• Examination (3 hours) – 80%
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None.

Synopsis *

This module comprises a range of contemporary topics covering methods of analysis and the interpretational issues associated with forensic DNA profiling. The materials take students through the evolution of forensic DNA processes and the practical issues of sample collection, processing and storage, DNA theory and practical DNA processing. Students will appreciate the difficulties associated with mixed samples and the statistical interpretation associated with both single source and mixture interpretation. The module draws upon the latest materials published by the Forensic Science Regulator and the latest quality and legal standards associated with DNA profiling. The module is contextualised throughout using a range of contemporary case studies.

PS700 Physical Science Research Investigation

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
3	Canterbury	Whole Year	M	15 (7.5)	100% Project	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours 35
Private study time 115
Total study hours 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Demonstrate an ability to identify relevant principles and laws when dealing with problems, and to make approximations necessary to obtain solutions.
Demonstrate an ability to execute and analyse critically the results of an experiment or investigation and draw valid conclusions. To evaluate the level of uncertainty in these results and compare them with expected outcomes, theoretical predictions or with published data; thereby to evaluate the significance of their results in this context.
Demonstrate competent use of appropriate C&IT packages/systems for the analysis of data and the retrieval of appropriate information.
Demonstrate an ability to present and interpret information graphically.
Demonstrate an ability to communicate scientific information, in particular to produce clear and accurate scientific reports.
Demonstrate an ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.
MPhys/MSci/MSc students:- Demonstrate an ability to communicate complex scientific ideas, the conclusion of an experiment, investigation or project concisely, accurately and informatively.
MPhys/MSci/MSc students:- Demonstrate an ability to make use of research articles and other primary sources.

The intended generic learning outcomes. On successfully completing the module students will be able to:
Demonstrate investigative skills in the context of independent investigation including the use of textbooks and other available literature, databases, and the interaction with colleagues to extract important information.
Demonstrate communication skills in the area of dealing with surprising ideas and difficult concepts, including listening carefully, reading demanding texts and presenting complex information in a clear and concise manner. C&IT skills are an important element to this.
Demonstrate analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
Demonstrate personal skills – the ability to work independently and as part of a group, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.
Demonstrate self-direction and originality in applying and adapting problem-solving skills to unfamiliar, complex and open-ended situations.
Demonstrate the independent learning ability required for continuing professional development.
Establish advanced research skills needed at a postgraduate level or graduate level in other sectors.
Demonstrate the capacity to undertake advanced scientific investigations, advanced problem solving and data analysis in a research environment.

Method of Assessment

100% coursework. The coursework assesses student's familiarity with and ability to implement current research methods. Preparation of their coursework will require independent, original problem solving while planning carefully for the time available and to present their work in a professional manner.

Colloquium Report 1 (10 hours) 20%
Colloquium Report 2 (10 hours) 20%
Application outline (4 hours) 10%
Group Research Project (30 hours) 40%
Poster Presentation of Project (10 hours) 10%

Preliminary Reading

http://www.epsrc.ac.uk/
http://www.scitech.ac.uk

On writing proposals:
https://www.epsrc.ac.uk/funding/howtoapply/preparing

FOR WRITING A FUNDING PROPOSAL
http://www.learnerassociates.net/proposal/
http://www.learnerassociates.net/proposal/

Pre-requisites

None.

Synopsis *

Students will develop a number of skills related to the investigation and planning of research such as analytical skills, critical thinking and ability to understand and communicate scientific information in graphically. Students will learn how to search and retrieve information from a variety of locations (colloquia, websites, journals, proceedings etc). They will learn how to compile professionally-produced scientific documents such as colloquia reports, posters and applications for funding of future research activities/research job applications. The Group research investigation strengthens these skills, adding experience of working in a team.

PS701 Topics in Functional Materials

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	M	15 (7.5)	80% Exam, 20% Coursework	

Availability

This is not available as a wild module.

Contact Hours

Total contact hours: 31
Private study hours: 119
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
Have:
A systematic understanding and a critical awareness of some current topics of interest in materials research.
A understanding of techniques applicable for synthesis and purification of materials.
A understanding of techniques applicable for chemical and physical characterisation methods of materials.
A critical awareness of the applications of materials in industry.
A systematic understanding of knowledge relating to materials.
An ability to apply the knowledge to solve problems in materials.
An understanding of the fundamental phenomena of the electronic structure of materials.
An appreciation of the key driving forces in nanoscience and knowledge of selected important nanomaterials

The intended generic learning outcomes.On successfully completing the module students will be able to:
Have:
Problem-solving skills, in the context of both problems with well-defined solutions and open-ended problems, extending to situations where evaluations have to be made on the basis of limited information.

Method of Assessment

Assignment 1 (3-4 pages, 6.67%)
Assignment 2 (3-4 pages, 6.67%)
Assignment 3 (3-4 pages, 6.67%)
Examination, 3 hours (80%)

Preliminary Reading

• Dieter Vollath "Nanomaterials", Wiley, 2013
• Anthony R. West “Solid State Chemistry and Its Applications”, Wiley, 2014
• Richard J. D. Tilley “Defects in Solids”, Wiley, 2008
• Richard M. Martin “Electronic Structure”, Cambridge University Press, 2008

Pre-requisites

None.

Synopsis *

Chemists and physicists are now playing an important role in the growing field of materials research. More recently, there has been a growing interest, driven by technological needs, in materials with specific functions and this requires a combination of physics and chemistry. For example, new materials are needed for the energy industry (batteries and photovoltaics), for the optics and electronics industry (glasses and semiconductors). The aim of this module is to introduce students to this area of modern materials and associated techniques. Examples of the topics that might typically be covered are: Crystal growth and defects; Liquid crystals; Nanomaterials; Glases; Magnetism and Magnetic Materials; Multiferroics; X-ray absorption spectroscopy (XAS).

PS713 Substances of Abuse

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	M	15 (7.5)	70% Exam, 30% Coursework	

Availability

Not available as an elective module.

Contact Hours

Private Study: 128
Contact Hours: 22
Total: 150

Learning Outcomes

On successfully completing the module students will be able to:

1. Demonstrate comprehensive knowledge and understanding of the theoretical chemistry of the principles of analysis and identification of several chemicals that are related to substances of abuse.

Method of Assessment

• Scientific Presentation (15 minutes) – 15%
• Case Study Presentation (5 minutes) – 10%
• Assignment – 5%
• Examination (3 hours) – 70%
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None.

Synopsis *

This module will allow students to develop knowledge of elements of synthetic organic chemistry and medicinal chemistry which are relevant to substances of abuse, and the theoretical chemistry and principles of analysis and identification of several substances that are substances of abuse. The following are indicative:

• Amphetamines and related compounds
• LSD and related compounds
• Cannabis and Cannabis products
• Opiate compounds
• Cocaine and related compounds
• Certain controlled pharmaceutical drugs

PS720 Advanced Project Laboratory

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
3	Canterbury	Whole Year	M	30 (15)	55% Project, 45% Coursework	

Availability

Not available as an elective module.

Contact Hours

Private Study: 258
Contact Hours: 42
Total: 300

Learning Outcomes

On successfully completing the module students will be able to:

1. Demonstrate knowledge and understanding of core scientific physical, biological, and chemical concepts, terminology, theory, units, conventions and laboratory methods in relation to forensic science and/or chemistry.
2. Demonstrate knowledge and understanding of advanced theory, concepts, and practice in chemical identification techniques.
3. Demonstrate knowledge and understanding of areas of chemistry (including analytical chemistry), numeracy (including data analysis and statistics), forensic investigation and interpretation (including the extraction, analysis, interpretation of physical evidence).
4. Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to the subject and to apply such knowledge and understanding to the solution of qualitative and quantitative problems.
5. Demonstrate the ability to recognise and solve scientific problems at an advanced level.
6. Demonstrate the ability to recognise and implement good measurement science and practice and commonly used forensic/chemical laboratory techniques.
7. Demonstrate the ability to select the most appropriate techniques for a given analysis and to use a wide range of advanced apparatus.
8. Demonstrate skills in the safe handling of chemical materials, taking into account their physical and chemical properties, including any specific hazards associated with their use and to risk assess such hazards.
9. Demonstrate the skills required for the conduct of standard laboratory procedures involved in analytical work and in the operation of standard chemical identification instrumentation such as that used for analytical investigations and separation.
10. Demonstrate the ability to interpret data derived from laboratory observations and measurements in terms of their significance and the theory underlying them.

Method of Assessment

• Experiment 1 (equivalent to 1,000 words) – 7.5%
• Experiment 2 (equivalent to 1,000 words) – 7.5%
• Experiment 3 (equivalent to 1,000 words) – 7.5%
• Experiment 4 (equivalent to 1,000 words) – 7.5%
• Experiment 5 (equivalent to 1,000 words) – 7.5%
• Experiment 6 (equivalent to 1,000 words) – 7.5%
• Detailed Literature Review Outline (1,000 words) – 15%
• Presentation (15 minutes) – 15%
• Literature Review Dissertation (5,000 words) – 25%

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None.

Synopsis *

This module comprises a range of contemporary topics covering methods of analysis and the interpretational issues associated with forensic DNA profiling. The materials take students through the evolution of forensic DNA; RFLP, Quad and the progression of DNA multiplexes to the present day and the practical issues of sample collection, processing and storage, DNA theory and practical DNA processing. Students will appreciate the difficulties associated with mixed samples and the statistical interpretation associated with both single source and mixture interpretation. The module draws upon the latest materials published by the Forensic Science Regulator and the latest quality and legal standards associated with DNA profiling. The module is contextualised throughout using a range of contemporary case studies.

PS740 Forensic Science Research Project MSCI

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	M	60 (30)	100% Project	

Availability

Not available as an elective module.

Contact Hours

Private Study: 358
Contact Hours: 242
Total: 600

Learning Outcomes

On successfully completing the module students will be able to:

1. Build on the research independence gained in Stage 3 as part of PSCI7200 (Advanced Forensic Science Laboratory).
2. Establish advanced research skills in Forensic Science at Level 7.
3. Have the capacity to undertake advanced scientific investigations, advanced problem solving and data analysis in a research environment.
4. Have the ability to communicate scientific ideas through presentations and written reports.
5. In conjunction with PSCI7000 (Physical Science Research Planning) to gain knowledge of how research is structured and funded.

Method of Assessment

- Progress Report (Approx. 4 pages) – 10%
- Presentation (20 minutes) – 20%
- Supervisor Assessment – 20%
- Project Report (Approx. 40 pages) – 50%

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None.

Synopsis *

Students will undertake a project from an available project listing and will work under the guidance of a supervisor. The student will be encouraged to develop some level of research independence within the project remit appropriate of a Level 7 Masters' student. The project will be assessed on a number of criteria which will include the project work (the amount, quality etc. appropriate for the level), effort put in by the student.

15 School of Computing

CO324		Computer Systems				
Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	C	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	C	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	C	15 (7.5)	80% Exam, 20% Coursework	
1	Medway	Autumn	C	15 (7.5)	50% Coursework, 50% Exam	
1	Medway	Autumn	C	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 26
Private study hours: 124
Total study hours: 150

Department Checked

Yes

Learning Outcomes

8. The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
8.1 Describe the purpose of, and the interaction between, the functional hardware and software components of a typical computer system.
8.2 Identify the principal hardware and software components which enable functionality and connectivity of systems ranging in scale from the global Internet down to tiny embedded systems like those that empower the Internet of Things.
8.3 Appreciate the principles and technologies behind the Internet, including layered architectures, and how this can be used to deliver effective network services.
8.4 Describe how networks and other computer hardware interact with operating systems, and can be shared between different programs and computers.
8.5 Assess the likely environmental impact of basic decisions involving computer hardware.

9. The intended generic learning outcomes.
On successfully completing the module students will be able to:
9.1 Communicate their understanding of basic computer hardware and software. □
9.2 Develop their understanding of how network technologies underpin the Internet.
9.3 Evaluate how computer hardware and software interact to deliver functionality and services at both small and large scales.

Method of Assessment

13. Assessment methods
13.1 Main assessment methods
Canterbury and Medway
Coursework 50%
(Test) A1 In-class Test (12.5%)
(Test) A2 In-class Test (12.5%)
(Test) A3 In-class Test (12.5%)
(Test) A4 In-class Test (12.5%)
2-hour unseen examination 50%

13.2 Reassessment methods
Like for like assessment

Preliminary Reading

McLoughlin, Ian Vince (2011) Computer Architecture: an embedded approach. McGraw-Hill, 512 pp. ISBN 9780-071311-182
Tanenbaum, Andrew & Bos, Herbert (2014) Modern Operating Systems (4th Edition). Pearson Education, 1136 pp. ISBN 978-0133591-620
Kurose, James and Ross, Keith (2009) Computer networking: a top-down approach (5th Edition). Pearson Education, ISBN 978-0131365-483
Mueller, Scott (2012) Upgrading and repairing PCs (20th ed onwards). QUE Press ISBN 978-0-7897-3954-4

Pre-requisites

None

Synopsis *

This module aims to provide students with an understanding of the fundamental behaviour and components (hardware and software) of a typical computer system, and how they collaborate to manage resources and provide services in scales from small embedded devices up to the global internet. The module has two strands: 'Computer Architecture' and ‘Operating Systems and Networks’. Both strands contain material which is of general interest to computer users; quite apart from their academic value, they will be useful to anyone using any modern computer system.

CO520 Further Object-Oriented Programming

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	100% Coursework	
1	Canterbury	Spring	I	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	
1	Medway	Autumn	I	15 (7.5)	100% Coursework	
1	Medway	Spring	I	15 (7.5)	100% Coursework	
1	Medway	Spring	I	15 (7.5)	50% Coursework, 50% Exam	

Contact Hours

Total contact hours:44
Private study hours: 106
Total study hours: 150

Department Checked

Yes

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1 Use advanced features of an object-oriented programming language, such as inheritance and graphical libraries, to write programs.
2 Use object-oriented analysis, design and implementation with a minimum of guidance, to recognise and solve practical programming problems involving inheritance hierarchies.
3 Design appropriate interfaces between modular components.
4 Evaluate the quality of competing solutions to programming problems.
5 Evaluate possible trade-offs between alternative solutions, for instance those involving time and space differences.
6 Thoroughly test solutions to programming problems.
7 Discuss the quality of solutions through consideration of issues such as encapsulation, cohesion and coupling.

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1 Make appropriate choices when faced with trade-offs in alternative designs.
2 Recognise and be guided by social, professional and ethical issues and guidelines and the general contexts in which they apply.
3 Deploy appropriate theory and practices in their use of methods and tools.

Method of Assessment

Main assessment methods
100% Coursework

Reassessment methods
100% Coursework

Preliminary Reading

"Objects first with Java – A practical introduction using BlueJ", David J. Barnes and Michael Kölling, Pearson Education, 2017, ISBN 978-1-292-15904-1.

Pre-requisites

COMP3200: Introduction to Object-Oriented Programming

Synopsis *

This module builds on the foundation of object-oriented design and implementation found in CO320 to provide both a broader and a deeper understanding of and facility with object-oriented program design and implementation. Reinforcement of foundational material is through its use in both understanding and working with a range of fundamental data structures and algorithms. More advanced features of object-orientation, such as interface inheritance, abstract classes, nested classes, functional abstractions and exceptions are covered. These allow an application-level view of design and implementation to be explored. Throughout the course, the quality of application design and the need for a professional approach to software development is emphasised.

CO527 Operating Systems and Architecture

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Spring	I	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 24
Private study hours: 126
Total study hours: 150

Learning Outcomes

On successfully completing the module students will be able to:
Have an appreciation of modern computer architecture.
Understand the operation of computer systems, both at the hardware and software level, and understand the relationship between hardware and software within the system as a whole.
Understand the need for operating systems and be aware of their overall structure.
Be able to identify and explain issues relating to performance of systems and user programs.
Understand hardware support for high level languages and be aware of the relationship between compilers, compiled code and the operating system, and its effect on performance.
Be able to understand and modify existing operating systems as necessary. [

Method of Assessment

Main assessment methods

A1 – On line quiz (10%)
A2 – Practical class (10%)
A3 – Assessment, 10 hours (20%)
Two-hour examination (60%)

Preliminary Reading

Introduction to Operating Systems: Behind the Desktop, John English. Published by Palgrave Macmillan, 2004. ISBN 0-333-99012-9.
Structured Computer Organization (International Edition), 6th edition, Andrew S Tanenbaum and Todd Austin. Published by Pearson, 2012. ISBN 0-273-76924-3.
Applied Operating System Concepts (most variants), Abraham Silberschatz, Peter Galvin and Greg Gagne. Published by John Wiley and Sons Inc. 1999. ISBN 0-471-36508-4

Pre-requisites

Pre-requisites: COMP3240: Computer Systems or equivalent background knowledge for direct-entry students
COMP3200: Introduction to Object-Oriented Programming

Synopsis *

This module aims to provide students with a more in-depth understanding of the fundamental behaviour and components (hardware and software) of a typical computer system, and how they collaborate to manage resources and provide services. It will consider systems other than the standard PC running Windows, in order to broaden students' outlook. The module has two strands: "Operating Systems" and "Architecture", which each form around 50% of the material.

CO528 Introduction to Intelligent Systems

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	I	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	I	15 (7.5)	80% Exam, 20% Coursework	
1	Medway	Autumn	I	15 (7.5)	50% Coursework, 50% Exam	
2	Canterbury	Autumn	I	15 (7.5)	50% Coursework, 50% Exam	

Availability

Autumn or Spring

Contact Hours

Total contact hours: 28
Private study hours:122
Total study hours: 150

Department Checked

Yes

Learning Outcomes

On successfully completing the module students will be able to:
1. Explain the motivation for designing intelligent machines, their implications and associated philosophical issues, such as the nature of intelligence and learning.
2. Describe and apply the main kinds of state-space search algorithms, considering their strengths and limitations.
3. Explain the main concepts and principles associated with different kinds of knowledge representation, such as logic, case-based representations, and subsymbolic/connectionist representations.
4. Explain the differences between the major kinds of machine learning problems – namely supervised learning, unsupervised learning and reinforcement learning – and describe and implement the basic ideas of algorithms for solving those problems.
5. Describe the main concepts and principles of major kinds of biologically-inspired algorithms, and understand and implement one such technique.
6. Describe how various intelligent-system techniques have been used in the context of several case studies, and compare different techniques in the context of those case studies.

Method of Assessment

13.1 Main assessment methods
A1 – Practical assignment (25%)
A2 – Practical assignment (25%)
2 hour unseen written examination (50%)

13.2 Reassessment methods
Like for like

Preliminary Reading

S.J. Russell & P. Norvig, "Artificial Intelligence: A modern approach", 2nd Edition. Prentice-Hall, 2002. (main textbook)
S. Pinker. "How the Mind Works", W.W. Norton & Company, 1999.
A. Cawsey, “The Essence of Artificial Intelligence”, Prentice-Hall, 1998.
P. Bentley. “Digital Biology”, Simon & Schuster, 2002
R.L. Haupt & S.E. Haupt, “Practical Genetic Algorithms”, 2nd edition, Wiley, 2004.
S. Haykin, “Neural Networks and Learning Machines”, 3rd Edition. Pearson, 2009.

Pre-requisites

COMP5200: Further Object-Oriented Programming
or COMP5230: Fundamentals of Programming and Logic
or COMP3590: Programming for Artificial Intelligence

Synopsis *

This module covers the basic principles of machine learning and the kinds of problems that can be solved by such techniques. You learn about the philosophy of AI, how knowledge is represented and algorithms to search state spaces. The module also provides an introduction to both machine learning and biologically inspired computation.

CO532 Database Systems

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	I	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Spring	I	15 (7.5)	80% Exam, 20% Coursework	
1	Medway	Spring	I	15 (7.5)	50% Coursework, 50% Exam	
1	Medway	Spring	I	15 (7.5)	60% Exam, 40% Coursework	
1	Medway	Spring	I	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 28
Private study hours: 122
Total study hours: 150

Department Checked

Yes

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1 Understand the characteristics, strengths and limitations of current database systems [A2, A5].
2 Undertake self-directed background research in the module topics [B9], synthesise information collected from a variety of sources, including other modules [B1, B3], discuss database and data management issues with their peers and with nonspecialists [B2, D2].
3 Specify, design, implement and evaluate database solutions [C1, C2, C3], perform data manipulation and information retrieval operations [A2, C2].

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1 The module will extend IT skills to cover a key area that is not addressed in other parts of their programme. In particular, students will extend their ability to make effective use of modern information system environments. The module will also contribute to development of: self-management, adjust the pace and goals of their work to meet deadlines [D5]; oral and written communication [D2]; Internet-based information retrieval [D3].

Method of Assessment

Main assessment methods
Coursework : 50%
2-hour unseen examination (50%)

Reassessment methods
Like for like.

Preliminary Reading

C.J. Date An Introduction to Database Systems, 8th Edition, Addison Wesley, 2004.
T M Connolly & C E Begg, Database systems : a practical approach to design, implementation and management, 6th edition, Addison Wesley, 2015
R Elmasri, M Shamkant & B Navathe, Fundamentals of database systems, 7th edition, 2017
N S Ryan & D J Smith, Database Systems Engineering, Thompson, 1995.

Pre-requisites

COMP3230: Databases and the Web
or COMP5230 Fundamentals of Programming and Logic

Synopsis *

This module provides an introduction to the theory and practice of database systems. It extends the study of information systems in Stage 1 by focusing on the design, implementation and use of database systems. Topics include database management systems architecture, data modelling and database design, query languages, recent developments and future prospects.

CO600 Project

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	30 (15)	100% Project	
1	Canterbury	Whole Year	H	30 (15)	95% Project, 5% Coursework	
1	Medway	Whole Year	H	30 (15)	100% Project	
2	Canterbury	Whole Year	H	30 (15)	100% Project	
2	Medway	Whole Year	H	30 (15)	100% Project	

Availability

Autumn and Spring

Contact Hours

Total contact hours: 28
Private study hours: 272
Total study hours: 300

Department Checked

Yes

Learning Outcomes

8. The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
8.1 Understand particular technical topics in depth (for instance, use of a particular programming language, or software development tool, component architecture or mathematical technique) beyond that obtainable from the rest of the programme.
8.2 demonstrate an enhanced understanding (gained from practical experience) of project organisation, implementation, analytical skills and documentation techniques (as studied in other courses).
8.3 specify, design and implement a computer-based system that meets a real need;
8.4 evaluate and choose between potential solutions to a technical problem;
8.5 evaluate and deploy appropriate tools and techniques and demonstrate a degree of innovation and/or creativity

9. The intended generic learning outcomes.
On successfully completing the module students will be able to:
9.1 Appreciate the dynamics of working in a group
9.2 Demonstrate oral presentation skills
9.3 Write a technical report
9.4 Acquire technical knowledge and understanding in an independent fashion.
9.5 Critically evaluate and reflect on work performed
9.6 Manage their time and resources effectively

Method of Assessment

Main assessment methods
Project, assessed via several deliverables including a technical report and corpus, and an individual reflective report (272 hours) (100%)

Reassessment methods
Reassessment Instrument: 100% project

Preliminary Reading

None

Pre-requisites

None

Synopsis *

Students, working in small groups, undertake a project related to computer science and/or software engineering. The project may be self-proposed or may be selected from a list of project proposals. A project will involve the specification, design, implementation, documentation and demonstration of a technical artefact, demonstrating the ability to synthesise information, ideas and practices to provide a quality solution together with an evaluation of that solution.

CO620 Research Project

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	30 (15)	100% Project	
1	Medway	Whole Year	H	30 (15)	100% Project	

Availability

Combined Autumn and Spring

Contact Hours

Total contact hours: 26
Private study hours: 274
Total study hours: 300

Department Checked

Yes

Learning Outcomes

On successfully completing the module students will be able to:
1 demonstrate an in depth understanding of particular technical topics (for instance, use of a particular programming language, or software development tool, component architecture or mathematical technique) beyond that obtainable from the rest of the programme.
2 Apply practical and analytical skills present in the programme as a whole to a research topic that addresses a real need, and demonstrate significant innovation and/or
creativity
3 apply an appropriate research process to a substantial piece of work.

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1 appreciate the open-ended nature of research problems and of effective ways of tackling such problems.
2 Demonstrate oral presentational skills
3 Write a technical report, and demonstrate the ability to synthesise information, ideas and practices to provide a quality solution
4 acquire technical knowledge and understanding in an independent fashion
5 reflect on and critically evaluate work performed.
6 Manage their time and resources effectively

Method of Assessment

Main assessment methods
Project (including 8000 word technical report, poster, presentation, and short reflective report) - 100%

Reassessment methods
100% project

Preliminary Reading

None

Pre-requisites

None

Synopsis *

As a research project, this module is normally aimed at students who are achieving at upper second class level and above, and who may be intending to undertake research following graduation. Each student undertakes a project related to computer science and/or software engineering. The project may be self-proposed or may be selected from a list of project proposals. A project will involve background study and working on an open-ended research problem.
A small number of introductory lectures are given at the start of the project.

CO633 Computer Networks and Communications

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	65% Exam, 35% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	75% Exam, 25% Coursework	
1	Canterbury	Spring	H	15 (7.5)	60% Exam, 40% Coursework	

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
1 Have a comprehensive and systematic understanding of current network architectures, their individual protocol layers, including the algorithms employed.
2 Be able to analyse the specification for a protocol and develop software that implements a simple protocol.
3 Be aware of performance issues in general and/or analytical terms, and of the trade-offs involved.
4 Have a deeper understanding of selected key topics at the forefront of this field, including recent developments and outstanding issues.

Method of Assessment

Main assessment methods
40% Coursework and 60% Examination

Preliminary Reading

Computer Networks (Fourth Edition), Andrew S. Tanenbaum, Prentice Hall, 2002
Data and Computer Communications (7th International Edition), William Stallings, Prentice Hall, 2004
Data Communications and Networking (3rd International Edition), Behrouz A. Forouzan, McGraw-Hill, 2003
Business Data Communications and Networking (8th International Edition), Jerry Fitzgerald and Alan Dennis, Wiley, 2004

Pre-requisites

COMP3220: Foundations of Computing I
COMP3240 Computer Systems or COMP3370 Computers and the Cloud
COMP3250 Foundations of Computing II
COMP5200 Further Object-Oriented Programming

Synopsis *

The module starts with a comprehensive and detailed study of current computer networks and communications technologies. It includes: a review of network techniques, switching and multiple access; high speed local area networks; network protocols, including data link, network, transport and application layers. A selection of key topics are looked at in greater depth to reveal the state-of-the-art and issues (problems) that remain to be solved.

CO634 Computer Security and Cryptography

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Spring	H	15 (7.5)	80% Exam, 20% Coursework	
1	Medway	Autumn	H	15 (7.5)	70% Exam, 30% Coursework	

1	Medway	Autumn	H	15 (7.5)	80% Exam, 20% Coursework
1	Medway	Spring	H	15 (7.5)	80% Exam, 20% Coursework

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Department Checked

Yes

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1 have an understanding of the algorithms used in cryptography and be able to perform implementations of selected algorithms in this area [A2][C1];
2 have an understanding of the threats faced by computer operating systems, applications and networks and the various countermeasures that can be used [A1][A3];
3 be able to make informed choices of the appropriate security measures to put into place for a given network and/or operating system [C2][B5];
4 have an understanding of how cryptography can be used for providing security within applications.

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1 be able to apply relevant mathematical techniques [D4].
2 be able to analyse a problem specification and to design and implement a solution [B3][B4][D3].
3 to be aware of the relevant professional, ethical and legal issues in this subject area [B6].
4 be able to develop their own time management and organisational skills. [D5].

Method of Assessment

Main assessment methods
70% Examination and 30% Coursework

Reassessment methods
Like for like

Preliminary Reading

Charles P. Pfleeger , "Security in Computing ", 2nd ed. , September 1996, Prentice Hall William Stallings, "Cryptography and Network Security : Principles and Practice", 2nd ed. , July 1998, Prentice Hall
Rita C. Summers, "Secure Computing : Threats and Safeguards", January 1997, McGraw Hill
Bruce Schneier , "Applied Cryptography : Protocols, Algorithms, and Source Code in C", 2nd ed., December 1995, John Wiley & Sons
Jonathan Knudsen , "Java Cryptography", May 1998, O'Reilly & Associates
Scott Oaks, "Java Security", May 1998, O'Reilly & Associates
Ingemar Cox, Matthew Miller & Jeffrey Bloom, "Digital Watermarking: Principles and Practice", 2003, Morgan Kaufman.

Pre-requisites

Pre-requisite:
COMP3240 Computer Systems or COMP3370 Computers and the Cloud
COMP5270 Operating Systems and Architecture or COMP5570 Computer Systems
Module not to be taken by students having already taken COMP5580 Introduction to Cyber Security

Synopsis *

Security has always been an important aspect of computing systems but its importance has increased greatly in recent years. In this module you learn about areas where security is of major importance and the techniques used to secure them. The areas you look at include computer operating systems (and increasingly, distributed operating systems), distributed applications (such as electronic commerce over the Internet) and embedded systems (ranging from smart cards and pay-TV to large industrial plant and telecommunications systems).

CO636 Cognitive Neural Networks

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Medway	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Private Study: 111
Contact Hours: 39
Total Hours: 150

Learning Outcomes

On successfully completing the Level 6 module students will be able to:
1. Describe what is meant by neural networks, list a number of types of network and give a brief description of each together with some examples of their (actual or potential) applications.
2. Select the appropriate neural network paradigm for a particular problem and be able to justify this choice based on knowledge of the properties and potential of this paradigm. To be able to compare the general capabilities of a number of such paradigms and give an overview of their comparative strengths and weaknesses.
3. Explain the mathematical equations that underlie neural networks, both the equations that define activation transfer and those that define learning.
4. Analyse cognitive and neurobiological phenomena from the point of view of their being computational systems. To be able to take these phenomena and identify the features which are important for computational problem solving.
5. Build neural networks using state of the art simulation technology and apply these networks to the solution of problems. In particular, to select from the canon of learning algorithms which is appropriate for a particular problem domain.
6. Discuss examples of computation applied to neurobiology and cognitive psychology, both in the instrumental sense of the application of computers in modelling and in the sense of using computational concepts as a way of understanding how biological and cognitive systems function. To be able to analyse related systems not directly studied in the course in a similar fashion.
7. Discuss examples of neural networks as applied to neurobiology.

Method of Assessment

Main assessment methods
Two equally weighted practical assessments (individual; 12 hours; 20% total)
Examination (2 hours; 80%)

Reassessment methods:
Like for like

Preliminary Reading

O'Reilly, R.C. and Munakata, Y. (2000) Computational Explorations in Cognitive Neuroscience, Understanding the Mind by Simulating the Brain. A Bradford Book, MIT Press.
Rumelhart, D.E., McClelland J.L. and the PDP Research Group (1986) Parallel Distributed Processing, Volume 1: Foundations. MIT Press.
Rumelhart, D.E., McClelland J.L., and the PDP Research Group (1986) Parallel Distributed Processing, Volume 2: Psychological and Biological Models. MIT Press.
Bechtel, W. and Abrahamson, A. (2002) Connectionism and the Mind, Parallel Processing Dynamics and Evolution of Networks. Blackwell Publishers.
Haykin, S. (1999) Neural Networks, A Comprehensive Foundation. Prentice Hall International Edition.
Bishop, C.M. (1995) Neural Networks for Pattern Recognition. Oxford University Press.
Ellis, R. and Humphreys, G. (1999) Connectionist Psychology, A Text with Readings. Psychology Press Publishers.
Bengio, Yoshua, Ian Goodfellow, and Aaron Courville. Deep learning. MIT press, 2017.
Sejnowski, Terrence J. The deep learning revolution. MIT press, 2018.

Pre-requisites

Pre-requisite: COMP3220: Foundations of Computing I and COMP3250 Foundations of Computing II and either
COMP3200: Introduction to Object-Oriented Programming
or COMP3590: Programming for Artificial Intelligence

Synopsis *

In this module you learn what is meant by neural networks and how to explain the mathematical equations that underlie them. You also familiarise yourself with cognitive neural networks using state of the art simulation technology and apply these networks to the solution of problems. In addition, the module discusses examples of computation applied to neurobiology and cognitive psychology. The module also introduces artificial neural networks from the machine learning perspective. You will study the existing machine learning implementations of neural networks, and you will also engage in implementation of algorithms and procedures relevant to neural networks.

CO637 Natural Computation

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Spring	H	15 (7.5)	60% Exam, 40% Coursework	

Contact Hours

Private Study Hours: 128
Contact Hours: 22
Total Hours: 150

Learning Outcomes

On successfully completing the Level 6 module students will be able to:
1. describe what is meant by a natural computation paradigm, list a number of natural computing paradigms and give a brief description of each together with some examples of their (actual or potential) applications.
2. select the appropriate technique for a particular problem from a set of problem-solving heuristics based on these natural computing paradigms, and to be able to justify this choice based on a knowledge of the properties and potential of these methods. To be able to compare the general capabilities of a number of such methods and give an overview of their comparative strengths and weaknesses.
3. analyse phenomena from the natural world from the point of view of their being computational systems. To be able to take these phenomena and distinguish between the features which are important for computational problem solving and those that are merely a fact of their realization in the natural world.
4. exploit library and online resources to support investigations into these areas.

Method of Assessment

Main assessment methods:
Take-home computer test (about 15 hours) (20%)
One short essay (about 1,000 words) (20%)
Examination (60%)

Preliminary Reading

Eiben, AE, Smith, JE. (2015) Introduction to Evolutionary Computing, 2nd Edition. Springer.
Dorigo, M. and Stutzle, T. (2004) Ant Colony Optimization, MIT Press.
Barnes, DJ, Chu, D. (2010) Introduction to Modeling for Biosciences, Springer

Pre-requisites

Pre-requisite: COMP3220: Foundations of Computing I
and COMP3250 Foundations of Computing II
or A-level Maths or Equivalent

Pre-requisite: COMP5200 Further Object-Oriented Programming
or COMP5230 Fundamentals of Programming and Logic
or COMP3590 Programming for Artificial Intelligence

Synopsis *

There is an increasing use of nature-inspired computational techniques in computer science. These include the use of biology as a source of inspiration for solving computational problems, such as developments in evolutionary algorithms and swarm intelligence. It is therefore proposed to allow students the opportunity to become exposed to these types of methods for use in their late careers.

CO639 Electronic Commerce

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	H	15 (7.5)	50% Coursework, 50% Exam	
2	Medway	Spring	H	15 (7.5)	50% Coursework, 50% Exam	

Contact Hours

Total contact hours: 24
Private study hours: 126
Total study hours: 150 hours

Department Checked

Yes

Learning Outcomes

8. The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
8.1 Explain the relation of e-commerce to traditional commerce and the relative benefits of each [A10, B1, C2, C11];
8.2 Understand the notions of client-side and server-side programming and be able to write server-side programs[A2, B4, C1, C3, C4];
8.3 Understand the architectural features (client and server) required for supporting ecommerce [A2, A3];
8.4 Describe the different frameworks for e-commerce currently in use and be able to evaluate how appropriate a given framework is for a specific purpose [B3, C9]
8.5 Explain how the fundamental concepts of cryptography are used in e-commerce [B5, B7, D5];]
8.6 Understand the security aspects of payment and micropayment methods [B5];
8.7 Be aware of the legal background to e-commerce [B6, C10].

9. The intended generic learning outcomes.
On successfully completing the module students will be able to:
9.1 Make effective use of general IT facilities [D3];
9.2 Demonstrate comprehension of the trade-offs involved in design choices [B1];
9.3 Communicate technical issues clearly to specialist audiences [B2, D2];
9.4 Manage own learning and development, including time management and organisational skills [D5];
9.5 Recognise and be guided by social, professional and ethical issues and guidelines [B6].

Method of Assessment

Main assessment methods
2 pieces of coursework (each 20 hours) (50%)
Unseen examination (2 hours) (50%)

Reassessment methods
Like for like.

Preliminary Reading

Norris, M., West, S., Gaughan, K. (2001). eBusiness Essentials. John Wiley
Schneider, Gary P and Perry, James T. Electronic Commerce, Course Technology. Thomson Learning
Turban, E. et al. (1999). Electronic Commerce: A Managerial Perspective. Prentice Hall

Pre-requisites

Pre-requisites: COMP3230 (CO3230) Databases and the Web

Synopsis *

E-commerce is an increasingly important area for consumers, businesses and national economies. This module introduces what is meant by electronic commerce, and discusses its economic and social implications, its drivers and limitations. You will learn about the principal features of business-to-business and business-to-customer e-commerce and compare them with traditional forms of trading. The course also includes the chance to implement a simple end-to-end e-commerce system.

CO641 Computer Graphics and Animation

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	H	15 (7.5)	60% Exam, 40% Coursework	
1	Canterbury	Spring	H	15 (7.5)	75% Exam, 25% Coursework	

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

Demonstrate a broad and systematic understanding of computer graphics, animation and digital imaging from the perspective of computing, including an appreciation of technical and artistic applications;
Demonstrate familiarity with a range of technologies, techniques and algorithms for the acquisition, generation, manipulation, presentation, storage and communication of various kinds of visual data;
Apply this knowledge, including procedural techniques, through the use of 3D modelling tools.

Method of Assessment

Modelling with Blender (44%)
Computer Graphics Quiz 2%
Computer Animation Quiz 2%
Digital Imaging Quiz 2%

2 hour unseen written examination (50%)

Preliminary Reading

Computer Graphics with OpenGL (Fourth Edition, International Edition), Donald Hearn, M. Pauline Baker and Warren Carithers, Pearson Education, 2010
Computer Animation: Algorithms and Techniques (Third Edition), Richard Parent, Morgan Kaufmann, 2013
The Complete Guide to Blender Graphics: Computer Modeling and Animation (4th Edition), John M. Blain, CRC Press, 2017

Pre-requisites

None

Synopsis *

Computer graphics and animation are important for a variety of technical and artistic applications including web design, HCI and GUI development, games and simulations, digital photography and cinema, medical and scientific visualization, etc.
This module introduces the subject from the perspective of computing. You will learn about technologies and techniques for modelling, manipulating, capturing, displaying and storing visual scenes, digital images, animations and video. You will also gain practical experience of 3D modelling tools.

CO643 Computing Law and Professional Responsibility

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	H	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	H	15 (7.5)	75% Exam, 25% Coursework	
1	Medway	Spring	H	15 (7.5)	50% Coursework, 50% Exam	
1	Medway	Spring	H	15 (7.5)	75% Exam, 25% Coursework	

Contact Hours

Total contact hours (lectures and seminars): 30 hours
Private study hours: 120 hours
Total study hours: 150 hours

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
1 Possess an ability to appropriately understand and adopt techniques based on professional codes of practice and codes of practice of accrediting institutions.
2 Develop informed judgments about when specific actions are ethical and when legal.
3 Have a systematic understanding of basic legal processes.
4 Assess the impact of data privacy legislation on institutional activities, as well as being able to explain the basic aspects of computer law as it currently applies to IT in the UK.
5 Critically evaluate IT related health and safety issues.
6 Possess critical awareness of some of the potential legal and ethical problems of large IT projects.

The intended generic learning outcomes. On successfully completing the module students will be able to:
1 Evaluate systems in terms of health and safety issues and legal responsibilities, with an awareness of possible trade-offs.
2 Communicate legal and professional issues clearly to specialist audiences.
3 Apply relevant codes of conduct and practice.
4 Have demonstrated a commitment to being a responsible member of the seminars, forum, groups and teams that they have participated in during the module.

Method of Assessment

Main assessment methods:
A1 – Written assessment (25%)
A2 - Group Case Study (25%)
Two hour Examination (50%)

Preliminary Reading

Bott F et al. (2001). Professional Issues in Software Engineering, 3rd Edition (ISBN 0748409513). Taylor & Francis.
Bynum, TW and Rogerson, S. (2006). Computer Ethics and Professional Responsibility. Blackwell Publishing.
Ethics for the information age M.Quinn Pearson (2014)
Langford, D. (2000). Internet Ethics. Pearson/MacMillan.
Spinello, Richard A. (2003) Case studies in information technology ethics and policy, 2nd Edition, Prentice Hall.
The Cambridge Handbook of information and Computer Ethics Cambridge University press (2010)

Pre-requisites

There are no specific pre-requisites but students are expected to have completed Stage 1 of a relevant programme.

Synopsis *

The scope of the module is outlined below. Note that topics will not necessarily be delivered in this order:
Professional issues and professional organisations.
Data privacy legislation, and other UK laws relating to the professional use of computer systems.
Criminal law relating to networked computer use, including new Anti-Terrorism legislation; and their application
Intellectual Property Rights, including Copyright, Patent and Contract Law.
Health & Safety issues.
Computer-based Projects, including the vendor-client relationship and professional responsibilities.

CO646 Computing in the Classroom

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	75% Project, 25% Coursework	

Contact Hours

Lectures, classes and initial training: 14 hours
Time in school: 36 hours
Private study: 100 hours
Total study hours: 150 hours

Department Checked

Yes

Learning Outcomes

8. The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
8.1 Ability to present technical material succinctly and clearly to a variety of audiences
8.2 Students will realise the importance of professional responsibility and will have followed professional guidelines
8.3 Understanding of the National Curriculum and the role of Computing within it.
8.4 Knowledge of the organisation within schools and the management of people within them

9. The intended generic learning outcomes.
On successfully completing the module students will be able to:
9.1 Acting within a team, maintaining effective working relationships with teachers and pupils.
9.2 Communication skills, written and oral, both one to one and with an audience. [D2]
9.3 Ability to make effective use of general IT facilities to support their activities. [D3]
9.4 Understanding the needs of individuals.
9.5 Organisational, prioritisation, time management and negotiating skills. [D5]
9.6 Self analysis and critical evaluation. [D5, D6]
9.7 Preparation of lesson plans and teaching materials.

Method of Assessment

Main assessment methods
Weekly logs (25%)
P1 Report and portfolio (35%)
P2 Project presentation (25%)
P3 Teacher Assessment (15%)

Reassessment methods
Like for like where possible. Due to the nature of this module, and safeguarding issues relating to outside contact involving interaction with children, it is not necessarily possible to retrieve credit for this module. A different module must be chosen as a replacement if the failure is related to the actual placement.

Preliminary Reading

About UAS: http://www.uas.ac.uk
About SETNET: http://www.setnet.org.uk
Information on the National Curriculum: http://www.nc.uk.net

Pre-requisites

This module has no specific prerequisites but requires a general understanding of computing technology, as would be gained by completing Stage 1 of a computing related programme.
Acceptance on the module is by interview and is subject to DBS clearance. Acceptance does not guarantee a school placement; if no suitable placement can be found students must choose a different module.

Synopsis *

Students will spend one half-day per week for ten weeks in a school with a nominated teacher. They will observe sessions taught by their designated teacher and possibly other teachers. Later they will act somewhat in the role of a teaching assistant, by helping individual pupils who are having difficulties or by working with small groups. They may take 'hotspots': brief sessions with the whole class where they explain a technical topic or talk about aspects of university life. They must keep a weekly log of their activities. Each student must also devise a special project in consultation with the teacher and with the module convener. They must then implement and evaluate the project.

CO832 Data Mining and Knowledge Discovery

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 22 hours
Private study hours: 128 hours
Total study hours: 150 hours

Department Checked

Yes

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1 Explain the differences between the major data mining tasks, in terms of their assumptions, requirement for a specific kind of data, and the different kinds of knowledge
discovered by algorithms performing different kinds of task.
2 Describe data mining algorithms for the major data mining tasks.
3 Identify which data mining task and which algorithm is the most appropriate for a given data mining project, taking into account both the nature of the data to be mined
and the goals of the user of the discovered knowledge.
4 Use a state-of-the-art data mining tool in a principled fashion, being aware of the strengths and weaknesses of the algorithms implemented in the tool.
5 Evaluate the quality of discovered knowledge, taking into account the requirements of the data mining task being solved and the goals of the user.
6 Describe the main tasks and algorithms involved in the preprocessing and postprocessing steps of the knowledge discovery process.
7 Utilize the library and exploit web sites to support investigations into these areas.

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1 Understand the major kinds of data mining tasks and the main kinds of algorithms that are often used to solve these tasks.
2 Understand the strengths and weaknesses of some data mining algorithms, identifying the kind of algorithm that is most appropriate for each data mining problem.
3 Understand the process of knowledge discovery, involving not only data mining but also preprocessing and post-processing steps

Method of Assessment

Main assessment methods
20% Coursework and 80% Examination

One exercise with a data mining tool 10%
One Short Essay (about 1,000 words) 10%
Examination 80%

Reassessment methods
Like for like.

Preliminary Reading

Witten, IH, Frank, E, Hall, MA, Pal, CJ (2016). Data Mining: practical machine learning tools and techniques, 4rd edition. Morgan Kaufmann.
Tan, P-N, Steinbach, M, Karpatne, A, Kumar, V (2018) Introduction to Data Mining, Pearson, 2nd edition.

Pre-requisites

Pre-requisite: knowledge of programming such as that provided by
COMP5200 Further Object-Oriented Programming,
COMP8710 Advanced Java for Programmers,
COMP8820 Advanced Object-Oriented Programming,
COMP3590 Programming for Artificial Intelligence or
COMP8210 Programming for Data Handling

Synopsis *

This module explores a range of different data mining and knowledge discovery techniques and algorithms. You learn about the strengths and weaknesses of different techniques and how to choose the most appropriate for any particular task. You use a data mining tool, and learn to evaluate the quality of discovered knowledge.

EL600 Project

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	45 (22.5)	100% Coursework	
1	Canterbury	Whole Year	H	45 (22.5)	100% Project	
1	Canterbury	Whole Year	H	45 (22.5)	82% Project, 18% Coursework	
1	Canterbury	Whole Year	H	45 (22.5)	95% Exam, 5% Coursework	
1	Canterbury	Whole Year	H	45 (22.5)	95% Project, 5% Coursework	

Contact Hours

34 Contact Hours including lectures and weekly supervisions.
416 Independent Study Hours.
450 Total Study Hours

Learning Outcomes

1. Execute a substantial piece of independent design or development engineering work
2. Write a scientific report based on the research, development and evaluation they have conducted
3. Communicate information, ideas, problems, and solutions to both specialist and non-specialist audiences

Method of Assessment

100% Project

Preliminary Reading

Project Management, Baguley, P (2008) Publisher: Teach Yourself (London)
ISBN-10: 0340968184, ISBN-13: 9780340968185
Specific reading materials will be suggested by project supervisor

Synopsis *

Introduction to the project, research techniques, poster design, report structure and writing.

EL639 Video Games Development

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	H	15 (7.5)	100% Coursework	

Contact Hours

Total contact hours: 30
Private study hours:120
Total hours: 150

Department Checked

29/03/2018

Learning Outcomes

On successfully completing the module students will be able to:

1. Demonstrate a thorough understanding of game design theory and creative practice in the field of computer game development
2. Understand and apply principles of computer game design workflow to the production of a game
3. Critically analyse technical and usability issues associated with games design and development.

Method of Assessment

Main assessment methods; 100% Coursework eg:
(20%) Workshop exercises – mini game development
(60%) Video game design and development – a fully functioning game prototype
(20%) Video presentation – a short video on game design reflection

Preliminary Reading

Lintrami, T (2017) Unity 2017 Game Development Essentials - Third Edition, Packt Publishing
Thorn A (2017) Mastering Unity 2017 Game Development with C# - Second Edition: Create professional games with solid gameplay features and professional-grade workflow, Packt Publishing
Salen K. and Zimmerman E. (2003) Rules of Play: Game Design Fundamentals. MIT Press, ISBN-13: 978-0262240451
Crawford, C (1984) The Art of Computer Game Design ASIN: B0052QA5WU

Restrictions

None

Synopsis *

This module is concerned with a range of topics in video game design and development, including game physics, AI, level design, player behaviour, game rules and mechanics, as well as user interfaces. This module introduces students to game development using industry-standard software tools.

EL667 Embedded Computer Systems

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	15 (7.5)	65% Exam, 35% Coursework	

Contact Hours

Total contact hours: 25
Private study hours: 125
Total study hours: 150

Learning Outcomes

On successfully completing the module students will be able to:
1. Demonstrate an understanding of the design and operation of embedded systems;
2. Demonstrate an understanding of real time software and hardware system requirements;
3. Demonstrate practical experience of embedded systems based on case studies and laboratory experiments.

Method of Assessment

Examination 65%
Coursework 35%

Preliminary Reading

Core Text
• Shaw, AC (2001) Real-time systems and software, John Wiley, New York, Chichester
• Simon, DE (1999) n embedded software primer, Addison Wesley, Boston, London
• Qiu, Meikang, Li, Jiayin (c2011) Real-time embedded systems: optimization, synthesis, and networking, CRC, Taylor & Francis [distributor], Boca Raton, Fla, London

Pre-requisites

Pre-requisite for Computer Science students selecting this module as an option:
COMP5270 - Operating Systems and Architecture or
COMP5570 -Computer Systems

Synopsis *

This module introduces the theory and practice of employing computers as the control and organisational centre of an electronic or mechanical system, and examines time critical systems. It also provides embedded systems design through practical work, including real-time operating systems and microcomputer programming.

EL677 Digital Communication Systems

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	15 (7.5)	85% Exam, 15% Coursework	

Contact Hours

Total contact hours: 36
Private study hours: 114
Total study hours: 150

Department Checked

06/08/2018

Learning Outcomes

1. Demonstrate an understanding of information theory, error coding and its application in modern communication systems;
2. Demonstrate an understanding of communication network architectures and protocols.
3. Demonstrate an understanding of the principles of optical communication systems and their performance

Method of Assessment

Examination 85%
Coursework 15%

Preliminary Reading

Recommended Reading
• Computer Networking and the Internet, F Halsall, Addison Wesley
• Communication Systems, Simon Haykin, 5th Edition, 2010
• Communication Systems Engineering, Proakis, Salehi, Prentice Hall
• Optical Fiber Communications: Principles and Practice, Senior et al., Pearson
• Optical Fiber Communications G.Keiser McGraw-Hill 4th Edition (2010)

Pre-requisites

EENG5700 (EL570) Communication Principles

Synopsis *

Information theory and Shannon capacity, information measure and mutual information, source coding and channel coding/decoding, multiuser communications.

Network architecture, topology. Access networks, voice and data. Transport networks and multiplexing. Local are networks, Ethernet, WiFi. TCP/IP networks and the Internet.

Optical communication systems. Propagation in optical fibres. Sources (LEDs, laser), modulation. Photodiodes, receivers. Optical components. System power budgets, noise and dispersion.

EL885 Research Methods and Project Design for Mobile Apps

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	M	15 (7.5)	100% Coursework	
2	Canterbury	Whole Year	M	15 (7.5)	100% Coursework	

Contact Hours

Total contact hours: 20
Private study hours: 130
Total study hours: 150

Department Checked

14/11/2018

Learning Outcomes

1 Carry out a comprehensive literature survey on a selected topic using library and electronic information sources.
2 Identify the current status of a particular research area and define the state-of-art in that research area.
3 Identify and formulate further research, which could usefully be undertaken in a defined area of technology.
4 Plan a research project, including the definition of objectives, project management, experimental design and data collection and processing within time and resource constraints.
5 Undertake research using logical and effective methodologies.
6 Use common software packages for project management and presentation.
7 Communicate with peers by way of conference and journal publications.
8 Understand general issues concerning research including IPRs and research ethics.

Method of Assessment

Assignment (10%)
Assignment (80%)
Assignment (10%)

Pre-requisites

None

Progression

Restrictions

None

Synopsis *

LITERATURE SURVEY
Surveys using networked electronic information sources, on-line databases, inter-library loan facilities, private communications, etc. Identification of a technical area worthy of research, definition of the state-of -the-art in a given field, definition of the research project, and research proposals. Patent search.

GENERAL ISSUES AND PRACTICE
Choosing the field of interest. Concept of originality. Research theories: background theory, focal theory, data theory. Contribution towards knowledge. Types of research project (blue sky, basic, applied and experimental research). Research uncertainty. Risk management. Research approaches.

RESEARCH PROJECT MANAGEMENT
Time management. Resources management. Project management software (MS Project). Use of logbooks. Data management. Data security. Team working skills.

RESEARCH PROCESS
MSc research projects. MPhil/PhD research projects. Academic research and industrial R&D. Project planning, proposals and budgeting. Design of experimental tests. Modelling and simulation.

RESEARCH PUBLICATIONS
Structure, content and procedures. Project reports and theses. Journal and conference papers. Technical presentations. Use of references. Writing up of abstract, introduction and conclusions. Submission, refereeing and amendments. Effective use of figures, drawings and tables. MS WORD, ENDNOTE and LATEX.

PRESENTATIONS OF RESEARCH RESULTS
Objectives and structure. Audience analysis. Rehearsal and delivery. Design of visual aids. Use of computerized projection facilities. Multi-media approach. Poster design and poster presentation. Handling questions.

INTELLECTUAL PROPERTY RIGHTS
Patents, patent rights and know-how. Copyright and copying. Design rights and registered designs. Research contracts and agreements. Confidentiality agreement.

RESEARCH ETHICS
Ethics in engineering research. Research supervision. Modelling and simulation versus real experimental work. Processing and presentation of experimental data. Obfuscation in writing up research papers.

48 Centre for Journalism

JN603		Essential Media Law				
Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	H	15 (7.5)	100% Coursework	
1	Medway	Whole Year	H	15 (7.5)	50% Coursework, 50% Exam	

Availability

Compulsory to the Year in Journalism

Contact Hours

Total contact hours: 42
Total private study hours: 108
Total module study hours: 150

Department Checked

11/03/2022

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1. Demonstrate a detailed understanding of the key legal principles relevant to the production of multimedia journalism in England and Wales.
2. Identify key reference literature and sources used in newsrooms and be able to apply them to common news situations.
3. Critically examine how media law in England and Wales upholds the right to privacy and protects from reputational damage.
4. Critically examine how media law in England and Wales upholds the right to a fair trial and the protections offered to victims and witnesses of crime.
5. Articulate how copyright law applies in the production of multimedia journalism.

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1. Deal with complex issues logically and thoughtfully, make sound judgements and communicate conclusions clearly.
2. Use independent learning techniques to continue their professional development.
3. Demonstrate self-direction and originality in tackling and solving legal and ethical issues faced by media professionals.

Method of Assessment

Main assessment methods
Coursework – 2 x narrative Moodle quizzes (45 minutes each) – and 50% each

Reassessment methods
Like for like

Preliminary Reading

Hanna M and Dodds M, McNae's Essential Law for Journalists (25th edn, OUP 2020)
Quinn, F. (2018), Law for Journalists, 6th ed, Pearson

Pre-requisites

None

Restrictions

For "Year in Journalism" students only

Synopsis *

This module prepares students to pass the National Council for the Training of Journalists' exam Essential Media Law and Regulation. It provides a comprehensive and practical understanding of key concepts for professional journalists including: press freedom; defamation – components and defences; privacy; copyright; breach of confidence; regulation and self-regulation of media; contempt of court.

JN604 British Public Affairs

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	H	15 (7.5)	50% Coursework, 50% Exam	
1	Medway	Spring	H	15 (7.5)	100% Coursework	

Availability

Year in Journalism – compulsory module

Contact Hours

Total Contact Hours: 48
Private Study Hours: 102
Total Study Hours: 150

Department Checked

Yes LSSJ Covid AP permanent as discussed 24.3.21

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1) Show detailed understanding of the basic principles of the British constitution, the functions of Britain's national political institutions and their role in delivering accountable and representative outcomes
2) Demonstrate a comprehensive understanding of the electoral process, comparative electoral systems and the key issues facing electoral participation in a modern democracy
3) Show familiarity with how a range of approaches can be used to investigate how British political systems work, and with what success, and have some understanding of comparative systems
4) Demonstrate a detailed understanding of the structure and financing of public services including the National Health Service and social services

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1) Gather, organise and deploy information in order to formulate arguments cogently and confidently
2) Work confidently with abstract ideas and argue from competing perspectives
3) Comprehensively implement research and writing skills in individual written work
4) Exercise independent learning skills and organise study in an efficient and professional manner

Method of Assessment

Main assessment methods
In-course test, (45 mins.) – 50%
In-course test, (45 mins.) – 50%

Reassessment methods
Reassessment instrument: 100% coursework

Preliminary Reading

Morrison, J (2013), Essential Public Affairs for Journalists, 3rd edn, Oxford University Press, Oxford
Leach, R, Coxall, B and Robins, L (2011), British Politics, 2nd edn, Palgrave Macmillan, Basingstoke
Jones, B and Norton, P (2010), Politics UK, 7th edn, Pearson, Harlow
Moran, M (2011), Politics and Governance in the UK, 2nd edn, Palgrave Macmillan, Basingstoke
Judge, D (2005), Political Institutions in the United Kingdom, Oxford University Press, Oxford
Kavanagh, D, et al (2006), British Politics, 5th edition, Oxford University Press, Oxford
Peele, G (2004), Governing the UK. British Politics in the 21st Century, 4th edn, Blackwell, Oxford
Jones, B (2010), Dictionary of British Politics, 2nd edn, Manchester University Press, Manchester

Pre-requisites

None

Restrictions

Only for Year in Journalism students

Synopsis *

This module prepares journalists to hold power to account by developing a thorough understanding of the British political system, focusing on recent political and constitutional developments. It will investigate topics such as the roles of Parliament, the Prime Minister and Cabinet, regional authorities, political parties, and the electoral system. It will assess key issues facing democratic government and institutions within the UK, analysing for example the role of Europe, the challenges posed by devolution, the Treasury and the National Health Service. There will also be discussion of contemporary political behaviour, including the issue of political participation. This module prepares students to sit the National Council for the Training of Journalists' (NCTJ) professional exam in public affairs.

JN605 Reporting

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	H	45 (22.5)	100% Coursework	
1	Medway	Whole Year	H	45 (22.5)	60% Coursework, 40% Exam	

Availability

Year in Journalism – compulsory module

Contact Hours

Total contact hours: 144
Private Study Hours: 306
Total Study Hours: 450

Department Checked

11/03/2022

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1) Show a thorough understanding of different forms of journalism and a critical awareness of how they are practiced professionally alongside the principles of accuracy and fairness
2) Produce publishable news reports and features for publication in print and online with reference to professional ethics and standards
3) Understand the principles of investigative reporting including thorough research, following leads to a conclusion and treating statements by vested interests with due scepticism
4) Be able to evaluate current newsgathering and reporting techniques used in professional newsrooms and develop critiques of them

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1) Exercise initiative and personal responsibility in gathering, organising and deploying information
2) Make informed decisions and demonstrate self-direction in coping with complex and unpredictable situations
3) Consider and evaluate their work with reference to professional standards and develop critiques accordingly
4) Use information technology to complete a range of tasks to a set brief and deadline

Method of Assessment

Main assessment methods
1 x Timed newswriting test (45 mins) 25%
1 x Journalism portfolio (2,500 words) 75% - PASS COMPULSORY

Reassessment methods
Like for like

Preliminary Reading

Harcup T (2011), Journalism Principles and Practice, Sage Publications
Hicks W et al (2008), Writing for Journalists, Routledge
Marr A (2005), My Trade, Pan
Randall D (2011), The Universal Journalist, Pluto Books
Reeves I (2014), The Newspapers Handbook, 5th ed, Routledge
Smith J (2010), Essential Reporting, Sage Publications

Pre-requisites

None

Restrictions

For "Year in Journalism" students only

Synopsis *

Students will learn to identify what makes a story, develop newsgathering techniques to draw information from a range of sources and hone their writing skills to produce clean, accurate copy to a deadline. Students will consider how journalists should conduct themselves in public with reference to the Independent Press Standards Organisation code and other professional standards. Students will learn the difference between hard news, comment and features and be able to produce work for a range of outlets and audiences. This module will also prepare students to pass the National Council for the Training of Journalists' professional exams in reporting and journalism ethics.

JN606 Practical Multimedia Journalism

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	H	45 (22.5)	100% Coursework	
1	Medway	Whole Year	H	45 (22.5)	75% Coursework, 25% Exam	

Availability

Year in Journalism

Contact Hours

Total Contact Hours: 96
Private Study Hours: 354
Total Study Hours: 450

Department Checked

11/03/2022

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1) Demonstrate a systematic understanding and a critical awareness of the current key concepts of news delivery for online platforms
2) Have a comprehensive understanding of current thinking behind the economics of news delivery in different media and its implications for the industry
3) Have a comprehensive understanding of the fundamental technologies used in the gathering, production and dissemination of news in an online environment
4) Demonstrate professional skills and originality in using new and established techniques to produce quality journalism in text, audio and video
5) Produce properly structured multimedia journalism packages suitable for an international, national or regional audience

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1) Work effectively as individuals and in a team environment, exercising initiative and personal responsibility
2) Make informed decisions about deployment of resources in planning, gathering, producing and disseminating information in complex and unpredictable situations
3) Use complex multimedia hardware and software in an original and professional way with a specific audience in mind
4) Present systematic and creative analytical arguments based on a detailed understanding of economic, social and professional factors influencing media industry decision-makers

Method of Assessment

Main assessment methods
TV Assignment 1 – 12.5%
Print Assignment 2 – 12.5%
Radio Assignment 3 – 12.5%
Online Assignment 4 – 12.5%
Blog Postings (one per term) – 12.5%
News Conference Pitches (three per term) – 12.5%
Examination (two hours) – 25%

Reassessment methods
100% coursework

Preliminary Reading

Geller V (2007), Creating Powerful Radio, Focal Press
Harrower T (2007), The Newspaper Designer's Handbook, 6th ed, McGraw-Hill
Quinn S and Filak V F (2005), Convergent Journalism, Focal Press
Ray V (2003), The Television News Handbook, Macmillan
Ward M (2002), Journalism Online, Focal Press

Pre-requisites

None

Restrictions

For "Year in Journalism" students only

Synopsis *

This module equips students with the skills to produce journalism for TV, radio, print and multimedia online platforms to a professional standard. It includes the professional use of cameras, editing software and television studio production facilities; professional use of audio recording equipment, editing software and radio studio production facilities; print production software and facilities; and advanced use of multimedia authoring software and image manipulation software. It involves team work in radio, television, print and online news production. It also considered the culture, history and development of British journalism and the impact of online technologies on planning, reporting, producing and disseminating news. The skills learned on this module will prepare students to take several professional exams set by the National Council for the Training of Journalists (NCTJ).

37 Kent Law School

LW562		Criminal Law for Forensic Scientists				
Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	100% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	100% Coursework with Compulsory Numeric Elements	
1	Canterbury	Autumn	H	15 (7.5)	90% Exam, 10% Coursework	
1	Canterbury	Spring	H	15 (7.5)	100% Coursework	
1	Canterbury	Spring	H	15 (7.5)	100% Coursework with Compulsory Numeric Elements	

Availability

This is a compulsory module for students undertaking a BSc (Hons) in Forensic Science or a BSc (Hons) in Forensic Science with a Year in Industry

Contact Hours

Total Contact hours: 19
Private study: 131
Total Study Hours: 150

Department Checked

22/03/2022

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:

1. Understand, in detail, the core general concepts and principles underpinning the criminal law, and rules of key specific criminal offences
including murder/manslaughter and non-fatal offences against the person including core sexual offences.
2. Demonstrate a detailed understanding of the wider debate in respect of the use of the criminal law in the social context, the definitions of
harm and the boundaries of criminal law.
3. Engage in practical application of their knowledge, through consideration of criminal law problem questions, and engage in critical debate
of the issues raised.
4. Demonstrate critical knowledge of major theoretical debates in the criminal law field in at least one key area.
5. Critically discuss the major areas of the criminal law covered, making appropriate reference to legal and academic source authorities
6. Demonstrate a critical awareness of the economic, political and/or social implications of legal forms and remedies in the area of criminal
law.

The intended generic learning outcomes.
On successfully completing the module students will be able to:

1. Present relevant knowledge and understanding in the form of reasoned argument.
2. Identify and critically evaluate legal and policy problems according to their historical, political and legal context.
3. Carry out further research from a variety of sources informing a sustained and detailed argument.
4. Summarize detailed historical and conceptual material, recognizing different positions that are taken in the literature surveyed.

Method of Assessment

Main Assessment Methods

Essay of not more than 2500 words (50%) *
Take-home problem question of not more than 2,000 words (50%)

* students must achieve a mark of 40% in the essay to pass the module overall.

Reassessment methods

Reassessment instrument: 100% coursework

Preliminary Reading

The most up to date versions of the following texts:

• Ashworth & Horder; Principles of Criminal Law; Oxford University Press.
• Clarkson & Keating; Criminal Law Text: and Materials; Sweet & Maxwell.
• Elliott & Quinn; Criminal Law; Pearson.
• Herring; Criminal Law: Text Cases and Materials; Oxford University Press.

Pre-requisites

None

Restrictions

This is a compulsory module for students undertaking a BSc (Hons) in Forensic Science or a BSc (Hons) in Forensic Science with a Year in Industry

Synopsis *

This module seeks to provide a sound knowledge and understanding of the concepts and principles underlying the criminal law. This includes a grounding in its historical development and underlying philosophy; to provide a detailed grasp of key concepts and general principles; and to promote a critical discussion about the nature, function and effects of the use of criminal law in given contextual situations.

LW573 Law of Evidence for Forensic Scientists

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	100% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework with Compulsory Numeric Elements	

Availability

This module is only available for students on one of the Forensic Science programmes

Contact Hours

Total Study Hours: 150
Total Contact Hours: 30
Private Study Hours: 120

Department Checked

22/03/2022

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:

1. Identify and critically analyse sources relating to evidence, from a range of disciplines.
2. Utilise and apply inferential logic and then apply analysis to factual situations
3. Demonstrate detailed knowledge of the rules of evidence
4. Demonstrate comprehensive knowledge of implications for evidence, and procedure, in light of the European Convention on Human Rights
5. Demonstrate detailed knowledge of the relationship between forensic science and the rules of evidence

The intended generic learning outcomes.
On successfully completing the module students will be able to:

1. Apply knowledge to complex situations
2. Recognise potential alternative conclusions for particular situations, and provide supporting reasons for them
3. Use the English language and legal terminology with care and accuracy

Method of Assessment

Main assessment methods

The module will be assessed by 20% coursework and 80% exam as follows:
Multiple choice test, online (20%)
Written examination, 2 hours (80%)

* Students must achieve a mark of 40% in the exam in order to pass this module.

Reassessment methods

Reassessment instrument: (100% exam)

Students must achieve a mark of 40% in the exam in order to pass this module on reassessment.

Preliminary Reading

- Huxley, Blackstone's Statutes on Evidence (14th ed. Oxford: Oxford University Press, 2016)
- Keane and McKeown, The Modern Law of Evidence (11th ed. Oxford: Oxford University Press, 2016)

Background:
- Allen, C. Practical Guide to Evidence. (5th ed. New York: Routledge-Cavendish, 2016)
- Emson, R. Evidence (5th ed. Basingstoke: Palgrave Macmillan, 2010)
- Munday, R. Evidence. (9th ed. Oxford: Oxford University Press, 2017)

Pre-requisites

LAWS5620 Criminal Law for Forensic Scientists is normally a prerequisite but at the convenors discretion may be taken as a co-requisite

Restrictions

This module is only available for students on one of the Forensic Science programmes.

Synopsis *

The role of evidence in a courtroom is technical but its rules reflect core principles of the due process of law. These are becoming more significant with the implementation of the Human Rights Act 1998 and it is important for forensic scientists, who may act as expert witnesses, to have an understanding of these rules and their operation in the trial process. This module considers the position of forensic evidence within the trial process, rules governing the recognition of such evidence and the perception of its value in the trial. In addition matters such as the function of the judge and jury, burden and standard of proof, and hearsay are considered from a central focus of how they relate to forensic evidence.

MA501 Statistics for Insurance

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	100% Exam	
1	Canterbury	Spring	I	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Spring	I	15 (7.5)	90% Exam, 10% Coursework	

Contact Hours

Total contact hours: 36
Private study hours:114
Total study hours: 150

Learning Outcomes

On successfully completing the module students will be able to:

1. explain basic concepts and models of Bayesian statistics and apply them to credibility theory;
2. construct risk models appropriate to short term insurance contracts and make the related statistical inference;
3. describe and apply the fundamental concepts of loss distributions;
4. describe and apply the basic methodology of generalised linear models;
5. explain basic concepts and models of extreme value theory and apply them in insurance.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Boland, P.J. Statistical and Probabilistic Methods in Actuarial Science, Chapman & Hall, 2007.
Study notes published by the Actuarial Education Company for Subjects CS1 and CS2.

Pre-requisites

Pre-requisite: MAST5007 Mathematical Statistics
Co-requisite: MAST5001 Applied Statistical Modelling 1
Or:
Pre-requisite: MACT5290 Probability and Statistics for Actuarial Science 2 / MACT7290 Probability and Statistics for Actuarial Science

Synopsis *

This module covers aspects of Statistics which are particularly relevant to insurance. Some topics (such as risk theory and credibility theory) have been developed specifically for actuarial use. Other areas (such as Bayesian Statistics) have been developed in other contexts but now find applications in actuarial fields. Indicative topics covered by the module include Bayesian Statistics; Loss Distributions; Reinsurance and Ruin; Credibility Theory; Risk Models; Ruin Theory; Generalised Linear Models; Extreme Value Theory. This module will cover a number of syllabus items set out in Subjects CS1 and CS2 – Actuarial Statistics published by the Institute and Faculty of Actuaries.

MA509 Actuarial Practice

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	30 (15)	50% Coursework, 50% Exam	

Contact Hours

Total contact hours: 72
Private study hours: 228
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1 describe the main types of financial services encountered in actuarial work;
2 discuss the different roles undertaken by actuaries and the core skills required in each practice area;
3 describe how the design of financial services impacts on the risks for the various stakeholders;
4 discuss the application of actuarial science in the context of the general business, social and legal environment;
5 discuss sources of risk to providers of financial services;
6 describe how providers of financial services can manage risks;
7 discuss topical issues relevant to the financial services industry.

The intended generic learning outcomes. On successfully completing the module students will be able to:

1 demonstrate improved communication skills;
2 demonstrate enhanced intellectual independence;
3 demonstrate relevant computing skills, including the use of appropriate document preparation software;
4 demonstrate improved problem-solving skills;
5 demonstrate an awareness of important issues relating to good oral and written presentation of results;
6 demonstrate greater ability to select material from source texts, found independently or through recommendation; and awareness of the relationship of this material to
background and more advanced material;
7 demonstrate independent learning and time management skills;
8 demonstrate improved teamwork skills;
9 demonstrate the ability to reflect and an understanding of actions required for career development.

Method of Assessment

50% Examination, 50% Coursework

Preliminary Reading

Readings on current topics will be drawn from newspapers, professional magazines and journals, and online resources.
The following textbooks are not required to be purchased, but may be consulted as further reading for students.
Understanding Actuarial Management (2nd Edition) Bellis C, Lyon R, Klugman S and Shepherd J (editors), 2010, Institute of Actuaries of Australia and Society of Actuaries
Modern Actuarial Theory and Practice (2nd Edition) Haberman S, Booth P, Chadburn R, James D, Khorasanee Z, Plumb R and Rickayzen B, 2005, Chapman & Hall/CRC

Pre-requisites

MACT5160 Contingencies I

Synopsis *

The module will give students an understanding of the practical application of the techniques they learn in the BSc in Actuarial Science. It brings together skills from other modules, and ensures that students have the necessary entry-level skills and knowledge to join the actuarial profession or to embark on related careers, and also provides a platform for ongoing professional development. The syllabus is dynamic, changing regularly to reflect current practice and trends.

MA516 Contingencies 1

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	80% Exam, 20% Coursework	
2	Canterbury	Autumn	I	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

Total contact hours: 48
Private study hours: 102
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1 demonstrate systematic understanding of the mathematical techniques used to model and value cashflows which are contingent on mortality and morbidity risks;
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a reasonable level of skill in calculation and manipulation of
cashflows which are contingent on mortality and morbidity risks;
3 demonstrate a basic understanding of recent developments in Actuarial Mathematics and the links between the theory of Actuarial Mathematics and their practical
application.

The intended generic learning outcomes. On successfully completing the module students will be able to:
1 apply a logical mathematical approach to solving problems;
2 demonstrate skills in written communication;
3 demonstrate skills in the use of relevant information technology;
4 demonstrate skills in time management, organisation and studying.

Method of Assessment

70% Examination, 30% Coursework

Preliminary Reading

Students are provided with the study notes published by the Actuarial Education Company for Subject CM1 – Actuarial Mathematics.

Pre-requisites

Prerequisite: MACT3150 or MACT4012 Financial Mathematics;
or co-requisite: MACT7150 or MACT6009 Financial Mathematics

Synopsis *

The aim of this module is to provide a grounding in the principles of modelling as applied to actuarial work – focusing particularly on deterministic models which can be used to model and value cashflows which are dependent on death, survival, or other uncertain risks. Indicative topics covered by the module include equations of value and its applications, single decrement models, multiple decrement and multiple life models. This module will cover a number of syllabus items set out in Subject CM1 – Actuarial Mathematics published by the Institute and Faculty of Actuaries.

MA525 Survival Models

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	H	15 (7.5)	70% Exam, 30% Coursework	
2	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
3	Canterbury	Autumn	H	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

Total contact hours: 42
Private study hours: 108
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the level 6 module students will be able to:

1 describe, interpret and discuss key aspects of survival models;
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a reasonable level of skill in calculation and manipulation of
survival models;
3 demonstrate an appreciation of recent developments in survival models and the links between the theory of survival models and their practical application in well-defined
contexts.

The intended generic learning outcomes. On successfully completing the level 6 module students will be able to:

1 develop a logical mathematical approach to solving complex problems including cases where information/data is not complete
2 demonstrate skills in written communication to both technical and non-technical audiences,
3 demonstrate skills in the use of relevant information technology,
4 demonstrate skills in time management, organisation and studying so that tasks can be planned and implemented at a professional level.

Method of Assessment

70% Examination, 30% Coursework

Preliminary Reading

Study notes published by the Actuarial Education Company for Subject CS2

Pre-requisites

MACT5160 (Actuarial Mathematics 1); MAST5007 Mathematical Statistics

Synopsis *

The aim of this module is to provide a grounding in mathematical and statistical modelling techniques that are of particular relevance to survival analysis and their application to actuarial work.

Calculations in life assurance, pensions and health insurance require reliable estimates of transition intensities/survival rates. This module covers the estimation of these intensities and the graduation of these estimates so they can be used reliably by insurance companies and pension schemes. The syllabus also includes the study of various other survival models, and an introduction to machine learning. This module will cover a number of syllabus items set out in Subject CS2 – Actuarial Mathematics published by the Institute and Faculty of Actuaries.

MA527 Corporate Finance for Actuaries

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 48
Private study hours: 102
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1. Use a range of established mathematical techniques to undertake critical analysis of financial information and to calculate or propose solutions to problems in corporate finance arising from that analysis;
2. Demonstrate knowledge and critical understanding of the concepts and elements of corporate finance, and the basic financial management issues and processes in a corporate entity.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

The Actuarial Education Company's course notes for subject CB1 of the Institute and Faculty of Actuaries examination syllabus.

Pre-requisites

Pre-requisite: MACT3150: Financial Mathematics or MACT4012 Financial Mathematics
Co-requisite: MACT5280: Financial Reports and their Analysis

Synopsis *

The aim of this module is to provide a basic understanding of corporate finance including a knowledge of the instruments used by companies to raise finance and manage financial risk. Indicative topics covered by the module include corporate governance and organisation, taxation, dividend policy, how corporates are financed, and evaluating projects. This module will cover a number of syllabus items set out in Subject CB1 – Business Finance published by the Institute and Faculty of Actuaries.

MA528 Financial Reports and their Analysis

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Spring	I	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

Total contact hours: 48
Private study hours:102
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1 construct the main accounts normally contained within corporate annual reports;
2 understand and interpret critically the concepts and methods of financial reporting;
3 analyse and compare corporate results across time and between firms using horizontal and vertical analysis techniques.

The intended generic learning outcomes. On successfully completing the module students will be able to:

1 use a logical mathematical approach to solving problems and will be able to solve problems in financial reporting and analysis using appropriate methods;
2 demonstrate enhanced skills in the selection and use of electronic sources to search for and retrieve information online, and to use generic commercial software and its applications to accounting;
3 manage their time and work independently;
4 demonstrate improved skills in numeracy, problem solving, and written communication.

Method of Assessment

70% Examination, 30% Coursework

Preliminary Reading

Students on the programmes listed in section 7 are provided with the study notes published by the Actuarial Education Company for Subject CB1.
Additional reading that students may find useful includes:
Financial accounting, Britton, Anne, Waterston, Christopher, Dawsonera 2010
Interpreting Company Reports and Accounts, Geoffrey Holmes, Alan Sugden & Paul Lee 10th Edition. Prentice Hall

Synopsis *

The aim of this module is to provide the ability to construct and interpret the accounts and financial statements of companies and financial institutions, to construct management information and to evaluate working capital.
This module will cover a number of syllabus items set out in Subject CB1 – Business Finance published by the Institute and Faculty of Actuaries.

MA529 Probability and Statistics for Actuarial Science 2

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	90% Exam, 10% Coursework	

Contact Hours

approximately 36 scheduled lecture hours; plus 6 workshops.

Learning Outcomes

The intended subject specific learning outcomes. On successful completion of the module, students:
a) will have a reasonable knowledge of probability theory and of the key ideas of statistical inference, in particular to enable them to study further statistics modules at levels I and H (for which this module is a pre-requisite);
b) will have a reasonable ability to use mathematical techniques to manipulate joint, marginal and conditional probability distributions, and to derive distributions of transformed random variables;
c) will have a reasonable ability to use mathematical techniques to calculate point and interval estimates of parameters and to perform tests of hypotheses;
d) will have some appreciation of the relevance of mathematical statistics to real world problems.

The intended generic learning outcomes. On successful completion of the module, students:
a) will have developed their understanding of probability and statistics;
b) will have applied a range of mathematical techniques to solve statistical problems;
c) will have developed their ability to abstract the essentials of problems and to formulate them mathematically;
d) will have improved their key skills in numeracy and problem solving;
e) will have enhanced their study skills and ability to work with relatively little supervision.

Method of Assessment

90% by a 2-hour written examination at the end of the year and 10% coursework.

Preliminary Reading

Students are provided with study notes published be the Actuarial Education Company.
I Miller & M Miller John E Freund’s Mathematical Statistics with Applications, 8th ed. Pearson Education, 2012 (QA276) (R)

RV Hogg, JW McKean & AT Craig Introduction to Mathematical Statistics, 7th ed. Boston, Pearson, 2013 (QA276) (B)
HJ Larson Introduction to Probability Theory and Statistical Inference. 3rd ed. Wiley, 1982 (HA29) (B)

Synopsis *

This module is a pre-requisite for many of the other statistics modules at Stages 2, 3 and 4, but it can equally well be studied as a module in its own right, extending the ideas of probability and statistics met at Stage 1 and providing practice with the mathematical skills learned in MA321. Marks on this module can count towards exemption from the professional examination CT3 of the Institute and Faculty of Actuaries. It starts by revising the idea of a probability distribution for one or more random variables, and then looks at different methods to derive the distribution of a function of random variables. These techniques are then used to prove some of the results underpinning the hypothesis test and confidence interval calculations met at Stage 1, such as for the t-test or the F-test. With these tools to hand, the module moves on to look at how to fit models (probability distributions) to sets of data. A standard technique, known as the method of maximum likelihood, is introduced, which is then used to fit the model to the data to obtain point estimates of the model parameters and to construct hypothesis tests and confidence intervals for these parameters. Linear regression and analysis of variance models are introduced, which aim to describe the relationship between a random variable of interest and one or more covariates, for example the relationship between income and education level or gender. Outline Syllabus includes: Joint, marginal and conditional distributions of discrete and continuous random variables; Generating functions; Transformations of random variables; Poisson processes; Sampling distributions; Point and interval estimation; Properties of estimators; Maximum likelihood; Hypothesis testing; Neyman-Pearson lemma; Maximum likelihood ratio test; Simple linear regression: ANOVA.

Marks on this module can count towards exemption from the professional examination CT3 of the Institute and Faculty of Actuaries. Please see http://www.kent.ac.uk/casri/Accreditation/index.html for further details.

MA533 Contingencies 2

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Spring	H	15 (7.5)	80% Exam, 20% Coursework	
2	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

Total contact hours: 42
Private study hours: 108
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1. demonstrate systematic understanding of the mathematical techniques used to model and value cashflows which are contingent on mortality and morbidity risks;
2. demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a good level of skill in calculation and manipulation of
   models used to value cashflows which are contingent on mortality and morbidity risks;
3. demonstrate an understanding of recent developments in Actuarial Mathematics and the links between the theory of Actuarial Mathematics and their practical application.

The intended generic learning outcomes. On successfully completing the module students will be able to:

1 apply a logical mathematical approach to solving problems;
2 demonstrate skills in written communication to both technical and non-technical audiences;
3 demonstrate skills in the use of relevant information technology;
4 demonstrate skills in time management, organisation and studying.

Method of Assessment

70% Examination, 30% Coursework

Preliminary Reading

Students are provided with the study notes published by the Actuarial Education Company for Subject CM1 – Actuarial Mathematics.

Pre-requisites

MACT5160: Actuarial Mathematics 1

Synopsis *

The aim of this module is to provide a grounding in the principles of modelling as applied to actuarial work – focusing particularly on deterministic models which can be used to model and value cashflows which are dependent on death, survival, or other uncertain risks. Indicative topics covered by the module include equations of value and its applications, single decrement models, multiple decrement and multiple life models, pricing and reserving. This module will cover a number of syllabus items set out in Subject CM1 – Actuarial Mathematics published by the Institute and Faculty of Actuaries.

MA535 Portfolio Theory and Asset Pricing Models

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
2	Canterbury	Autumn	H	15 (7.5)	70% Exam, 30% Coursework	
2	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

Total contact hours: 36
Private study hours: 114
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the level 6 module students will be able to:
1 describe, interpret and discuss financial economics, and asset and liability models;
2. demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a basic level of skill in calculation and manipulation of
financial economics, and asset and liability models;
3 demonstrate a basic appreciation of recent developments in financial economics and modelling and the links between the theory of these topics and their practical
application.

The intended generic learning outcomes. On successfully completing the level 6 module students will be able to:
1 use a logical mathematical approach to solve problems;
2 solve problems and communicate in writing effectively to both a technical and non-technical audience;
3 manage their time and work independently.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

David Hillier, Mark Grinblatt, Sheridan Titman, 2012. Financial markets and corporate strategy, McGraw-Hill Higher Education, London.

Martin Baxter, Andrew Rennie, 1996. Financial Calculus: An Introduction to Derivative Pricing, Cambridge University Press, Cambridge.

Students on the BSc Actuarial Science and BSc Actuarial Science with a Foundation Year programmes are provided with the study notes published by the Actuarial Education Company for Subject CM2 – Actuarial Mathematics 2.

Pre-requisites

Prerequisites: MAST5007: Mathematical Statistics or alternatively students would be expected to have studied material equivalent to that covered in MAST5007.

Synopsis *

The aim of this module is to provide a grounding in the principles of modelling as applied to actuarial work – focusing particularly on stochastic asset liability models. These skills are also required to communicate with other financial professionals and to critically evaluate modern financial theories.

Indicative topics covered by the module include theories of financial market behaviour, measures of investment risk, stochastic investment return models, asset valuations, and liability valuations.

This module will cover a number of syllabus items set out in Subject CM2 – Actuarial Mathematics 2 published by the Institute and Faculty of Actuaries.

MA537 Mathematics of Financial Derivatives

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 36
Private study hours:114
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the level 6 module students will be able to:

1 describe, interpret and discuss the mathematics of financial derivatives;
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a basic level of skill in calculation and manipulation of
financial derivatives;
3 demonstrate a basic appreciation of recent developments in the mathematics of financial derivatives and the links between the theory of the mathematics of financial
derivatives and its practical application.

The intended generic learning outcomes. On successfully completing the level 6 module students will be able to:

1 use a logical mathematical approach to solve problems;
2 solve problems and communicate in writing effectively to both a technical and non-technical audience;
3 manage their time and work independently.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Hull, John, Options, Futures and other derivatives, 8th Edition, Prentice Hall, 2012.
Baxter, Martin; Rennie, Andrew, Financial Calculus: an introduction to derivative pricing, Cambridge University Press, 1996 (E-book version also available)
Study notes published by the Actuarial Education Company for Subject CM2

Pre-requisites

Pre-requisites: MAST5007 Mathematical Statistics or alternatively students would be expected to have studied material equivalent to that covered in MAST5007.

Synopsis *

The aim of this module is to provide a grounding in the principles of modelling as applied to actuarial work – focusing particularly on the valuation of financial derivatives. These skills are also required to communicate with other financial professionals and to critically evaluate modern financial theories.

Indicative topics covered by the module include theories of stochastic investment return models and option theory.

This module will cover a number of syllabus items set out in Subject CM2 – Actuarial Mathematics published by the Institute and Faculty of Actuaries.

MA539 Financial Modelling

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	H	15 (7.5)	100% Coursework	

Contact Hours

Total contact hours: 36
Private study hours: 114
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1 demonstrate skills in specific actuarial software and information technology (e.g. PROPHET);
2 understand the principles of specific actuarial mathematics techniques;
3 develop simple actuarial computer models to solve actuarial problems;
4 interpret and communicate the results of the models derived in 3 above.

The intended generic learning outcomes. On successfully completing the module students will be able to:

1 use a logical mathematical approach to solving problems;
2 communicate material competently in writing;
3 apply relevant computing skills.

Method of Assessment

100% coursework

Preliminary Reading

This is primarily a practical model. The majority of the reading will be provided by specific lecture notes.

Pre-requisites

Co-requisite: MACT5330 Actuarial Mathematics 2

Synopsis *

This module is split into two parts:

1. An introduction to the practical experience of working with the financial software package, PROPHET, which is used by commercial companies worldwide for profit testing, valuation and model office work. The syllabus includes: overview of the uses and applications of PROPHET, introduction on how to use the software, setting up and performing a profit test for a product , analysing and checking the cash flow results obtained for reasonableness, using the edit facility on input files, performing sensitivity tests , creating a new product using an empty workspace by selecting the appropriate indicators and variables for that product and setting up the various input files, debugging errors in the setting up of the new product, performing a profit test for the new product and analysing the results.

2. An introduction to financial modelling techniques on spreadsheets which will focus on documenting the process of model design and communicating the model's results. The module enables students to prepare, analyse and summarise data, develop simple financial and actuarial spreadsheet models to solve financial and actuarial problems, and apply, interpret and communicate the results of such models.

MA549 Discrete Mathematics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	100% Exam	
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	90% Exam, 10% Coursework	
1	Canterbury	Spring	H	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 42
Private study hours: 108
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the level 6 module students will be able to:
1 demonstrate systematic understanding of key aspects of the theory and practice of finite fields and their application to Latin squares, cryptography, m-sequences and
cyclic codes;
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a reasonable level of skill in calculation and manipulation of
the material in the following areas: modular arithmetic, factorising polynomials, construction of finite fields, Latin squares, classical and public key ciphers including RSA,
m-sequences and cyclic codes;
3 apply key aspects of discrete mathematics in well-defined contexts, showing judgement in the selection and application of tools and techniques.

The intended generic learning outcomes.
On successfully completing the level 6 module students will be able to:
1 manage their own learning and make use of appropriate resources;
2 understand logical arguments, identifying the assumptions made and the conclusions drawn;
3 communicate straightforward arguments and conclusions reasonably accurately and clearly;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make competent use of information technology skills such online resources (Moodle), internet communication;
7 communicate technical material competently;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

N L Biggs, Discrete Mathematics, Oxford University Press, 2nd edition, 2002
D Welsh, Codes and Cryptography, Oxford University Press, 1988
R Hill, A First Course in Coding Theory, Oxford University Press, 1980

Pre-requisites

Pre-requisite: MAST4001 (Algebraic Methods) or MAST4005 (Linear Mathematics)
Co-requisite: None

Synopsis *

Discrete mathematics has found new applications in the encoding of information. Online banking requires the encoding of information to protect it from eavesdroppers. Digital television signals are subject to distortion by noise, so information must be encoded in a way that allows for the correction of this noise contamination. Different methods are used to encode information in these scenarios, but they are each based on results in abstract algebra. This module will provide a self-contained introduction to this general area of mathematics.
Syllabus: Modular arithmetic, polynomials and finite fields. Applications to
• orthogonal Latin squares,
• cryptography, including introduction to classical ciphers and public key ciphers such as RSA,
• "coin-tossing over a telephone",
• linear feedback shift registers and m-sequences,
• cyclic codes including Hamming,

MA561 Introduction to Lie Groups and Algebras

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
3	Canterbury	Autumn	M	15 (7.5)	70% Exam, 30% Coursework	
3	Canterbury	Autumn	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 42
Private study hours: 108
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes
On successfully completing the level 7 module students will be able to:
1 demonstrate systematic understanding of Matrix Lie Groups and Lie Algebras;
2 demonstrate the capability to solve complex problems using a very good level of skill in calculation and manipulation of the material in the following areas: Matrix Lie
groups, Lie algebras, representations of Lie groups and Lie algebras;
3 apply a range of concepts and principles in Matrix Lie Groups and Lie Algebras theory in loosely defined contexts, showing good judgment in the selection and
application of tools and techniques.

The intended generic learning outcomes.
On successfully completing the level 7 module students will be able to:
1 work competently and independently, be aware of their own strengths and understand when help is needed;
2 demonstrate a high level of capability in developing and evaluating logical arguments;
3 communicate arguments confidently with the effective and accurate conveyance of conclusions;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make effective use of information technology skills such as online resources (Moodle), internet communication;
7 communicate technical material effectively;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

• K. Erdmann and M. Wildon: Introduction to Lie algebras. Springer Undergraduate Mathematics Series. Springer-Verlag London, Ltd., London, 2006. x+251 pp. ISBN: 978-1-84628-040-5; 1-84628-040-0
• B. Hall: Lie groups, Lie algebras, and representations. An elementary introduction. Second edition. Graduate Texts in Mathematics, 222. Springer, Cham, 2015. xiv+449 pp. ISBN: 978-3-319-13466-6; 978-3-319-13467-3

Synopsis *

• Introduction to Matrix Lie Groups: Basic examples. Matrix groups GL(n), SL(n), SO(n), Sp(n).
• Representations of SU(2): Tensor product of representations, Clebsch-Gordan series for SU(2).
• The Lie algebra of a Lie group. The exponential map.
• Introduction to Lie algebras: The Lie algebras gl(n), sl(n), so(n), sp(n). Nilpotent, solvable and semi-simple Lie algebras. The adjoint action of a group on its Lie algebra,
and of a Lie algebra on itself. Derivations.
• Representations of sl(2).

MA563 Calculus of Variations

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

44

Learning Outcomes

The intended subject specific learning outcomes. On successful completion of the module students will have acquired :–
a. a competence in the classical Calculus of Variations, comprising a knowledge of the theory, an ability with problem solving, and an appreciation of the subject's relevance to an extensive variety of fields of application
b. a mathematical proficiency, maturity and autonomy, in the Calculus of Variations, commensurate with the level expected of a graduate in Mathematics
c. an appreciation of methods that solve the resulting Euler-Lagrange equations, both exactly and graphically
d. a knowledge of how simple geometric group actions such as translations, scalings, and rotations give rise to conserved quantities of Euler-Lagrange equations, such as conservation of energy and momentum in mechanical problems, via Noether's Theorem
e. basic competence in calculating and solving discrete Euler-Lagrange equations

The intended generic learning outcomes. On successful completion of the module students will have :–
a. matured in their problem formulating and solving skills, by a shift from the uncritical formal approach often adequate at earlier levels, to a preoccupation with the sense and meaning conveyed by the symbols of their mathematical language
b. enhanced their capacity to communicate mathematical statements and conclusions, both symbolically and literally
c. an enhanced ability to use mathematical and graphical software to obtain and validate solutions to differential and discrete problems, to graduate level
d. consolidated a wide variety of Calculus-based mathematical skills

Preliminary Reading

Bruce van Brunt The Calculus of Variations, Springer-Verlag, 2004
Charles Fox An Introduction to the Calculus of Variations, Dover, 1987
L.A. Pars An Introduction to the Calculus of Variations, Heivemann, 1962

Pre-requisites

Core second year modules MA552, MA553 and, MA555 Several Variable Calculus.

Synopsis *

In the Calculus of Variations, definite integrals involving one or more unknown functions are considered, and it is required to determine these unknown functions so that the definite integral shall take maximum or minimum values. The topic has connections with many others, such as differential equations, differential geometry, dynamical systems and as well as setting forth the basic theory, the module will explore various of its applications.

The syllabus includes: Introduction and motivation. The Euler equation for extremals. Natural boundary conditions. Constrained problems. Noether's Theorem. Lagrangian and Hamiltonian mechanics.

MA564 Functions of Several Variables

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	I	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

48

Learning Outcomes

The intended subject specific learning outcomes
On successful completion of this module students will:
a) have a grasp of formal definitions and rigorous proofs in functions of several variables;
b) have gained an appreciation of how to generalise concepts previously encountered in one-dimensional analysis to higher dimensions and potential difficulties;
c) be aware of applications of basic techniques and theorems of functions of several variables in other areas of mathematics, e.g., optimisation theory, mechanics.
d) be able to work with fundamental concepts in functions of several variables, such as continuity and differentiability;
e) be able to apply abstract ideas to concrete problems in analysis;
f) be able to perform calculations for specific examples involving functions of several variables.

The intended generic learning outcomes
Students who successfully complete this module will have further developed:
a) a logical, mathematical approach to solving problems;
b) their ability to communicate solutions, simple proofs and calculations;
c) their numeracy and computational skills;
d) their ability to plan and carry out effective ways of studying;
e) their ability to read and comprehend mathematical ideas.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Lang: Calculus of Several Variables, 3rd edition, Springer 1987.
Salas & Hille: Calculus - Several Variables, 7th edition, Wiley, 1995.

Pre-requisites

MA321 (Calculus and Mathematical Modelling), MA322(Proofs and Numbers) and either MA323 (Matrices and Probability) or MA326 (Matrices and Computing)

Synopsis *

Functions of several variables occur in many important applications. In this module we introduce the derivative for functions of several variables and derive an important consequence, namely the chain rule. We use this to calculate maxima and minima and Taylor series for functions of several variables. We also discuss the important problem of finding maxima and minima of functions subject to a constraint using the method of Lagrange multipliers. Furthermore, we define different ways to integrate functions of several variables such as arclength integrals, line integrals, surface integrals and volume integrals. Outline Syllabus includes: Continuity and Differentiation; tangent plane; swapping order of partial derivatives; implicit function theorem; inverse function theorem; paths independence of line integrals; use of polar, cylindrical and spherical polar coordinates; integral theorems such as Green's theorem.

MA566 Number Theory

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 42
Private study hours: 108
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1 demonstrate knowledge and critical understanding of the well-established principles within Number Theory;
2 demonstrate the capability to use a range of established techniques and a reasonable level of skill in calculation and manipulation of the material to solve problems in the
following areas: integers, prime numbers, congruences, arithmetic functions, quadratic residues, Diophantine equations;
3 apply the concepts and principles in Number Theory in well-defined contexts beyond those in which they were first studied, showing the ability to evaluate critically the
appropriateness of different tools and techniques;
4 make appropriate use of Maple.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Demonstrate an increased ability to:
1 manage their own learning and make use of appropriate resources;
2 understand logical arguments, identifying the assumptions made and the conclusions drawn;
3 communicate straightforward arguments and conclusions reasonably accurately and clearly;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make use of information technology skills such as online resources (Moodle), internet communication;
7 communicate technical material competently.
8 demonstrate an increased level of skill in numeracy and computation.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

D.M. Burton, Elementary Number Theory, McGraw-Hill, 2010.
G.A. Jones and J.M. Jones, Elementary Number Theory, Springer, 1998.
W. Stein, Elementary Number Theory: Primes, Congruences, and Secrets, Undergraduate Texts in Mathematics, Springer, 2009.

Pre-requisites

Pre-requisite: MAST4001 (Algebraic Methods) or MAST4005 (Linear Mathematics)

Synopsis *

The security of our phone calls, bank transfers, etc. all rely on one area of Mathematics: Number Theory. This module is an elementary introduction to this wide area and focuses on solving Diophantine equations. In particular, we discuss (without proof) Fermat's Last Theorem, arguably one of the most spectacular mathematical achievements of the twentieth century. Outline syllabus includes: Modular Arithmetic; Prime Numbers; Introduction to Cryptography; Quadratic Residues; Diophantine Equations.

MA567 Topology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Spring	H	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 42
Private study hours: 108
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the level 6 module students will be able to:

1 demonstrate systematic understanding of key aspects of topology;
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a reasonable level of skill in calculation and manipulation of the material in the following areas: topological spaces, continuity, convergence, homotopy theory;
3 apply key aspects of topology in well-defined contexts, showing judgement in the selection and application of tools and techniques.

The intended generic learning outcomes. On successfully completing the level 6 module students will be able to:

1 manage their own learning and make use of appropriate resources;
2 understand logical arguments, identifying the assumptions made and the conclusions drawn;
3 communicate straightforward arguments and conclusions reasonably accurately and clearly;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make competent use of information technology skills such as online resources (Moodle), internet communication;
7 communicate technical material competently;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

The module will not follow a specific text. However, the following texts cover the material.
J.G. Hocking and G. Young: Topology, Dover Publications, 1988
J.R. Munkres: Topology, a first course, Prentice-Hall, 1975
C. Adams and A. Franzosa: Introduction to Topology, pure and applied, Pearson Prentice-Hall, 2008

Pre-requisites

Pre-requisite: MAST5013 (Real Analysis 2)
Co-requisite: None

Synopsis *

This module is an introduction to point-set topology, a topic that is relevant to many other areas of mathematics. In it, we will be looking at the concept of topological spaces and related constructions. In an Euclidean space, an "open set" is defined as a (possibly infinite) union of open "epsilon-balls". A topological space generalises the notion of "open set" axiomatically, leading to some interesting and sometimes surprising geometric consequences. For example, we will encounter spaces where every sequence of points converges to every point in the space, see why for topologists a doughnut is the same as a coffee cup, and have a look at famous objects such as the Moebius strip or the Klein bottle.

MA568 Orthogonal Polynomials and Special Functions

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Spring	H	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 42
Private study hours: 108
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the level 6 module students will be able to:

1 demonstrate systematic understanding of key aspects of orthogonal polynomial sequences and in particular classical polynomials, special functions and their properties;
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a reasonable level of skill in calculation and manipulation of the
material in the following areas: analysis of solutions to linear differential equations with polynomial coefficients which includes their asymptotic behaviour; approximation
theory; numerical analysis techniques; mathematical physics problems; probability theory;
3 apply key aspects of orthogonal polynomials and special functions in well-defined contexts, showing judgement in the selection and application of tools and techniques;
4 show judgement in the selection and application of Maple as appropriate.

The intended generic learning outcomes. On successfully completing the level 6 module students will be able to:

1 manage their own learning and make use of appropriate resources;
2 understand logical arguments, identifying the assumptions made and the conclusions drawn;
3 communicate straightforward arguments and conclusions reasonably accurately and clearly;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make competent use of information technology skills such online resources (Moodle), internet communication);
7 communicate technical material competently;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

The module does not follow a specific text. However, the following texts cover the material.
R. Askey, Orthogonal Polynomials and Special Functions, Society for Industrial and Applied Mathematics, Philadelphia, PA, 1975
R. Beals and R. Wong, Special Functions – A Graduate Text, Cambridge University Press, Cambridge, 2010
T.S. Chihara, An Introduction to Orthogonal Polynomials, Dover Publ., Mineola, N.Y., 2011
M. Ismail, Classical and Quantum Orthogonal Polynomials in One Variable, Cambridge University Press, Cambridge, 2005
F.W.J. Olver, D.W. Lozier, C.W. Clark,R.F. Boisvert, Digital Library of Mathematical Functions, National Institute of Standards and Technology, Gaithersburg, U.S.A., 2010 (http://dlmf.nist.gov)
I.N. Sneddon, Special Functions of Mathematical Physics and Chemistry, 3rd Edition, Longman, London, 1980
G. Szego, Orthogonal Polynomials, 4th Ed., American Mathematical Society, Providence, RI, 1975

Pre-requisites

Pre-requisite: MAST4004 (Linear Algebra); MAST4010 (Real Analysis 1); MAST5013 (Real Analysis 2); MAST5012 (Ordinary differential equations).

Synopsis *

This module provides an introduction to the study of orthogonal polynomials and special functions. They are essentially useful mathematical functions with remarkable properties and applications in mathematical physics and other branches of mathematics. Closely related to many branches of analysis, orthogonal polynomials and special functions are related to important problems in approximation theory of functions, the theory of differential, difference and integral equations, whilst having important applications to recent problems in quantum mechanics, mathematical statistics, combinatorics and number theory. The emphasis will be on developing an understanding of the structural, analytical and geometrical properties of orthogonal polynomials and special functions. The module will utilise physical, combinatorial and number theory problems to illustrate the theory and give an insight into a plank of applications, whilst including some recent developments in this field. The development will bring aspects of mathematics as well as computation through the use of MAPLE. The topics covered will include: The hypergeometric functions, the parabolic cylinder functions, the confluent hypergeometric functions (Kummer and Whittaker) explored from their series expansions, analytical and geometrical properties, functional and differential equations; sequences of orthogonal polynomials and their weight functions; study of the classical polynomials and their applications as well as other hypergeometric type polynomials.

MA572 Complex Analysis

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	100% Exam	
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	90% Exam, 10% Coursework	
1	Canterbury	Spring	H	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

48 (approx.. 36 lectures and 12 example classes).

Learning Outcomes

The intended subject specific learning outcomes
On successful completion of this module students will:
a) Have a reasonable ability to perform basic computational skills: calculations with Cartesian and polar form of complex numbers, modulus and argument; roots of unity; partial fractions and the general binomial theorem; calculations with exponential, trigonometric and hyperbolic functions, complex logarithm and complex exponents, and hyperbolic functions.
b) Have a reasonable knowledge, and understand the place in the theory and the proofs: of the Cauchy Fundamental Theorem, Cauchy Integral Formulae with and without winding numbers, the Deformation Theorem, Existence and formulae for Taylor and Laurent series, differentiability of power series, Cauchy Residue Theorem, the Cauchy-Riemann equations, a proof of the Fundamental Theorem of Algebra..
c) Gain experience and solve problems using more advanced analytic skills such as: computation of Taylor and Laurent series; radius of convergence of power series; calculation of residues and types of singularity; evaluation of integrals using residues, possibly including the use of Riemann surfaces; homotopy of paths to ease calculations of path integrals; use of winding numbers of paths; evaluation of limits and differentiability of a complex function; conjugate harmonic functions.

The intended generic learning outcomes
Students who successfully complete this module will have further developed:
a) a logical mathematical approach to solving problems;
b) an ability to solve problems relevant to applications in engineering and physics;
c) the basic skills for postgraduate studies in topology, engineering mathematics and applied analysis.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

M.R. Spiegel Complex Variables, McGraw-Hill, 1964
H.A. Priestley Introduction to Complex Analysis, Oxford University Press, 2003
J.H. Mathews & R.W Howell Complex Analysis for Mathematics and Engineering, Jones and Bartlett 5th ed., 2006
I Stewart & D Tall, Complex Analysis, Cambridge, 2004

Pre-requisites

MA552 (for undergraduate courses only)

Synopsis *

This module is concerned with complex functions, that is functions which are both defined for and assume complex values. Their theory follows a quite different development from that of real functions, is remarkable in its directness and elegance, and leads to many useful applications.Topics covered will include: Complex numbers. Domains and simple connectivity. Cauchy-Riemann equations. Integration and Cauchy's theorem. Singularities and residues. Applications.

MA574 Polynomials in Several Variables

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Spring	H	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

Total contact hours: 42
Private study hours: 108
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the level 6 module students will be able to:
1 demonstrate systematic understanding of key aspects of polynomials in several variables;
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a reasonable level of skill in calculation and manipulation of
the material in the following areas: solution sets for systems of polynomial equations and the corresponding ideals in the ring of polynomials;
3 apply key aspects of polynomial in several variables in well-defined contexts, showing judgement in the selection and application of tools and techniques;
4 show judgement in the selection and application of computer calculation of Gröbner bases.

The intended generic learning outcomes.
On successfully completing the level 6 module students will be able to:
1 manage their own learning and make use of appropriate resources;
2 understand logical arguments, identifying the assumptions made and the conclusions drawn;
3 communicate straightforward arguments and conclusions reasonably accurately and clearly;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make competent use of information technology skills such online resources (Moodle), internet communication;
7 communicate technical material competently;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Adams, Loustaunau, An introduction to Gröbner bases, AMS, 1994
Cox, Little, O'Shea, Ideals, Varieties and Algorithms, Springer, Undergraduate Texts in Mathematics, 1991
Hibi, Gröbner bases: Statistics and Software Systems, Springer, 2013

Pre-requisites

Pre-requisite: MAST4001 (Algebraic Methods), MAST5503 (Groups and Symmetries)
Recommended: MAST5514 (Rings and Fields)
Co-requisite: None

Synopsis *

This module provides a rigorous foundation for the solution of systems of polynomial equations in many variables. In the 1890s, David Hilbert proved four ground-breaking theorems that prepared the way for Emmy Nöther's famous foundational work in the 1920s on ring theory and ideals in abstract algebra. This module will echo that historical progress, developing Hilbert's theorems and the essential canon of ring theory in the context of polynomial rings. It will take a modern perspective on the subject, using the Gröbner bases developed in the 1960s together with ideas of computer algebra pioneered in the 1980s. The syllabus will include
• Multivariate polynomials, monomial orders, division algorithm, Gröbner bases;
• Hilbert's Nullstellensatz and its meaning and consequences for solving polynomials in several variables;
• Elimination theory and applications;
• Linear equations over systems of polynomials, syzygies.

MA577 Elements of Abstract Analysis

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Spring	H	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

48

Learning Outcomes

The Intended Subject Specific Learning Outcomes. On successful completion of the module students will:
(a) be able to work with fundamental concepts in analysis and metric spaces including, Cauchy sequences, compactness, completeness, inner-product spaces, and complete orthonormal systems;
(b) have a grasp of formal definitions and rigorous proofs in analysis;
(c) have gained an appreciation of a wider context in which previously encountered concepts from analysis can be used;
(d) be able to apply abstract ideas to concrete problems in analysis;
(e) be aware of applications of basic techniques and theorems of metric spaces and analysis in other areas of mathematics, e.g., approximation theory, and the theory of ordinary differential equations.

The Intended Generic Learning Outcomes. We expect students successfully completing the module to have
(i) an enhanced ability to correctly formulate abstract problems and solve them efficiently;
(ii) enhanced skills in understanding and communicating mathematical results and conclusions;
(iii) furthered a holistic view of mathematics as a problem solving and intellectually stimulating discipline;
(iv) an appreciation of the power of abstract reasoning and formal proofs in mathematics and its applications

On completion of the module students will have:
• matured in their problem formulating and solving skills;
• enhanced their ability to apply abstract methods and theorems from analysis in a wide context.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

- E Kreyszig, Introductory Functional Analysis with Applications. (John Wiley, 1978) (B)
- W Rudin, Principles of Mathematical Analysis. (International Series in Pure and Applied Mathematics, McGraw-Hill, 1976) (B)
- N Young, An Introduction to Hilbert space. (Cambridge University Press, 1998) (R)
- JR Giles, Introduction to the Analysis of Metric Spaces. (Australian Mathematical Society Lecture Series, Cambridge, 1987) (R)
- K Saxe, Beginning Functional Analysis. (Springer, 2002) (B)

Synopsis *

In this module we build on the key analytical concepts of sequences, series, limits,and continuity developed in any first course on Real Analysis, and place them in the more general context of metric spaces. In the first part of the course fundamental notions of metric spaces, such as compactness and completeness, are discussed. Metric space theory underpins much of modern anaylisis and its applications. In the second part of the course we use techniques and theorems from metric spaces to discuss elements of Hilbert space theory. The course emphasizes formal definitions and proofs, and aims to enable you to place your previous knowledge of anaylsis in a much wider context.

The syllabus will be taken from the following topics:
(1) Metric space theory.
• Definitions and examples of metric spaces, normed spaces, inner-product spaces.
• Balls, boundedness, open and closed sets.
• Convergence, Cauchy sequences, completeness, and equivalence of metrics.
• Completion of a metric space, uniform convergence, and exchanging limits.
• Incompleteness of the space of Riemann-integrable functions under Lp-norms, and an informal discussion of its completion, i.e., Lp-spaces. The space of continuous functions and supremum norm.
• Limit points, closure, boundary, separability, density.
• Banach contraction mapping theorem; applications to ODE theory (Picard's theorem), and/or integral equations.
• Continuity in metric spaces, uniform continuity, and continuity of linear mappings.
• Compactness, sequential compactness, Heine-Borel, Non-compactness of balls in infinite dimensional normed spaces.
• The spaces of continuous functions C(X) on a compact metric space X, and the Weierstrass approximation theorem.

(2) Basic Hilbert space theory.
• Definitions and examples of inner-product spaces, Hilbert spaces, Cauchy-Schwarz inequality, parallelogram identity, l2 and L2([a,b]).
• Orthogonal complements and orthogonal projections.
• Orthonormal sets and Gram-Schmidt orthogonalisation.
• Examples of orthogonal polynomials, e.g., Legendre polynomials and/or Chebyshev polynomials.
• Complete orthonormal systems, Bessel's inequality, Parseval's theorem, and the Riesz-Fisher theorem. Trigonometric series and L2 convergence.

MA587 Numerical Solution of Differential Equations

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	90% Exam, 10% Coursework	
1	Canterbury	Spring	H	15 (7.5)	90% Exam, 10% Coursework	

Contact Hours

Total contact hours: 42
Private study hours: 108
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1 demonstrate systematic understanding of key aspects of finite difference methods for approximating solutions of ordinary differential equations (ODEs) and partial
differential equations (PDEs);
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a reasonable level of skill in calculation and manipulation of
the material in the following areas: multistep methods, approximation of boundary value problems for ODEs, discretization of PDEs, error and stability analysis,
elementary numerical linear algebra;
3 apply key aspects of finite difference methods in well-defined contexts, showing judgement in the selection and application of tools and techniques;
4 show judgement in the selection and application of Matlab commands to implement numerical methods.

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1 manage their own learning and make use of appropriate resources;
2 understand logical arguments, identifying the assumptions made and the conclusions drawn;
3 communicate straightforward arguments and conclusions reasonably accurately and clearly;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make competent use of information technology skills such as online resources (Moodle), internet communication;
7 communicate technical material competently;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Burden, R.L., and Faires, J.D., and Burden, A. M., Numerical Analysis, 10th edition, Cengage Learning, 2016
Iserles, A first course in the numerical analysis of differential equations, 2nd edition, Cambridge University Press, 2009
Morton, K. W. and Mayers, D.F., Numerical solution of partial differential equations: an introduction, Cambridge University Press, 2011

Pre-requisites

Pre-requisite: MAST5005 (Linear Partial Differential Equations), MAST5012 (Ordinary differential equations)
Recommended: MAST5009 (Numerical Methods)

Synopsis *

Most differential equations which arise from physical systems cannot be solved explicitly in closed form, and thus numerical solutions are an invaluable way to obtain information about the underlying physical system. The first half of the module is concerned with ordinary differential equations. Several different numerical methods are introduced and error growth is studied. Both initial value and boundary value problems are investigated. The second half of the module deals with the numerical solution of partial differential equations. The syllabus includes: initial value problems for ordinary differential equations; Taylor methods; Runge-Kutta methods; multistep methods; error bounds and stability; boundary value problems for ordinary differential equations; finite difference schemes; difference schemes for partial differential equations; iterative methods; stability analysis.

MA601 Individual Project in Mathematics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	30 (15)	100% Project	

Contact Hours

Total contact hours: 9
Private study hours: 291
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will:

1 have appreciated a particular area of mathematical thought or mathematical exposition in greater depth than in previous taught courses;
2 have developed skills in mathematical computation and/or communication relevant to the topic;
3 be able to draw conclusions from statistical data, mathematical calculations or computer output;
4 have a reasonable ability to apply mathematical concepts and/or statistical techniques in a particular context;
5 have written a reasonably coherent account of an area of mathematical thought, or a statistical method;
6 have performed computations that show their understanding of the techniques relevant to the topic;
7 have improved their ability in mathematical and statistical modelling of particular problems.

The intended generic learning outcomes. On successfully completing the module students will have:

1 improved communication skills;
2 enhanced intellectual independence;
3 relevant computing skills, including use of appropriate document preparation and word-processing packages;
4 improved problem solving skills
5 awareness of important issues relating to good written presentation of results;
6 greater ability to select material from source texts, either recommended to or found by the student, and shown awareness of the relationship of the material to background
and to more advanced material;
7 increased their ability for independent learning and time management.

Method of Assessment

100% Project

Preliminary Reading

An appropriate reading list will be provided by the supervisor for each topic.

Pre-requisites

None

Synopsis *

NB: Only for Mathematics with Secondary Education students.

This module provides an opportunity for students on the Mathematics with Secondary Education programme to explore and research a topic in mathematics or statistics that is of interest to the student. Under the guidance of a supervisor, the student will engage in self-directed study to produce a dissertation. Outline syllabus: This is determined by the topic of the project. Indicative mathematics titles include the following: Knot theory; Logistic map; Totally non-negative matrices; Signed permutations and the four colour theorem; Generating functions; Latin squares; Teaching further Linear Algebra; Graph theory; Exploring mathematics with origami; Classical invariant theory; Zeta functions; Foundations of the real numbers; Euler's formula; Creative use of random numbers to teach Statistics; The National Lottery; Circular data.

MA636 Stochastic Processes

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	80% Exam, 20% Coursework	
1	Canterbury	Autumn	H	15 (7.5)	90% Exam, 10% Coursework	

Contact Hours

Total contact hours: 48
Private study hours: 102
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the level 6 module students will be able to:
1 demonstrate systematic understanding of key aspects of stochastic modelling;
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a reasonable level of skill in calculation and manipulation of
the material in the following areas: random walks, discrete and continuous time Markov chains, queues and branching processes;
3 apply key aspects of stochastic modelling in well-defined contexts, showing judgement in the selection and application of tools and techniques.

The intended generic learning outcomes.
On successfully completing the level 6 module students will be able to:
1 manage their own learning and make use of appropriate resources;
2 understand logical arguments, identifying the assumptions made and the conclusions drawn;
3 communicate straightforward arguments and conclusions reasonably accurately and clearly and communicate technical material competently;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make competent use of information technology skills such as online resources (Moodle);
7 communicate technical material competently;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Ross, S.M. (1996) Stochastic Processes. New York, Wiley.
Breuer, L. and Baum, D. (2005) An introduction to Queueing Theory and Matrix-Analytic Methods. Springer, Dordrecht.
Jones, P.W. and Smith, P. (2001) Stochastic Processes: An Introduction. London, Arnold.
Karlin, S., Taylor, H.M. (1998) A First Course in Stochastic Processes. 3rd Edition, Academic Press, London.
Ross, S.M. (1970) Applied Probability Models with Optimization Applications. Holden-Day, San Francisco.
Cox, D.R. and Miller, H.D. (1965) The Theory of Stochastic Processes. Chapman & Hall/CRC.

Pre-requisites

Pre-requisite: MAST4009 (Probability), MAST4011 (Statistics), MAST4006 (Mathematical Methods 1), MAST4007 (Mathematical Methods 2), either MAST4010 (Real Analysis 1) and MAST4004 (Linear Algebra) or MAST4005 (Linear Mathematics), and MAST5007 Mathematical Statistics; or their equivalents.

Co-requisite: None

Synopsis *

Introduction: Principles and examples of stochastic modelling, types of stochastic process, Markov property and Markov processes, short-term and long-run properties. Applications in various research areas.

Random walks: The simple random walk. Walk with two absorbing barriers. First–step decomposition technique. Probabilities of absorption. Duration of walk. Application of results to other simple random walks. General random walks. Applications.

Discrete time Markov chains: n–step transition probabilities. Chapman-Kolmogorov equations. Classification of states. Equilibrium and stationary distribution. Mean recurrence times. Simple estimation of transition probabilities. Time inhomogeneous chains. Elementary renewal theory. Simulations. Applications.

Continuous time Markov chains: Transition probability functions. Generator matrix. Kolmogorov forward and backward equations. Poisson process. Birth and death processes. Time inhomogeneous chains. Renewal processes. Applications.

Queues and branching processes: Properties of queues - arrivals, service time, length of the queue, waiting times, busy periods. The single-server queue and its stationary behaviour. Queues with several servers. Branching processes. Applications.

MA639 Time Series Modelling and Simulation

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	H	15 (7.5)	80% Exam, 20% Coursework	
2	Canterbury	Spring	H	15 (7.5)	90% Exam, 10% Coursework	

Contact Hours

Total contact hours: 46
Private study hours: 104
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing this module students will be able to:
1 demonstrate systematic understanding of key aspects of time series modelling and simulation;
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a reasonable level of skill in calculation and manipulation of
the material in the following areas: ARIMA and GARCH time series models including those modelling seasonality, main methods for simulating random variates;
3 apply key aspects of time series modelling in well-defined contexts, showing judgement in the selection and application of tools and techniques.

The intended generic learning outcomes. On successfully completing this module students will be able to:
1 manage their own learning and make use of appropriate resources;
2 understand logical arguments, identifying the assumptions made and the conclusions drawn;
3 communicate straightforward arguments and conclusions reasonably accurately and clearly and communicate technical material competently;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make competent use of information technology skills such as online resources (Moodle);
7 communicate technical material competently;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Enders, W. (2004), Applied Econometric Time Series, New York: Wiley.
Brockwell, P.J., and Davis, R. A. (2002), Introduction to Time Series Analysis and Forecasting, New York: Springer-Verlag.
Morgan, B. J. T. (1984), Elements of Simulation, London: Chapman & Hall/CRC.

Pre-requisites

MAST5007 Mathematical Statistics (or equivalent) or MACT7290 Probability and Statistics for Actuarial Science

Synopsis *

Stationary Time Series: Stationarity, autocovariance and autocorrelation functions, partial autocorrelation functions, ARMA processes.
ARIMA Model Building and Testing: estimation, Box-Jenkins, criteria for choosing between models, diagnostic tests for residuals of a time series after estimation.
Forecasting: Holt-Winters, Box-Jenkins, prediction bounds.
Testing for Trends and Unit Roots: Dickey-Fuller, ADF, structural change, trend-stationarity vs difference stationarity.
Seasonality and Volatility: ARCH, GARCH, ML estimation.
Multiequation Time Series Models: transfer function models, vector autoregressive moving average (VARM(p,q)) models, impulse responses.
Spectral Analysis: spectral distribution and density functions, linear filters, estimation in the frequency domain, periodogram.
Simulation: generation of pseudo-random numbers, random variate generation by the inverse transform, acceptance rejection. Normal random variate generation: design issues and sensitivity analysis.

MA771 Computational Statistics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	H	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 38
Private study hours: 112
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the level 6 module students will be able to:
1 demonstrate systematic understanding of key aspects of computational statistics;
2 demonstrate the capability to deploy established approaches accurately to analyse and solve problems using a reasonable level of skill in calculation and manipulation of
material in the following areas: numerical aspects of maximum likelihood estimation, EM algorithm and simulation methods;
3 apply key aspects of computational statistics in well-defined contexts, showing judgement in the selection and application of tools and techniques;
4 adapt R programs, showing judgement in the application of R.

The intended generic learning outcomes.
On successfully completing the level 6 module students will be able to:
1 manage their own learning and make use of appropriate resources;
2 understand logical arguments, identifying the assumptions made and the conclusions drawn;
3 communicate straightforward arguments and conclusions reasonably accurately and clearly;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make competent use of information technology skills such as online resources (moodle), internet communication;
7 communicate technical material competently;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Morgan, B. J. T. (2009) Applied Stochastic Modelling, Chapman and Hall.

Pre-requisites

MAST5001 (Applied Statistical Modelling 1); MAST5007 (Mathematical Statistics)

Synopsis *

Statistics methods contribute significantly to areas such as biology, ecology, sociology and economics. The real data collected does not always follow standard statistical models. This module looks at modern statistical models and methods that can be utilised for such data, making use of R programs to execute these methods.

Indicative module content: Motivating examples; model fitting through maximum likelihood for specific examples; function optimization methods; profile likelihood; score tests; Wald tests; confidence interval construction; latent variable models; EM algorithm; mixture models; simulation methods; importance sampling; kernel density estimation; Monte Carlo inference; bootstrap; permutation tests; R programs.

MA858 Computational Statistics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 38
Private study hours: 112
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the level 7 module students will be able to:
1. demonstrate systematic understanding of computational statistics;
2. demonstrate the capability to solve complex problems using a very good level of skill in calculation and manipulation of the material in the following areas: Numerical
aspects of maximum likelihood estimation, EM algorithm and simulation methods, including advanced techniques;
3. apply a range of concepts and principles in computational statistics in loosely defined contexts, showing good judgment in the selection and application of tools and
techniques;
4. write R programs for complex applications, making effective and well-considered use of R.

The intended generic learning outcomes.
On successfully completing the level 7 module students will be able to:
1. work competently and independently, be aware of their own strengths and understand when help is needed;
2. demonstrate a high level of capability in developing and evaluating logical arguments;
3. communicate arguments confidently with the effective and accurate conveyance of conclusions;
4. manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5. solve problems relating to qualitative and quantitative information;
6. make effective use of information technology skills such as online resources (Moodle), internet communication;
7. communicate technical material effectively;
8. demonstrate an increased level of skill in numeracy and computation;
9. demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Morgan, B. J. T. (2009) Applied Stochastic Modelling, Chapman and Hall.

Pre-requisites

Pre-requisite: None
Co-requisite: MAST8810 (Probability and Classical Inference), MAST8820 (Advanced Regression Modelling)

Synopsis *

Statistics methods contribute significantly to areas such as biology, ecology, sociology and economics. The real data collected does not always follow standard statistical models. This module looks at modern statistical models and methods that can be utilised for such data, making use of R programs to execute these methods.
Indicative module content: Motivating examples; model fitting through maximum likelihood for specific examples; function optimization methods; profile likelihood; score tests; Wald tests; confidence interval construction; latent variable models; EM algorithm; mixture models; simulation methods; importance sampling; kernel density estimation; Monte Carlo inference; bootstrap; permutation tests; R programs.
In addition, for level 7 students: advanced EM algorithm methods, advanced simulation methods, writing R programs for advanced methods and applications.

MA871 Asymptotics and Perturbation Methods

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
4	Canterbury	Autumn	M	15 (7.5)	80% Exam, 20% Coursework	
4	Canterbury	Spring	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

42

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the level 7 module students will be able to:
1 demonstrate a systematic understanding of the use of asymptotic techniques in the study of integrals and differential equations;
2 critically apply the techniques to obtain asymptotic approximations of various types of integrals and approximate solutions of linear differential equation in complex situations;
3 demonstrate a good understanding of the techniques of matched asymptotic expansions for singular perturbation and boundary layer problems;
4 make effective use of WKB (Wentzel-Kramers-Brillouin), multiple scales and related methods to obtain asymptotic expansions of solutions of some differential equations.

The intended generic learning outcomes. On successfully completing the level 7 module students will be able to:
1 work competently and independently, be aware of their own strengths and understand when help is needed;
2 demonstrate a high level of capability in developing and evaluating logical arguments;
3 communicate arguments confidently with the effective and accurate conveyance of conclusions;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make effective use of information technology skills such as using online resources (Moodle);
7 demonstrate an increased level of skill in numeracy and computation.

Method of Assessment

80% Examination, 20% coursework

Preliminary Reading

C M Bender and S A Orszag, "Advanced Mathematical Methods for Scientists and Engineers I: Asymptotic Methods and Perturbation Theory", Springer-Verlag, New York (1999)
J D Murray, "Asymptotic Analysis", Springer-Verlag, New York (1997)
M H Holmes, "Introduction to Perturbation Methods", Second Edition, Springer, New York (2013)

Pre-requisites

Synopsis *

The lectures will introduce students to asymptotic and perturbation methods for the approximate evaluation of integrals and to obtaining approximations for solutions of ordinary differential equations. These methods are widely used in the study of physically significant differential equations which arise in Applied Mathematics, Physics and Engineering. The material is chosen so as to demonstrate a range of the Mathematical techniques available and to illustrate some different applications which are amenable to such analysis.
The indicative syllabus is:
• Asymptotics. Ordering symbols. Asymptotic sequences, expansions and series. Differentiation and integration of asymptotic expansions. Dominant balance. Solution of algebraic and transcendental equations.
• Asymptotic evaluation of integrals. Integration by parts. Laplace's method and Watson's lemma. Method of stationary phase.
• Approximate solution of linear differential equations. Classification of singular points. Local behaviour at irregular singular points. Asymptotic expansions in the complex plane. Stokes phenomena: Stokes and anti-Stokes lines, dominance and sub-dominance. Connections between sectors of validity. Airy functions.
• Matched asymptotic expansions. Regular and singular perturbation problems. Asymptotic matching. Boundary layer theory: inner, outer and intermediate expansions and limits.
• WKB method. Schrödinger equation and Sturm-Liouville problems. Turning points.
• Multiple scales analysis and related methods. Secular terms. Multiple scales method. Method of strained coordinates (Lindstedt--Poincaré method).

Level 7 Students will study selected topics in greater depth than level 6 students.

MA881 Probability and Classical Inference

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 36
Private study hours: 114
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1 demonstrate a systematic understanding of probability and frequentist statistical inference;
2 use a comprehensive range of relevant concepts and principles;
3 select and apply these to solve advanced problems in probability and statistical inference, using a variety of methods.

The intended generic learning outcomes. On successfully completing the module students will be able to:

1 apply a logical, mathematical approach to their work, identifying the assumptions made and the conclusions drawn;
2 solve challenging problems.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

BICKEL, P.J. and DOKSUM, K. (2001). Mathematical Statistics: Basic Ideas and Selected Topics, Volume 1, 2nd edition. London: Prentice-Hall International
CASELLA, G. and BERGER, R. L. (2002). Statistical Inference, 2nd Edition. Pacific Grove, CA: Duxbury.
FELLER, W. (1967). An Introduction to Probability Theory and its Applications, Volume 1, New York: Wiley.
HOGG, R., McKEAN, J. and CRAIG. A. (2014). Introduction to Mathematical Statistics. 7th International Edition. Harlow, Essex: Pearson Education.
ROSS, S.M. (2014). A First Course in Probability, 9th International Edition. Harlow, Essex: Pearson Education.

Synopsis *

This course introduces (and revises for some students) the essentials of probability and classical (frequentist) statistical inference, which provide the backbone for later modules.
Syllabus: Probability: axioms, marginal, joint and conditional distributions, Bayes theorem, important distributions, generating functions and various modes of convergence. Classical Inference: Sampling distributions. Point estimation: consistency, Cramer-Rao inequality, efficiency, sufficiency, minimum variance unbiased estimators. Likelihood. Methods of estimation. Hypothesis tests: maximum likelihood-ratio test, Wald and score tests, profile and test-based confidence intervals.

MA883 Bayesian Statistics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

Total contact hours: 36
Private study hours: 114
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1 demonstrate systematic understanding of key aspects of Bayesian Statistics;
2 demonstrate the capability to solve complex problems using a very good level of skill in calculation and manipulation of the material in the following areas: derivation of posterior distributions; computation of posterior summaries, including the predictive distribution; construction of Bayesian hierarchical models and their estimation using Markov chain Monte Carlo methods; critical evaluation and interpretation of software output.
3 apply a range of concepts and principles in Bayesian Statistics in loosely defined contexts, showing good judgement in the selection and application of tools and techniques;
4 show judgement in the selection and application of R and WinBugs/OpenBugs.

The intended generic learning outcomes. On successfully completing the module students will be able to:

1 manage their own learning and make use of appropriate resources.
2 understand logical arguments, identifying the assumptions made and the conclusions drawn
3 communicate straightforward arguments and conclusions reasonably accurately and clearly
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working
5 solve problems relating to qualitative and quantitative information
6 make competent use of information technology skills such as R and WinBugs/OpenBugs, online resources (Moodle), internet communication.
7 communicate technical material competently
8 demonstrate an increased level of skill in numeracy and computation

Method of Assessment

80% examination and 20% coursework

Preliminary Reading

A.F.M. Smith and Bernardo, J.M. (1994). Bayesian Theory. Wiley.
A. Gelman, J.B. Carlin, H.S. Stern, D.B. Dunson, A. Vehtari and D.B. Rubin (2014). Bayesian Data Analysis. 3rd Edition, Chapman & Hall/CRC Texts in Statistical Science.
D. Gamerman and H.F. Lopes (2006). Markov Chain Monte Carlo: Stochastic Simulation for Bayesian Inference. 2nd Edition, Taylor and Francis.

Pre-requisites

For undergraduate programmes:
Pre-requisite: MAST5007: Mathematical Statistics

For postgraduate programmes:
Co-requisite: MAST7077: Probability and Classical Inference

Synopsis *

Bayes Theorem for density functions; Conjugate models; Predictive distribution; Bayes estimates; Sampling density functions; Gibbs and Metropolis-Hastings samplers; Winbugs/OpenBUGS; Bayesian hierarchical models; Bayesian model choice; Objective priors; Exchangeability; Choice of priors; Applications of hierarchical models.

MA884 Principles of Data Collection

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

42 hours

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the level 7 module students will be able to:
1 demonstrate systematic understanding of sampling and experimental design;
2 demonstrate the capability to solve complex problems using a very good level of skill in calculation and manipulation of the material in the following areas: sampling,
questionnaire design, analysis of variance, clinical trial design, advanced experimental design;
3 apply a range of concepts and principles in sampling and experimental design in loosely defined contexts, showing good judgment in the selection and application of tools
and techniques;
4 make effective and well-considered use of R for the analysis of data from experiments.

The intended generic learning outcomes. On successfully completing the level 7 module students will be able to:
1 work competently and independently, be aware of their own strengths and understand when help is needed;
2 demonstrate a high level of capability in developing and evaluating logical arguments;
3 communicate arguments confidently with the effective and accurate conveyance of conclusions;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make effective use of information technology skills such as R, online resources (moodle), internet communication;
7 communicate technical and non-technical material effectively;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% examination and 20% coursework

Preliminary Reading

Barnett, V. (2002) Sample Survey Principles and Methods. 3rd edition. New York, Wiley.
Cox, D.R. (1992) Planning of Experiments. New York, Wiley.
Cochran, W.G. & Cox, G.M. (1992) Experimental Designs. 2nd edition. New York, Wiley.
Cox. D.R & Reid, N. (2000) The Theory of the Design of Experiments. Boca Raton, Chapman & Hall/CRC
Lawson, J. (2015) Design and Analysis of Experiments with R. Boca Raton, Chapman & Hall/CRC.
Matthews, J. N. S. (2000) An Introduction to Randomized Controlled Clinical Trials. 2nd edition. Boca Raton, Chapman & Hall/CRC.

Pre-requisites

Students are expected to have studied material covered equivalent to that covered in the following modules:

MAST4009 (Probability), MAST4011 (Statistics) and at least one of MAST5007 (Mathematical Statistics) and MAST5001 (Applied Statistical Modelling 1)

Synopsis *

Sampling: Simple random sampling. Sampling for proportions and percentages. Estimation of sample size. Stratified sampling. Systematic sampling. Ratio and regression estimates. Cluster sampling. Multi-stage sampling and design effect. Questionnaire design. Response bias and non-response.

General principles of experimental design: blocking, randomization, replication. One-way ANOVA. Two-way ANOVA. Orthogonal and non-orthogonal designs. Factorial designs: confounding, fractional replication. Analysis of covariance.

Design of clinical trials: blinding, placebos, eligibility, ethics, data monitoring and interim analysis. Good clinical practice, the statistical analysis plan, the protocol. Equivalence and noninferiority. Sample size. Phase I, II, III and IV trials. Parallel group trials. Multicentre trials.

In addition, level 7 students will study hierarchical designs: fixed and random effects models; split-plot designs; crossover trials; variance components.

MA962 Geometric Integration

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	M	15 (7.5)	70% Exam, 15% Coursework, 15% Project	

Contact Hours

Total contact hours: 30
Private study hours: 120
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1 derive numerical methods and their properties;
2 demonstrate appreciation of the geometric interpretation of differential equations and numerical algorithms;
3 demonstrate understanding of the meaning and interpretation of error in approximations, in particular the relative importance of local errors versus global properties;
4 demonstrate appreciation of the importance, meaning and interpretation of numerical stability;
5 apply specific sophisticated numerical tools which preserve certain mathematical structures;
6 use mathematical software such as MatLab to masters level.

The intended generic learning outcomes. On successfully completing the module students will be able to:

1 reason and deduce confidently from given definitions and constructions;
2 show an enhanced understanding of what is meant by an answer to a modelling problem;
3 read independently and manage their time;
4 demonstrate enhanced skills with mathematical and graphical software, to postgraduate level;
5 show their matured problem formulating and solving skills;
6 apply a wide variety of Calculus, Linear Algebra, Mathematical Modelling, and Mathematical Methods based skills.

Method of Assessment

70% Examination, 15% Coursework, 15% Project

Preliminary Reading

All texts are available in the Templeman library and are recommended for background reading.
Books:
Simulating Hamiltonian Dynamics, Leimkuhler and Reich, Cambridge University Press, 2005.
Geometric Numerical Integration, Hairer and Lubich and Wanner, second edition, Springer Verlag, 2006.
Review articles:
Six Lectures in Geometric Integration, MacLachlan and Quispel, in Foundations of Computational Mathematics pages 155-210, ed. R. DeVore, A. Iserles, E. S¨uli, Cambridge University
Press, Cambridge, 2001. (Available online)
Geometric Integration and its Applications, Handbook of Numerical Analysis, Volume XI NorthHolland 2000.

Pre-requisites

MA587 is highly recommended as a pre-requisite. Otherwise MA587 is a co-requisite.

Synopsis *

The equations studied in this module will be ordinary differential systems, especially Hamiltonian systems. The aim of this subject area is to obtain and study numerical solutions of these systems that preserve specific qualitative and geometric properties. For certain differential equations, these geometric methods can be far superior to standard numerical methods. The syllabus includes: A review of basic numerical methods, variational methods and Hamiltonian mechanics; Properties that numerical methods can preserve (first integrals, symplecticity, time reversibility); Geometric numerical methods (modified Euler and Runge-Kutta methods, splitting methods); Use and misuse of the various notions of error.

MA963 Poisson Algebras and Combinatorics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

up to 30 hours

Learning Outcomes

The intended subject specific learning outcomes. Students who successfully complete this module will
(a) have a sound knowledge of the basic structure of Poisson algebras and their quantisations
and be familiar with examples including quantum affine spaces and quantum matrices;
(b) be able to compute symplectic leaves of Poisson algebras;
(c) have increased their knowledge of the theory of symmetric groups;
(d) have increased their knowledge of the theory and practice of matrices and linear algebra;
(e) have learned how to formulate and prove statements about Poisson algebras in precise abstract algebraic language;
(f) have a sound knowledge of combinatorial objects such as Cauchon diagrams, pipe dreams, planar networks.

The intended generic learning outcomes. On completion of the module students will
(a) have matured in their problem formulating and solving skills;
(b) have an enhanced capacity to communicate mathematical statements and conclusions;
(c) better be able to appreciate mathematics as a unified discipline;
(d) consolidated a wide variety of Calculus, Linear Algebra, Geometry, Combinatorics, and Mathematical Methods based skills;
(e) appreciate the power of algorithmic methods in Algebra/Combinatorics/Geometry.

Method of Assessment

80% examination and 20% coursework.

Preliminary Reading

We will not follow a single text, and the lecture notes will cover the entire syllabus. Nevertheless the following books contain a large amount of the material.
KA Brown & KR Goodearl, Lectures on Algebraic Qantum Groups. (Advanced Courses in Mathematics. CRM Barcelona, Birkhäuser Verlag, Basel, 2002) (B)

FR Gantmacher, The theory of matrices. Vol. 1. (AMS Chelsea Publishing, Providence, RI, 1998) (B)
S Launois & TH Lenagan, From quantum algebras to total non-negativity. (available at www.kent.ac.uk/ims/personal/sl261/Teaching/LTCC2009/LTCC2009.pdf) (R)

P Vanhaecke, Integrable Systems in the realm of Algebraic Geometry. (Lecture Notes in Mathematics 1638, Springer-Verlag, 2001) (B)

Pre-requisites

None

Synopsis *

The general topics of this module are Poisson algebras, their quantisations, and applications to combinatorics. Poisson algebras first appeared in the work of Siméon-Denis Poisson two centuries ago when he was studying the three-body problem in celestial mechanics. Since then, Poisson algebras have been shown to be connected to many areas of mathematics and physics.

This module will provide a rigorous but example led introduction to the main ideas and notions of Poisson algebras and their quantisations. Specific applications will be to problems in combinatorics and to the study of totally positive matrices that are used in statistics, game theory, mathematical economics, mathematical biology.... This module will have a strong computational strand: a large part of the module will be devoted to explicit computations of symplectic leaves of Poisson algebras and to algorithmic methods in total positivity.

The syllabus will be
• Poisson algebras: basic structure and examples. Symplectic leaves;
• Symplectic leaves in Poisson matrix varieties and Bruhat order on the symmetric group;
• Deformation of Poisson algebras: an introduction to algebraic quantum groups and their prime ideals through examples (quantum plane, quantum matrices...);
• Totally positive/nonnegative matrices: definition, examples, properties and cell decomposition.
• Link between total positivity and Poisson algebras;
• Algorithmic methods for detection of totally nonnegative matrices.

The curriculum can be extended in various ways: Poisson-Lie groups, Coxeter groups, Hopf algebras, representation theory, and these are suitable for project work.

MA964 Applied Algebraic Topology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	M	15 (7.5)	70% Exam, 15% Coursework, 15% Project	

Contact Hours

Total contact hours: 32
Private study hours: 118
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1 understand the basic concepts of topology with particular emphasis on CW complexes, manifolds and simplicial complexes;
2 apply topological methods to real-world problems;
3 use homological and computational methods to solve topological problems;
4 demonstrate geometric and algebraic intuition;
5 demonstrate the ability to formulate and prove abstract mathematical statements, and appreciate their connection with concrete calculation;
6 demonstrate enhanced computational skills.

The intended generic learning outcomes. On successfully completing the module students will be able to:

1 communicate their own ideas clearly and coherently;
2 read and comprehend sophisticated mathematical ideas;
3 apply problem solving skills;
4 demonstrate an understanding of abstract concepts;
5 demonstrate their grasp of a wide variety of mathematical techniques and methods.

Method of Assessment

70% Examination, 15% Coursework, 15% Project

Preliminary Reading

Introduction to Metric & Topological Spaces, W A Sutherland, 2nd edition, Oxford UP, 2009.
Basic Topology, M A Armstrong, Springer, 1983.
A Basic Course in Algebraic Topology, W S Massey, Springer, 1991.
Computational Homology, Kaczynski, Mischaikow & Mrozek, Springer, 2004.
Introduction to Topology: Pure and Applied, C Adams & R Franzosa, Pearson/Prentice Hall, 2008.
Algebaric Topology, A Hatcher, Cambridge UP, 2012.

Pre-requisites

MAST5670 (Topology) or equivalent

Synopsis *

There is growing interest in applying the methods of algebraic topology to data analysis, sensor networks, robotics, etc. The module will develop the necessary elements of algebra and topology, and investigate how these techniques are used in various applications. The syllabus will include: an introduction to manifolds, CW complexes and simplicial complexes; an investigation of the elements of homotopy theory; an exploration of homological and computational methods; applications such as homological sensor networks and topological data analysis.

MA965 Symmetries, Groups and Invariants

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

42-48 hours

Learning Outcomes

The Intended Subject Specific Learning Outcomes. On successful completion of this module students will have increased their knowledge, understanding, intuition and computational expertise in:
(a) rigorous thinking
(b) detecting symmetries and common patterns
(c) systematic observation, generalization and techniques of proof
(d) using group theory to calculate with symmetries
(e) distinction and classification of objects up to equivalences and symmetries
(f) the use of \normal forms" and \invariants" to distinguish symmetry classes
(g) combinatorial analysis and enumeration of symmetry classes and group orbits
(h) proficient use of mathematical software such as Maple and MAGMA to masters level

The Intended Generic Learning Outcomes. We expect students successfully completing the module to have
(i) an enhanced ability to correctly formulate classification problems and solve them efficiently;
(ii) enhanced skills in understanding and communicating mathematical results and conclusions;
(iii) a holistic view of mathematics as a problem solving and intellectually stimulating discipline;
(iv) an appreciation of algorithms and computational methods in algebra and group theory.

On completion of the module students will have:
_ matured in their problem formulating and solving skills;
_ consolidated a variety of tools from abstract algebra to model and classify concrete objects and configurations.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

G Burde & H Zieschang, Knots. (De Gruyter Studies in Mathematics, 1985, Walter de Gruyter, ISBN 3-11-008675-1)

LH Kauffman, On Knots. (Princeton, 1987, ISBN 0-691-08435-1)
A Kerber, Applied finite group actions. (Springer, 1999, ISBN/ISSN 3540659412)
WBR Lickorish, An introduction to knot theory. (Springer, 1997, ISBN/ISSN 038798254X)
V Manturov, Knot Theory. (Chapman & Hall, 2004, ISBN 1-415-31001-6)
K Murasugi, Knot theory and its applications. (Birkhäuser, 1996, ISBN/ISSN 0817638172)

Pre-requisites

MA565

Synopsis *

In this module we will study certain configurations with symmetries as they arise in real world applications. Examples include knots described by "admissible diagrams" or chemical structures described by "colouring patterns". Different diagrams and patterns can describe essentially the same structure, so the problem of classification up to equivalence arises. This will be solved by attaching "invariants" which are then put in "normal form" to distinguish them. The syllabus will be as follows: (a) Review of basic methods from linear algebra, group theory and discrete mathematics; (b) Permutation groups, transitivity, primitivity, Burnside formula; (c) Finitely generated Abelian groups; (d) Applications to knot theory, Reidemeister moves, the Abelian knot group; (e) Examples, observations, generalizations and proofs; (f) General Polya-enumeration (as an extension of the Burnside formula).

MA968 Mathematics and Music

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
3	Canterbury	Spring	M	15 (7.5)	70% Exam, 15% Coursework, 15% Project	

Contact Hours

42

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the level 7 module students will be able to:
1 demonstrate systematic understanding of discrete Fourier analysis, the geometry of world rhythms and rhythmic tilings, and the geometry of harmony space;
2 demonstrate the capability to solve complex problems using a very good level of skill in calculation and manipulation of the material in the following areas: Chladni patterns, digital signal processing, the mathematical construction of world rhythms;
3 apply a range of concepts and principles in discrete Fourier analysis in loosely defined contexts, showing good judgment in the selection and application of tools and techniques;
4 make effective and well-considered use of Maple and musical composition software as appropriate.

The intended generic learning outcomes.
On successfully completing the level 7 module students will be able to:
1 work competently and independently, be aware of their own strengths and understand when help is needed;
2 demonstrate a high level of capability in developing and evaluating logical arguments;
3 communicate arguments confidently with the effective and accurate conveyance of conclusions;
4 manage their time and use their organisational skills to plan and implement efficient and effective modes of working;
5 solve problems relating to qualitative and quantitative information;
6 make effective use of information technology skills such as online resources (Moodle), internet communication;
7 communicate technical material effectively;
8 demonstrate an increased level of skill in numeracy and computation;
9 demonstrate the acquisition of the study skills needed for continuing professional development.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

D. Benson, Music: A Mathematical Offering Cambridge University Press, Cambridge, 2006.
G. Loy, Musimathics: The Mathematical Foundations of Music MIT Press, Vols 1 and 2, 2007.
N. Collins, Introduction to Computer Music, Wiley, 2010.
J.S. Walker and G.W. Don, Mathematics and Music: Composition, perception and performance, CRC Press, 2013
D. Tymoczko, A Geometry of Music, Oxford University Press, 2011.
G. Toussaint, The Geometry of Musical Rhythm, CRC Press, 2013.

Pre-requisites

None

Synopsis *

This module is divided into two - one part is about the mathematics of sound, both acoustic and digital, and the other is about the structure of music as it affects musical composition.
The mathematics of sound includes the study of the linear wave equation, in particular, the mathematics of drums and Chladni patterns. We then move on the mathematics of digital sound - the discrete Fourier transform, the short time Fourier transform and the Gabor transform. Here we can answer questions like, does Louis Armstrong play the trumpet the same way he sings? And, how to slow down music without losing pitch?
The mathematics of rhythm and harmony are two very different fields of study. Many world music rhythms can be studied using the Euclidean algorithm. Finally, the harmonic progression of a musical composition can be modelled as a path in chord space. In this part of the module, we will look at how simple geometric ideas are used to model voice leading and harmony . For this last part, familiarity with the keyboard would be helpful but is not a prerequisite.
Indicative syllabus:
Part 1
a. The mathematics of the drum
i. Solutions of the linear wave equation in two dimensions in terms of Bessel functions
ii. Standing waves and Chladni patterns

b. The mathematics of digital music processing
i. Aliasing, Sampling, Filtering
ii. Discrete Fourier Transform, Convolutions
iii. Gabor transform and applications
iv. Spectrograms and applications

Part 2
c. The mathematics of rhythm: Euclidean rhythms in world music
i. The mathematics of harmony in tonal music: Introduction to a mathematical chord space, the Tonnetz.

At level 7, topics will be studied and assessed to greater depth.

MA969 Applied Differential Geometry

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

42-48 hours.

Learning Outcomes

The Intended Subject Specific Learning Outcomes. On successful completion of this module students will:
(i) understand basic geometric objects such as curves and surfaces and be able to determine their intrinsic properties
(ii) be able to derive the geometric evolution equations for curves and surfaces and understand the connection with nonlinear integrable systems
(iii) have broadened their experience with the basic concepts in Riemannian geometry such as metrics, connections and curvatures
(iv) have developed awareness of modern applications to mathematical physics, computer vision and image processing

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

R Hartley & A Zisserman, Multiple View geometry in computer vision. (Cambridge university press, 2nd ed, 2003) (B)

R Kimmel, Numerical geometry of images, theory, algorithms and applications. (Springer Verlag, 2003) (B)

PJ Olver, Lectures on moving frames. (preprint, University of Minnesota, 2008) (B)
C Rogers & WK Schief, Bäcklund and Darboux transformations: Geometry and modern applications in soliton theory. (Cambridge University Press, 2002) (B)

IA Taimanov, Lecture on differential geometry. (EMS series of Lectures in Mathematics, 2008) (R)

Pre-requisites

None.

Synopsis *

Differential geometry studies geometrical objects using analytical methods. It originates in classical mechanics. Modern differential geometry has made a huge impact in the development of nonlinear mathematical physics including integrable systems and string theory. Nowadays differential geometry is at the centre of the analysis of pattern recognition, image processing and computer graphics.

Indicative specific subtopics are:
• Theory of curves. Plane and space curves. Euclidean invariants of curves. Frenet frame.
• Theory of surfaces. Metrics on regular surface. Curvature of a curve on a surface. Gaussian curvature and mean curvature. Covariant derivative and geodesics. The Euler-Lagrange equations. Minimal surfaces.
• Evolution of curves and surfaces as integrable systems: Invariant curve evolution. The mean curvature flows. The connection with integrable systems. The modified Korteweg de-Vries equation.
• Curves in Riemannian manifolds: Riemannian metrics, connections, curvatures and geodesics. Curves evolution in Riemannian manifold with constant curvature.
• Modern applications.
i. 2D and 3D projective geometry and application to multiple view geometry in computer vision;
ii. Moving frames, invariant signatures in pattern recognition;
iii. Poisson manifold and Hamiltonian systems.

MA971 Introduction to Functional Analysis

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

42-48 lectures and example classes

Learning Outcomes

The intended subject specific learning outcomes. On successful completion of this module students will:
a) be able to work with fundamental concepts in functional analysis, such as linear operators and functionals;
b) have a grasp of formal definitions and rigorous proofs in analysis;
c) have gained an appreciation of a wider context in which previously encountered concepts from analysis, such as convergence and continuity, can be used;
d) be able to apply abstract ideas to concrete problems in analysis;
e) appreciate differences between analysis in infinite and finite dimensional spaces;
f) be aware of applications of basic techniques and theorems of functional analysis in other areas of mathematics, e.g., approximation theory, and the theory of ordinary differential equations.
In addition M-level students will have
g) an increased ability to understand on their own, and communicate to others, fundamental ideas and results in abstract mathematical analysis

The intended generic learning outcomes. We expect students successfully completing the module to have
a) an enhanced ability to correctly formulate abstract problems and solve them efficiently;
b) enhanced skills in understanding and communicating mathematical results and conclusions;
c) furthered a holistic view of mathematics as a problem solving and intellectually stimulating discipline;
d) an appreciation of the power of abstract reasoning and formal proofs in mathematics and its applications
On successful completion of this module, M-level students will also have:
e) an enhanced ability for independent learning.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Introductory Functional Analysis with Applications, Erwin Kreyszig, John Wiley, 1978.
Principles of Mathematical Analysis. Walter Rudin, International Series in Pure and Applied Mathematics, McGraw-Hill, 1976 3rd edition.
Beginning Functional Analysis, Karen Saxe, Springer, 2002.
Introduction to Functional Analysis, Angus E.Taylor, David C.Lay, John Wiley, 1980 2nd edition.
Functional Analysis. Walter Rudin. McGraw-Hill, 1991 2nd edition.

Pre-requisites

None

Synopsis *

This module will give an introduction to one of the main areas underpinning research in Analysis today: Functional Analysis, which has applications in many sciences, in particular in the modern theory of solutions of partial differential equations. As well as giving the main definitions and theorems in the area, the module will focus on applications, in particular to differential equations and in approximation theory. The following topics will be covered in the module: 1) Linear spaces: Normed and Banach spaces, Inner-product and Hilbert spaces, examples 2) Linear operators and functionals: bounded linear operators, functionals, dual spaces, reflexive spaces, adjoint operators, selfadjoint operators, examples 3) Fundamental theorems: Hahn-Banach, Uniform boundedness principle, Open mapping & Closed graph theorem, Baire Category theorem 4) Fixed point theorems and applications to differential and integral equations 5) Applications in approximation theory: best approximation in Hilbert space, approximation of continuous functions by polynomials. Possible additional topic: Spectral theory of bounded linear operators, weak and weak* topologies, algebras of bounded linear operators.

MA972 Algebraic Curves in Nature

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	M	15 (7.5)	70% Exam, 30% Coursework	

Contact Hours

30 hours

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

1 rigorous thinking.
2 calculating with and visualization of geometrical objects.
3 systematic observation, generalization and techniques of proof.
4 the use of geometrical methods in other areas of mathematics and physics.
5 algebraic and analytical techniques for understanding geometry.
6 classification of objects according to their topological and geometrical properties.
7 connecting abstract mathematics to the real world.
8 proficient use of mathematical software such as Maple and MAGMA to masters level.

The intended generic learning outcomes. On successfully completing the module students will be able to:

1 an enhanced ability to correctly formulate geometrical problems and solve them efficiently;
2 enhanced skills in understanding and communicating mathematical results and conclusions;
3 a holistic view of mathematics as a problem solving and intellectually stimulating discipline;
4 an appreciation of algorithms and computational methods in geometry.
5 matured in their problem formulating and solving skills;
6 consolidated a variety of analytical and algebraic tools to model and classify geometrical objects and configurations.

Method of Assessment

70% examination, 30% coursework

Preliminary Reading

Complex Algebraic Curves, Frances Kirwan, LMS Student Texts 23, Cambridge, 1992, ISBN-100521423538.
Algebraic Curves and Riemann Surfaces, Rick Miranda, Graduate Studies in Math., vol. 5, AMS, 1995, ISBN 0-8218-0268-2.
Lectures on elliptic curves. J.W.S. Cassels, LMS Student Texts 24, Cambridge, 1991, ISBN-100521425301.
Algebraic Aspects of Cryptography, N. Koblitz, Springer, 1998, ISBN 978-3-540-63446-1.
A Course of Modern Analysis, E.T. Whittaker and G.N. Watson, Cambridge, fourth edition, 1927 (reprinted 2005), ISBN 0-521-58807-3.
The Arithmetic of Elliptic Curves, Joseph H. Silverman, Graduate Texts in Mathematics 106, Springer, 1986, ISBN 0-387-96203-4.

Pre-requisites

Synopsis *

In this module we will study plane algebraic curves and the way that they arise in applications to other parts of mathematics and physics. Examples include the use of elliptic functions to solve problems in mechanics (e.g. the pendulum, or Euler's equations for rigid body motion), spectral curves of separable Hamiltonian systems, and algebraic curves over finite fields that are used in cryptography. The geometrical properties of a curve are not altered by coordinate transformations, so it is important to identify quantities that are invariant under such transformations. For curves, the most basic invariant is the genus, which is most easily understood in terms of the topology of the associated Riemann surface: it counts the number of handles or "holes". The case of genus zero (corresponding to the Riemann sphere) is well understood, but curves of genus one (also known as elliptic curves) lead to some of the most interesting and difficult problems in modern number theory.

MA973 Basic Differential Algebra

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	M	15 (7.5)	80% Exam, 20% Coursework	

Contact Hours

28 (if lectured)

Learning Outcomes

The intended subject specific learning outcomes and, as appropriate, their relationship to programme learning outcomes
On successful completion of this module students will:
a) be familiar with basic structures of differential algebra and the ideal/variety correspondence for nonlinear differential systems;
b) be able to simplify and normalize small examples of differential systems and use dedicated computer algebra packages for big ones;
c) be able to separate the generic solution from singular components by way of differential reduction in nonlinear models;
d) be able to write small Maple scripts using the differential algebra functions from the existing Maple library;
e) have strengthened their basic knowledge in commutative algebra and algebraic geometry, viewing also differential objects from an algebraic perspective;
f) have learned how to prove some statements in differential algebra in terms of ideals and reduction;
g) have some knowledge of characteristic sets as an analog of Groebner bases, with skills for computing them manually or by dedicated packages;
h) handle the main tools provided in the Maple package "DifferentialAlgebra" and be able to apply them for various tasks on concrete problems.
The intended generic learning outcomes and, as appropriate, their relationship to programme learning outcomes
On successful completion of the module students will have improved their:
a) skill of specifying problems, solving them algorithmically as much as possible;
b) skill of communicating mathematical statements and conclusions;
c) vision of mathematics as a unified field with powerful analogies;
d) understanding of the complementary nature of analytic / algebraic thinking;
e) appreciation of algorithmic tools for solving mathematical problems;

Method of Assessment

80% examination, 20% coursework

Preliminary Reading

Since the discipline of differential algebra is rather young, there is no suitable textbook on differential algebra, so there will be specific lecture notes for this module, complemented by reading assignments for appropriate passages in the following reference works:

(1) Joseph Fels Ritt, Differential Algebra, Dover Publications, New York, 1966.

(2) Ellis Kolchin, Differential Algebra & Algebraic Groups, Academic Press, NY, 1973.

(3) Andy Magid, Lectures on Differential Galois Theory, 2nd ed., AMS, 1994.

(4) Irving Kaplansky, An Introduction to Differential Algebra, Hermann, Paris, 1957.

(5) Kolchin Seminar in Differential Algebra, http://www.sci.ccny.cuny.edu/~ksda .

The website (5) is a particularly nice starting point for exploring a rich variety of different topics in differential algebra, both elementary and advanced.

Pre-requisites

Polynomials in Several Variables (MA574), or other courses on commutative algebra

Synopsis *

Differential algebra is a relatively recent branch of algebra that exploits the analogies between systems of algebraic equations and nonlinear systems of (mainly ordinary) differential equations. The tools developed in differential algebra are useful for practical problem solving, but they must be used through computer algebra packages since computations can get very heavy. In this module, we will give special emphasis to the package "DifferentialAlgebra" included in the Maple kernel. We will give a rigorous but example led introduction to the main ideas of computer algebra. The main applications to be discussed are the analysis of singularities and the simplification of nonlinear differential systems. As already indicated, the module will have a strong computational flavour: Students will explore concrete examples with the computer algebra system Maple, comparing hand computations with the results achieved by the full-blown algorithms and dispatching large computations to the package. Outline Syllabus: Differential rings and field; differential ideals and homomorphisms; rankings; Ritt's reduction algorithm; characteristic sets; singular solutions.

SO670 Kent Student Certificate for Volunteering, Platinum Award

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	15 (7.5)	100% Coursework	
1	Canterbury	Whole Year	H	15 (7.5)	Pass/Fail Only	
2	Canterbury	Whole Year	H	15 (7.5)	100% Coursework	

Availability

It is intended that where generic/elective credit can be used towards an undergraduate degree that the Kent Student Volunteering module should be credit bearing for an undergraduate programme. = This module can only be taken as an option if permitted by the course specification and with the agreement of the student's School.

Contact Hours

Total Contact Hours: 10
Placement Hours: 100
Private Study Hours: 40
Total Study Hours: 150

Department Checked

14/03/2022

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
8.1 Demonstrate systematic awareness and understanding of the issues and barriers surrounding volunteering;
8.2 Demonstrate advanced self-awareness of their skills and abilities and ability to manage the application of said skills to the wider working community;
8.3 Demonstrate awareness of the benefits and value of volunteering to the local and wider community;
8.4 Critically evaluate to an advanced level their own impact upon a volunteering placement;

The intended generic learning outcomes.
On successfully completing the module students will be able to:
9.1 Demonstrate communication skills;
9.2 Demonstrate team work and interactive group skills as evidenced through working within a variety of volunteering placements to achieve group aims and goals;
9.3 Demonstrate leadership and motivation as evidenced through spear-heading and developing specific volunteering projects and managing their own teams of volunteers;
9.4 Demonstrate problem solving through the undertaking of self-led tasks and overcoming barriers to volunteering;
9.5 Demonstrate the ability to adapt to changing situations as evidenced by experiencing a variety of volunteering placements;
9.6 Demonstrate the ability to self-appraise and reflect on practice;
9.7 Demonstrate the ability to plan and manage learning as evidenced through completion of the extra self-directed study necessary to supplement placements.
9.8 Demonstrate the development and practical application of transferable skills.
9.9 Demonstrate the ability to manage and reflect critically on personal learning process.

Method of Assessment

Main assessment methods
100% coursework:
Portfolio (word count would depend on the portfolio contents) – 50% *
Essay (2000 words) – 50%
* Students must the portfolio to pass the module

Reassessment methods
100% Coursework

Preliminary Reading

Nina Eliasoph (2013) The Politics of Volunteering. Cambridge: Polity Press
Colin Rochester, Steve Howlett, Angela Ellis Paine (2010) Volunteering and Society in the 21st Century. Palgrave Macmillan.

Restrictions

Students who choose this module will be required to attend a welcome meeting. This meeting will introduce the volunteering requirements of the module and give you a chance to get started on your volunteering over the summer. If you have any questions, please email Dr Eddy Hogg at E.Hogg@kent.ac.uk

Synopsis *

This module will enhance your CV, particularly if you are hoping to work in the public or voluntary sector. You will be supported to undertake three placements in a variety of volunteering roles, both on and off campus; attend four lectures on the voluntary sector and complete a reflective learning log to help you think about your experiences and the transferable skills you are gaining.

The following 2 units are compulsory:
• Active community volunteering
• Project Leadership

Plus 1 unit selected from the following:
• Active university volunteering
• Training facilitator
• Mentoring
• Committee role

All students taking this module are expected to attend four sessions that provide the academic framework for understanding volunteering, as well as practitioner knowledge that will be helpful as you progress through your placements, and invaluable preparation for your essay. These sessions last one hour each and are spaced evenly throughout the academic year

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SP637 Forensic Psychology: Theoretical and Applied Perspectives

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	H	15 (7.5)	70% Coursework, 30% Exam	
1	Canterbury	Autumn	H	15 (7.5)	70% Project, 30% Exam	
1	Canterbury	Spring	H	15 (7.5)	70% Coursework, 30% Exam	
1	Canterbury	Spring	H	15 (7.5)	70% Project, 30% Exam	

Availability

Compulsory to Psychology with Forensic Psychology BSc.
Optional to other undergraduate Psychology programmes.
Available as an elective module.
Available to Short-Term credit students at the discretion of school and/or convenor.

Contact Hours

22 hours

Department Checked

15.03.21

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

8.1 Demonstrate an understanding of the practical role played by contemporary forensic psychologists in society

8.2 Demonstrate critical knowledge of forensic psychology as a discipline and research methods used within forensic psychology

8.3 Demonstrate an awareness of the fundamental application of psychology, as a science, to understand key forensic issues

8.4 Understand key concepts and sub-topics within forensic psychology and how they relate to each other (i.e., ability to synthesise core concepts within forensic psychology)

8.5 Evaluate core theories and research in forensic psychology

Method of Assessment

Essay: 2,500 Words: 70%
Examination: 30%

An alternative assessment may be provided for those short-term students who will no longer be registered when the examination takes place

Reassessment methods: Like for Like.

Please note that the exam in May/June 2023 will be Online (Restricted time window)

Preliminary Reading

Davies, G., & Beech, A. (2012). Forensic psychology: Crime, Justice, Law, Interventions. Chichester, K: John Wiley & Sons, Ltd.

Journal articles and additional readings will be assigned on a weekly basis.

Pre-requisites

For non-psychology students, the minimum pre-requisite is PSYC3040 Introduction to Psychology 1, PSYC3050 Introduction to Psychology 2 OR PSYC3060 Introduction to Forensic Psychology.

Restrictions

Available to Short-Term credit students at the discretion of school and/or convenor.

Synopsis *

This module will provide students with an in-depth examination of the theoretical and applied aspects of Forensic Psychology. It will include the development of laws and the principles on which the judicial system is founded, offending by specific sections of the community including street gangs and career criminals, Criminal Justice responses to offending by the police and forensic profilers, the role and credibility of eyewitnesses and the interview processes employed with suspects, the role of juries, how sentences are compiled for convicted offenders, the aims of punishment and how prisoners respond to imprisonment, theoretical perspectives of rehabilitation and an examination of the implementation of the sex offender treatment programme. The module will focus on the in-depth application of forensic psychology to the justice system, its role in identifying and ameliorating offending behaviour. In particular it will evaluate the role of psychology in criminal justice: systems, policies and practices by presenting and critically evaluating research and research methods within forensic psychology. Students will be encouraged to develop skills to critique the literature and methodologies to further their understanding of the core forensic issues the course presents.

SS503 Sports Event Management

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	H	30 (15)	100% Coursework	
1	Medway	Whole Year	H	30 (15)	80% Project, 20% Coursework	

Contact Hours

Total Contact Hours: 72
Total Private Study Hours: 228
Total Study Hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Demonstrate knowledge of the Human Resource Management practices required for running a special event.
Discuss and apply policy, financial planning and reporting procedures.
Implement a marketing plan for the sporting event of their choice.
Apply relevant Health, Safety and Security legislation and procedures.
Relate and apply the theoretical knowledge gained in order to successfully plan, implement, review and evaluate a sporting event.
Demonstrate an ability to integrate the "Key Skills" into their assignments, projects and presentation.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Demonstrate communication and presentation skills via the use of student led presentations and practicals and working in groups on a variety of material.
Demonstrate skills in information Technology and numeracy through the preparation of event planning and proposals, budgets, and presentations.
Display interactive group skills, evidenced through conducting student led presentations and tasks.
Demonstrate skills in problem solving, achieved through the identification and implementation of correct leadership style.

Method of Assessment

Event Proposal Presentation (20 minutes) – 30%
Event Observation – 30%
Event Defence Interview (20 minutes) – 40%

Preliminary Reading

Bowdin, G.A.J., Getz, D., & Lashley, C. (2011). Events Management (3rd Ed). Oxford: Butterworth-Heinemann.
Health and Safety Executive (1999). The Event Safety Guide (2nd Ed) HMSO.
Masterman G. (2009) Strategic Sports Event Management an International Approach. Elselvier Butterworth-Heinemann. Oxford, U.K. ISBN 0 7506 5938 1
Robinson, L. & Palmer, D. (2011) Managing Voluntary Sport Organisation. Abington: Routledge.
Schmader, S.W. Jackson, R. (1997). Special Events: Inside and Out. 2nd Ed. Illinois: Human Kinetics.
Silvers, J.R. (2004). Professional Event Coordination. New Jersey: John Wiley and Sons.
Van Der Wagen, L. (2007). Event Management for Tourism, Cultural Business and Sporting Events (3rd Edition). Harlow: Pearson Education.
Watt, D.C. (1998). Event Management in Leisure and Tourism. Harlow: Longman.

Pre-requisites

None

Synopsis *

The module provides a structured opportunity to put into practice the theoretical and practical knowledge and skills that students have acquired, in the context of delivering a significant sport or exercise related event. As such, this module will provide opportunities for students to develop appropriate vocational and applied academic knowledge.
In the process of proposing, planning, implementing, reviewing and evaluating an actual event, students will need to integrate market research, marketing, human resource management, leadership, health and safety issues, security, logistical and financial management in an appropriate way. The emphasis is on the processes that surround the actual event itself.
The module includes:

An introduction to the sport events industry
The planning cycle for major events
Market research and the development of an event concept
Human resource planning and management required for running a special event
Financial planning and management of a sport event
Marketing the event
Health, safety and security legislation and procedures
Establishing timelines and checklists.
Event implementation
Event evaluation

SS504 Individual Research Study

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Medway	Whole Year	H	30 (15)	100% Coursework	
2	Medway	Whole Year	H	30 (15)	100% Project	

Contact Hours

Total Contact Hours: 12
Total Private Study Hours: 288
Total Study Hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Demonstrate an understanding of research investigation within sport.
Display an understanding of the main features of scientific and non-scientific investigation and presentation.
Appreciate the relative advantages and disadvantages of selected research methods.
Demonstrate knowledge and application of appropriate data analysis techniques.
Present research findings, relating to sports and exercise management in an appropriate format.
Produce a dissertation suitable for Stage 3 study in sport and exercise management.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Demonstrate skills in numeracy, evidenced via working with statistics necessary to identify correlations and differences within data.
Demonstrate skills in information technology, through the preparation for presentations (including importing of graphics, word processing, internet searches) and working with a statistical software package.
Demonstrate communication and presentation skills via the use of student effectively communicating the findings of the research project.
Demonstrate skills in problem solving, achieved through the identification and correct usage of statistical tests for specific data types and sets.
Demonstrate the ability to plan and manage learning through completing the self-directed study necessary to successfully complete the required assignments set within this module.
Demonstrate interactive group skills, evidenced through the student having to work with individuals and groups of subjects to complete the data collection section of their research.

Method of Assessment

Individual Research Project (10,000 words) – 100%

Preliminary Reading

Burns, R. (2000). Introduction to Research Methods. London: Sage.
Holliday, A. (2002). Doing and Writing Qualitative Research. Sage publications.
Coolican, H. (1999). Research Methods and Statistics in Psychology. Hodder and Stoughton.
Nitoumanis, N. (2001). A Step-by-Step Guide to SPSS for Sport and Exercise Studies. Routledge.
Thomas, J, R., Nelson, J. K. (2001). Research Methods in Physical Activity. Human Kinetics.
Williams, C., Wragg, C. (2004). Data Analysis and Research for Sport and Exercise Science: A Student Guide. Routledge.
Coakes, S. J., Steed, L. G. (2003). SPSS Analysis Without Anguish Version 11.0 for Windows. Wiley.

Pre-requisites

None

Synopsis *

The course takes the form of an individual research study. There are initial taught lectures covering ethical considerations and the management of a research project. The research projects are then conducted with the supervision of a School tutor who will advise the student on issues such as methodology, analysis and presentation, but it is the student's responsibility to organise, conduct, analyse and present the research as required.

SS523 Exercise Prescription, Referral & Rehabilitation

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	H	30 (15)	40% Exam, 40% Project, 20% Coursework	
1	Medway	Whole Year	H	30 (15)	60% Coursework, 40% Exam	

Contact Hours

Total contact hours: 44
Private study hours: 256
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Critically discuss the role of exercise/physical activity for different clinical population groups.
Explain appropriate adaptation/modification of exercise/physical activity for different clinical population groups.
Recommend/prescribe appropriate exercise/physical activity plans for different clinical population groups

The intended generic learning outcomes. On successfully completing the module students will be able to:

Communication, presentation, numeracy & C & IT skills - via the use of student-lead practicals and presentations on a variety of subject specific material with both individual and group settings used and via analysing data collected when carrying out physiological tests and through the use of appropriate information technology to analyse fitness test results and prescribe appropriate exercise/physical activity recommendations.
Interactive group skills – evidenced through conducting the physiological tests, working with other students on presentations or problem solving tasks, working with clients and School technicians.
Problem solving skills – achieved through the analysis of data collected from physiological tests, case studies and prescription of exercise/physical activity.
Ability to self-appraise and reflect on practice achieved through evaluation of exercise prescription & interpretation of physiological data.
Ability to plan and manage learning - through completing the self-directed study necessary to successfully complete the required assignments and tasks set during this module.

Method of Assessment

Written assignment - 3000 words – 60%
Examination – 2 hours – 40%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

ACSM (2009) ACSM's Guidelines for Exercise Testing and Prescription. 8th Ed. Maryland: Lippincott Williams & Wilkins.
ACSM (2010) ACSM’s Resource Manual for Guidelines for Exercise Testing and Prescription. 6th Ed. Maryland: Lippincott Williams &Wilkins.
Skinner, J.S. (Ed.) (2005) Exercise Testing and Exercise Prescription for Special Cases: Theoretical Basis & Clinical Application 3rd Ed. Baltimore: Lippincott Williams & Wilkins.
Woolf-May, K. (2006) Exercise Prescription: Physiological Foundations. A Guide for Health, Sport and Exercise Professionals. London: Churchill Livingstone Elsevier

Pre-requisites

None

Synopsis *

Exercise prescription for the asymptomatic older adult
Physical activity and cardiovascular diseases
Physical activity and metabolic diseases
Physical activity and neurological impairment
Physical activity and orthopedic diseases
Physical activity and pulmonary diseases
Exercise in clinical rehabilitation settings
Exercise psychology

SS527 Exercise for Special Populations

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Spring	I	15 (7.5)	100% Exam	

Contact Hours

Total contact hours: 22
Private study hours: 130
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Evaluate the role of exercise / physical activity for special population groups.
Explain appropriate adaptation of exercise / physical activity for special population groups.
Recommend appropriate exercise / physical activity for special population groups.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Demonstrate problem solving: through critical analysis and evaluation
Plan and manage learning: through planning and completing self-directed learning
Transfer learning: through evaluation of case studies and other literature.

Method of Assessment

Examination – 2 hours (100%)
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

ACSM (2018) ACSM's Guidelines for Exercise Testing and Prescription. 10th Ed. Maryland: Lippincott Williams & Wilkins.
ACSM (2014) ACSM’s Health-Related Physical Fitness Assessment Manual. 4th Ed. Baltimore: Lippincott Williams & Wilkins.
ACSM (2014) ACSM’s Resource Manual for Guidelines for Exercise Testing and Prescription. 7th Ed. Maryland: Lippincott Williams & Wilkins.

Pre-requisites

None

Synopsis *

The topic areas covered in this module build upon the knowledge gained in SPOR3480 Introduction to Fitness Testing & SPOR5700 Fitness Training Methods, which covers the fundamental aspects of exercise testing and prescription. Special populations are those groups of individuals that may need some adaptation or modification to an exercise prescription or programme, to take into consideration a limitation, whether that be physiological, biological or psychosocial. The emphasis is on promoting health, fitness and safety in exercise, as well as some consideration being given to performance environments.
A synopsis of indicative topics included in this module are:

Exercise, physical activity and health
Fitness assessment issues related to special population groups
Children and physical activity
Females and exercise issues
Exercise considerations for a sedentary population
Exercise and the older adult
Special exercise considerations and adaptations for special populations
Risks and benefits of exercise for special populations
Psychosocial issues & strategies for exercise/physical activity adherence

SS530 Sport & Exercise Leadership

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	I	15 (7.5)	100% Coursework	
1	Medway	Autumn	I	15 (7.5)	100% Project	
1	Medway	Autumn	I	15 (7.5)	60% Project, 40% Coursework	

Contact Hours

Total contact hours: 21
Private study hours: 129
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Discuss how the role and philosophy of the coach affects performers
Apply the theory of leadership to different coaching or instructing environments
Analyse learning styles and devise an appropriate coaching or instructing programme
Analyse coaching performance and identify an appropriate style of leadership

The intended generic learning outcomes. On successfully completing the module students will be able to:

Communication and presentation skills - via the use of individual or group student-led presentations and practical sessions, and working in groups on a variety of subject specific material.
Information Technology and numeracy - through the planning, preparation, completion and evaluation of a placement, log-book, essay and presentations in a sport and exercise leadership context.
Interactive group skills – evidenced through conducting student led presentations, practical work and tasks during seminars; completion of observation in a sport, exercise setting.
Problem solving – achieved through the identification and implementation of correct leadership style during seminars, critical evaluation of a leader at a sport and exercise setting
Ability to plan and manage learning - through completing the extra self-directed study necessary to successfully complete the required assignments and tasks set during this module.

Method of Assessment

Portfolio -100% (consists of a 8 hours of observations, a video recording of a sports leader and a written critique of 2500 words)

Preliminary Reading

Bompa, T. (2009). Theory and Methodology of Training. 5th ed. Leeds: Human Kinetics
Maxwell, J.C. (2007). The 21 Irrefutable Laws of Leadership: Follow Them and People Will Follow You. New York: Neilson Thomas
Priest, S., and Gass, M.A. (2005). Effective Leadership in Adventure Programming. 2nd ed. Human Kinetics, Leeds, UK.
Slack, T. and Parent, M.M. (2006). Understanding Sport Organizations – The Application of Organization and Theory. 2nd Ed. Human Kinetics, Champaigne Illinois.
Taylor, P. (Ed) (2011) Torkildsen's Sport and Leisure Management 6th Ed, London Routledge.
Wolsey, C., Minten, S., and Abrams, J. (2012). Human Resource Management in the Sport and Leisure Industry. Routledge, Oxon, Abington, U.K.

Pre-requisites

None

Synopsis *

Leadership in the context of sport and exercise is becoming increasingly recognised as providing the 'spark' that drives successful sport organisations. In this module, students will become more aware of styles of leadership and types of communication used in the sporting context. This module is important for establishing the necessary academic and specific sport management skills that students will need to complete a successful third year at University.
a) Leadership theory
b) Leadership styles
c) Philosophy of teaching and the facilitation of learning
d) Communication styles and techniques
e) Importance of feedback
f) Session delivery and observation
g) Motivation styles and techniques
h) Evaluating performance

SS533 Applied Nutrition for Sports Performance

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	I	15 (7.5)	100% Coursework	
1	Medway	Autumn	I	15 (7.5)	70% Coursework, 30% Exam	

Availability

Not available as an elective module.

Contact Hours

Private Study: 134
Contact Hours: 16
Total: 150

Learning Outcomes

On successfully completing the module students will be able to:

1. Demonstrate knowledge and critical understanding of applied sports nutrition with regard to the maintenance and enhancement of exercise and sport performance.
2. Demonstrate knowledge of the main methods of inquiry and approaches in sports nutrition.
3. Critically interpret dietary data/ research and communicate sound nutritional guidance

Method of Assessment

• Nutritional Report (3,000 words) – 100%

* At least one formative feedback opportunity will be provided in this module that will directly support

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None.

Synopsis *

This module considers the nutritional needs of different types of sports people. Students will learn to apply sound nutritional guidance. Nutritional guidance is based on an understanding of the underpinning concepts and principles associated with sports performance and how applied nutrition can maintain and enhance performance.

SS534 Applied Sport and Exercise Physiology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	I	30 (15)	50% Coursework, 50% Exam	
1	Medway	Whole Year	I	30 (15)	60% Coursework, 40% Exam	

Contact Hours

Total contact hours: 40
Private study hours: 260
Total study hours: 300

Learning Outcomes

1. Critically evaluate the cardio-pulmonary & metabolic responses to exercise in healthy individuals.
2. Critically evaluate the physiological factors limiting exercise performance in healthy adults.
3. Employ appropriate data handling & analysis techniques to interpret data sets on physiological responses to exercise.

Method of Assessment

• Lab Logbook (2,000 words) – 50%
• Examination (2 hours) – 50%
Academic year 2022/23 examined: In-Person Exam (Standard Exam)

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None

Synopsis *

The module explores the physiological response to exercise for a healthy adult. There is a focus on cardio-pulmonary & metabolic responses, which will be scrutinised in terms of differing exercises intensities and duration. The module will examine the key physiological factors that determine and thus limit exercise performance in humans, and will expose students to different methods of collecting, handling and processing exercise data.

SS546 Applied Sport & Exercise Psychology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Medway	Autumn	H	15 (7.5)	100% Coursework	
2	Medway	Spring	H	15 (7.5)	100% Coursework	

Contact Hours

Total contact hours: 22
Private study hours: 128
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to demonstrate knowledge and understanding in the following areas:

Philosophy and psychological approaches to understanding human behaviour in sport and exercise psychology contexts
Ethical and professional practice: standards, considerations, and evidence-based practice
Use of psychological skills and strategies to improve sport performance and physical health and wellbeing
Clinical issues relating to participation in sport and/or exercise
Analysis and evaluation of psychological data – evidenced by collecting and interpreting interview, questionnaire and/ or observational data
Reflective practice – critical self-reflection on their applied work, including needs analysis and design of an evidence-based intervention strategy

The intended generic learning outcomes. On successfully completing the module students will be able to:

Demonstrate an ability to integrate key skills through information technology to construct a written case report: e.g., word-processing and the use of electronic resources to search for, identify and organise information in library books, journal articles and the internet.
Communicate effectively with other individuals or groups of individuals throughout the course of this module and communicate learning in the form of a written case report.
Demonstrate evidence-based scientific reasoning – achieved by teaching and assessment of ethical thinking and applied practice decision-making
Demonstrate an ability to make critical judgements and evaluations – evidenced by the successful interpretation of theoretical concepts in applied examples.
Plan and manage their own learning by completing the extra self-directed study necessary to successfully meet the requirements for this module.
Critically self-reflect on their development of knowledge and application of theory to practice

Method of Assessment

Case report (up to 2,500 words) (100%)

Preliminary Reading

Andersen, M.B. (2000). Doing sport psychology. Champaign, IL: Human Kinetics
Biddle, S. & Mutrie, N. (2008). Psychology of Physical Activity. London: Routledge
Hemmings, B. & Holder, T. (2009) Applied Sport Psychology: A Case Study Approach. Oxford: Wiley-Blackwell
Williams, J.M. (2010). Applied sport psychology: Personal growth to peak performance. New York: McGraw-Hill

Pre-requisites

None

Synopsis *

The module aims to provide students with knowledge and understanding of the role of applied practice within sport and exercise psychology. A key module aim is to provide students with knowledge and understanding of the applied sport and exercise psychology service delivery process. Students will explore how sport psychology practitioners initially approach intervention work; consider ethical and professional practice dilemmas; appraise and evaluate approaches to evidence-based evidence; design an intervention; and reflect on their practice. Students will be required to conduct a case study with a sport or exercise participant.
A synopsis of the indicative topics included in this module are:

Introduction to the module
Frameworks and approaches in sport psychology (including philosophy and models of practice)
Professional practice (ethical standards, considerations, and evidence-based practice)
Initial needs assessment (Intake, interview, and performance profiling)
Choosing and planning an intervention
Psychological skills and strategies
Reflective practice - Athletic injuries and psychology - Clinical psychology (eating disorders, burnout, and exercise addiction)
Working with special populations (youth athletes, older adults, and living with disability/chronic illness)

SS555 Principles of Sports Marketing

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	I	30 (15)	100% Coursework	

Contact Hours

Total contact hours: 40
Private study hours: 260
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Construct and present a situational analysis for a proposed small business within the sports industry
Discuss market research techniques and apply the knowledge gained to gather market research for a proposed small business within the sports industry.
Construct and present a marketing mix for a proposed small business within the sports industry.
Investigate consumer behaviour
Critically discuss a current sports marketing campaign

The intended generic learning outcomes. On successfully completing the module students will be able to:

Communication and presentation skills - via the use of student lead presentations and demonstrations on a variety of subject specific material
Numeracy and information technology - through the use of internet searches for information to support development and learning
Interactive and group skills – through working with others to gather market research data and to prepare and present information
Problem solving – through the ability to successfully complete the written and practical assessments
Ability to self-appraise and reflect on practice – evidenced within written and oral assessments

Method of Assessment

Marketing Proposal – 50%-3500 words
Oral Presentation – 50% -15 minutes in length followed by Q& A

Preliminary Reading

Beech, J. Chadwick, S. (2007). The Marketing of Sport (2nd Ed) Prentice Hall, Harlow.
Doyle, P. and Stern P. (2006). Marketing Management & Strategy (4th Ed) Harlow Prentice Hall.
Kotler, P. and Armstrong P. (2011). Principles of Marketing (14th Ed), New Jersey Prentice.
Shank, M.D. (2009). Sports Marketing A Strategic Perspective (4th Ed), New Jersey Prentice Hall.

Pre-requisites

None

Synopsis *

Indicative content:

The structure of the sports industry
The structure of a situational analysis, including the micro and macro environment.
Market segmentation and targeting.
The 7 P's Marketing Mix.
Primary and secondary research within a business context.
Construction of a market research plan.
Cultural, social, personal and psychological factors relating to consumer behaviour.
Evaluate a range of marketing campaigns.

SS556 Sports Industry Placement

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	H	30 (15)	100% Coursework	

Contact Hours

Total contact hours: 10.5
Private study hours: 89.5
Placement hours: 200
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Show a comprehensive understanding and knowledge of the procedures, processes and disciplines of working within a sports related department or organisation.
Demonstrate the ability to apply some of the intellectual skills specified for the main programme in practice.
Demonstrate the ability to communicate effectively, orally and in writing, about business, management and/or professional/technical matters.
Demonstrate the ability to be able to undertake independent research beneficial to the placement department or organisation.
Demonstrate the ability to contextualise, record and reflectively evaluate the sport related activities of the department or organisation.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Demonstrate skills associated with their chosen sport organisation or department.
Communicate effectively orally and in writing, using media appropriate to the purpose
Demonstrate independence in initiating and executing work.
Be responsible for the management of their own time, and the prioritising of their workloads.
Demonstrate an ability to individually conduct research into business and management issues.

Method of Assessment

Industry placement report (3,500 words) – 100%

Preliminary Reading

Brennan, J. Little, B. (2002) A Review of Work Based Learning in Higher Education, Harlow, Prentice Hall
Dessler, G. (2017) Human Resource Management (15th Ed) London Pearson
Doyle, P. (2006) Marketing Management & Strategy (4th Ed) Harlow Prentice Hall
Gardiner, S et al (2005) Sports Law London Cavendish Publishing
Little, B. (1998) Developing Key Skills Through Work Placement, Council for Industry & HE
Torkildsen, G. (2005) Leisure and Recreation Management (5th Edition) London E & FN Spon
Fill, C. Turnball, S. (2016) Hello Marketing Communications (7th Ed) Harlow, Pearson Education Ltd.

Pre-requisites

None

Synopsis *

The module provides a structured opportunity to combine appropriate developmental work experience with academic study. The placement will provide the opportunity for students to develop appropriate vocational and applied academic knowledge. In order for the student to take this module they must secure a placement during Stage 2. The placement should be appropriate to the student's degree, experience and their potential career aspirations.

SS558 Soft Tissue Techniques

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	H	15 (7.5)	100% Coursework	
1	Medway	Autumn	H	15 (7.5)	100% Coursework with Pass/Fail Elements	

Contact Hours

Total Contact Hours: 33
Total Private Study Hours: 117
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Manage indications, cautions and contraindications of selected soft tissue techniques.
Use clinical reasoning and critical analysis to select and evaluate the effectiveness of appropriate soft tissue techniques.
Demonstrate the application of appropriate therapeutic interventions.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Apply knowledge to the solution of familiar and unfamiliar problems.
Demonstrate communication, presentation, numeracy, and IT skills.
Demonstrate problem solving skills.
Plan and manage their own learning.

Method of Assessment

Written Assignment (2,000 words) – 30%
Practical Assessment (30 minutes) – 70%

Preliminary Reading

Chaitow, L., (2008). Positional Release. London: Churchill Livingstone.
Giammateo, S., and Giammateo, T., (2004). Integrative Manual for the Connective Tissue System. Berkely: North Atlantic Books.
Myers, T., (2014). Anatomy Trains. London: Churchill Livingstone.
Riggs, A (2014). Deep Tissue Massage. Berkeley: North Atlantic Books.
Travell, J., and Simons, D., (1998). Myofascial Pain and Dysfunction: The Trigger Point Manual. Vol 1: Upper Half of Body. Baltimore: LWW.
Travell, J., and Simons, D., (1992). Myofascial Pain and Dysfunction: The Trigger Point Manual. Vol 2: Lower Extremities. Baltimore: LWW.

Pre-requisites

Prerequisite: SPOR3530 – Sports and Remedial Massage

Synopsis *

Soft Tissue Techniques will enable students to pursue inquiry into the treatment of selected soft tissue injuries, using a variety of soft tissue techniques. This module develops the students' ability to use critical analysis and clinical reasoning skills in the application of soft tissue techniques. Students will be required to analyse current issues in the use of soft tissue techniques within the field of Sport and Exercise Therapy.

Topics include:

Deep Tissue Massage
Soft Tissue Release
Reciprocal Inhibition
Trigger Points
Positional Release
Taping techniques

SS559 Sports Injuries

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	I	15 (7.5)	100% Coursework	

Contact Hours

1 hour weekly lecture and 1 hour weekly seminar

Learning Outcomes

Students who take full advantage of the opportunities made available to them will, on successful completion of the module, be able to:
1. Relate the pathophysiology of injury to common signs and symptoms of sports injuries.
2. Differentiate between mechanisms of injury and their associated risk factors.
3. Apply knowledge of the biomechanics of human movement to sports injuries

Method of Assessment

In class written test 30%
Written coursework 70%

Preliminary Reading

Brukner, P, Kahn,K. (2006) Clinical Sports Medicine. London: McGraw-Hill

Whiting, W., Zernicke, R. (2008) Biomechanics of musculoskeletal injury. Philadelphia:Human Kinetics

Synopsis *

This module will enable students to interpret the pathophysiology of a range of sports injuries by anatomical region and tissue type. The module develops the students' ability to relate the biomechanics of human movement and injury to the sports injuries process. Students will be required to critically analyse the risk factors associated with sports injuries.
A synopsis of topics included in this module are:
- Introduction to movement analysis
- Identify pathology of major sports injuries
- Classify the mechanisms of injury of major sports injuries
- Identify the risk factors of main sports injuries.

SS560 Clinical Practice

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	H	45 (22.5)	100% Coursework	
1	Medway	Whole Year	H	45 (22.5)	100% Coursework	
1	Medway	Whole Year	H	45 (22.5)	100% Coursework with Pass/Fail Elements	

Contact Hours

Total contact hours: 95
Private study hours: 355
Total study hours: 450

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Assess, plan, and deliver safe and effective sports therapy practice.
Critically reflect on personal strengths and weaknesses in the context of the role, limitations and competencies of a sports therapist.
Demonstrate the application of business skills to the promotion and management of sports therapy practice.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Apply information technology: through coursework; accessing contemporary research; and managing in the workplace.
Apply problem solving: through critical analysis and clinical reasoning.
Plan and manage learning: through planning and completing self-directed learning.
Self-appraise and reflect on practice: through evaluation of their own and others' clinical practice.

Method of Assessment

Case Study – 15%
Marketing Leaflet – 15%
Practical – 20%
Log Book – 50%
200 Clinical Hours – Pass/Fail

Preliminary Reading

Brukner, P. & Khan, K. (2006) Clinical sports medicine. McGraw Hill Medical. 3rd Ed. ISBN-10: 0074715208.
Higgs, J. et al. (2008) Clinical reasoning in the health professions. Oxford: Butterworth-Heinemann. 3rd Edition. ISBN 0750688858
Magee, D.J. (2008) Orthopedic physical assessment. Saunders, London. 5th Edition. ISBN 0721605710
Nordin, M. & Frankel, D.L. (2001) Basic biomechanics of the musculoskeletal system. Lippincott, Williams & Wilkins, London. 3rd Edition. ISBN 0683302477
Prentice, W.E. (2003) Rehabilitation techniques in sports medicine. McGraw Hill. 4th Ed. ISBN-10: 0072462108

Pre-requisites

Prerequisites:
SPOR5570 (SS557) Therapeutic Interventions
SPOR5610 (SS561) Examination and Assessment
SPOR5620 (SS562) Rehabilitation

Synopsis *

Students are required to undertake supervised clinical placement hours in order to gain eligibility for membership of the professional body. This module aims to provide the framework for students to undertake these hours and to support their development of professional skills and employability for the working environment. The module enables students to experience work with injured athletes in a variety of sports therapy environments and across disciplines. The majority of the module will be the demonstration of sports therapy skills within a clinical environment. Topics that will be covered include:
• Working in interdisciplinary teams and referrals
• Professional sports therapy organisations and continuing professional development
• Setting up and running a sports therapy practice.
• Anti-doping, substance abuse and the role of the sports therapist
• Electrotherapy theory and practice
• Taping and strapping theory and practice
• Immobilisation and protective devices, ambulation aids and gait analysis and re-education
• Common orthopaedic surgical procedures
• Differential diagnosis and special tests
• Injury prevention and risk factors
• Nutrition and psychology
• Hydrotherapy

SS561 Examination and Assessment

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	I	15 (7.5)	100% Coursework	

Contact Hours

Course delivery will include lectures, seminars and clinical practice.

Learning Outcomes

Students who take full advantage of the opportunities made available to them will, on successful completion of the module, be able to:
1. Examine and assess peripheral joints in a safe and appropriate manner.
2. Recognise the components of the objective assessment and their significance to presenting signs and symptoms
3. Record assessment findings in an appropriate and consistent manner.

Method of Assessment

Practical assessment 70%
Written coursework 30%

Preliminary Reading

Brukner, P. & Khan, K. (2006) Clinical sports medicine McGraw Hill Medical. 3rd Edition. ISBN-10: 0074715208.

Hislop, H.J. & Montgomery, J. (2007) Daniel & Worthingham's muscle testing: techniques of manual examination. 8th Edition. Elsevier Saunders, Edinburgh

Magee, D.J. (2008) Orthopedic physical assessment. Saunders, London. 5th Edition. ISBN 0721605710

Reese, N.B. & Bandy, W.D. (2010) Joint range of motion and muscle length testing. 2nd Edition. Saunders Elsevier, St Louis, MO.

Synopsis *

This module develops the students' ability to examine and clinically assess the upper and lower limbs. The sports therapy examination and assessment protocol will be used as the framework for delivery of this module. This module will continue to build skills in problem solving and clinical reasoning including subjective and objective assessment and the relation to presenting signs and symptoms.

The following topics will be covered in this module are:
- Objective clinical examination and assessment techniques: theory, practice and application.
- Upper and lower limb joint assessment incuding: ankle and foot; knee; hip; shoulder; elbow; wrist and hand.
- Principles and practical application of assessing ranges of movement; muscle length and strength; ligamentous stability; and special tests as appropriate for each anatomical region.
- Requirements and maintenance of medical records including recording assessment findings.

SS562 Rehabilitation

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	I	30 (15)	100% Coursework with Pass/Fail Elements	
1	Medway	Whole Year	I	30 (15)	100% Coursework	
1	Medway	Whole Year	I	30 (15)	100% Coursework with Pass/Fail Elements	

Contact Hours

1 hour lecture and 2 hour seminar weekly

Learning Outcomes

Students who take full advantage of the opportunities made available to them will, on successful completion of the module, be able to:

1. Recognise and describe the stages of rehabilitation and the components of a rehabilitation programme
2. Apply/relate criteria for progression and regression for different sports and exercise participants
3. Formulate appropriate sports specific rehabilitation programmes for different sports and exercise participants

Method of Assessment

Practical assessment
60%
Written coursework
40%

Preliminary Reading

Brukner, P. & Khan, K. (2006) Clinical sports medicine. Sydney. London: Mc Graw-Hill

Houglum, P.A. (2005) Theraputic Exercise for Musculoskeletal Injury (2nd ed.) Champaign IL. Human Kinetics Prentice, W. (2004) Rehabilitation Techniques for Sport Medicine and Athletic Training. 4th Ed. London. Mc-Graw Hill

Synopsis *

The main aims of this module are to provide students with the knowledge and ability to recognise and describe the different stages and components of rehabilitation. Students will learn how to progress athletes form one stage to the next and be able to recognise when athletes are ready to return to their sport or activity. The students will also be able to recognise when an athlete needs to regress their rehabilitation programme. Students will be able to formulate sport specific rehabilitation programmes for a range of sports.

The following topics will be covered in this module:
Components of rehabilitation and the criteria for progression and return to play including strength, power, speed, agility, flexibility, range of motion (ROM), cardiovascular endurance, sports specific requirements and psychological factors and PRICE

SS564 High Performance Physiology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	H	15 (7.5)	100% Coursework	
1	Medway	Spring	H	15 (7.5)	100% Coursework	

Contact Hours

Total contact hours: 24
Private study hours: 126
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Understand the integrated nature of exercise physiology
Critically analyse the key physiological components required in sport and exercise related activities
Critically analyse contemporary issues in relation to exercise physiology and training.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Demonstrate an ability to integrate key skills in communication and presentation via the use of student lead practicals and presentations on a variety of subject specific material with both individual and group settings used.
Demonstrate an ability to integrate key skills in numeracy and information technology – evidenced via analysing data collected when carrying out the battery of tests with clients and through the use of appropriate information technology in order to analyse a battery of tests.
Demonstrate an ability to integrate key skills in problem solving – achieved through the ability to successfully analyse and interpret the requirements of the written coursework assessment.
Plan and manage learning - through completing the extra self-directed study necessary to successfully complete the required assignments and tasks set during this module.

Method of Assessment

Coursework (2,500 words) (100%)

Preliminary Reading

Brooks, G. Fahey, T. White, T. Baldwin, K. (2005) Exercise Physiology. Human Bioenergetics and its Applications (4th Ed.) McGraw Hill.
Eston, R. Reilly, T. (Eds) (2009) Kinanthropometry and Exercise Physiology Laboratory Manual. Test, Procedures and Data (3rd Ed.). Routledge: London.
Tanner, R. Gore, C. (Eds.) (2013) Physiological Tests for Elite Athletes (2nd Ed.) Human Kinetics.

Pre-requisites

None

Synopsis *

This module aims to increase the student's knowledge and understanding of the physiology governing sports performance. Contemporary training methods will be discussed. It also further develops the skills necessary to analyse and critically assess performance. Practical sessions will be conducted to reinforce theoretical knowledge.
The following indicative topics covered in this module are:
- Submaximal and maximal determinants of exercise performance
- Strength and power in athletic performance
- Processes of fatigue and implications for training
- Contemporary issues in training
- Monitoring training and recovery

SS565 Contemporary Issues in Sport and Exercise Nutrition

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Spring	H	15 (7.5)	100% Coursework	

Availability

Not available as an elective module.

Contact Hours

Private Study: 117
Contact Hours: 33
Total: 150

Learning Outcomes

On successfully completing the module students will be able to:

1. Demonstrate a critical understanding of current research in sports nutrition.
2. Demonstrate critical awareness of nutrition strategies, and use of ergogenic aids purported to enhance sport/exercise performance.
3. Critically evaluate research evidence in sports nutrition.

Method of Assessment

• Scientific Report (3,000 words) – 100%

* At least one formative feedback opportunity will be provided in this module that will directly support

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

Prerequisite: SPOR5330 – Applied Nutrition for Sports Performance

Synopsis *

In this module students will study and investigate the latest research in sports nutrition. This will provide the opportunity to critically analyse research evidence and practical nutritional strategies in sports nutrition. Students will study nutritional ergogenic aids and nutritional strategies suggested to improve performance. Students will conduct practical sessions in order to test some of the theories and strategies studied.

SS566 Research Study in Sport Sciences

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	H	45 (22.5)	85% Project, 15% Coursework	
1	Medway	Whole Year	H	45 (22.5)	90% Project, 10% Coursework	

Contact Hours

Total Contact Hours: 12
Private Study Hours: 438
Total Study Hours: 450

Learning Outcomes

1. Identify an appropriate research topic that makes a relevant contribution to the student's programme of study.
2. Demonstrate a critical understanding of the theories and concepts underpinning the chosen area of study.
3. Select the most appropriate research methods, and produce an individual research study that is presented in the appropriate way

Method of Assessment

Coursework (Presentation) – 15%
Project (Dissertation 10,000 words) – 85%

Preliminary Reading

Creswell, J. (2013). Research design: qualitative, quantitative, and mixed methods approaches. 4th Ed. London: Sage.
Dancey, C. P., Reidy, J. & Rowe, R. (2012) Statistics for the Health Sciences: A Non-Mathematical Introduction. London: Sage.
Field, A. (2017). Discovering statistics using IBM SPSS Statistics. 5th Ed. London: Sage.
Greenhalgh, T. (2014) How to read a paper: the basics of evidence-based medicine. 5th Ed. Chichester: Wiley-Blackwell.
Joyner, R. L, Rouse, W. A., & Glatthorn, A. A (2012) Writing the Winning Thesis or Dissertation: A Step by Step Guide. 3rd Edn. Corwin Press: London
Vincent, W. J. & Weir, J. (2012) Statistics in Kinesiology. 4th Ed. Leeds: Human Kinetics.

Synopsis *

The module takes the form of an individual research study. There are taught lectures covering the management of a research project. The research projects are then conducted with the supervision of a tutor who will advise the student on issues such as methodology, analysis and presentation. It is the student's responsibility to organise, conduct, analyse and present the research as required. The research project may comprise an experimental laboratory based dissertation, or a systematic review of the literature.

SS567 Sport and Exercise Promotion

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	I	30 (15)	100% Coursework	
1	Medway	Whole Year	I	30 (15)	100% Project	

Contact Hours

Total contact hours: 42
Private study hours: 258
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

understand the principles underpinning sport and exercise promotion
describe and analyse data on the health and activity status of different population groups
describe the strategies and methods for promoting sport and exercise participation
evaluate the evidence and rationale supporting sport/exercise guidelines and interventions

The intended generic learning outcomes. On successfully completing the module students will be able to:

Communication and presentation skills - via the use of student lead practical sessions and presentations on a variety of subject specific material with both individual and group settings used.
Numeracy and Information Technology – evidenced via the preparation for presentations (including importing of graphics, word processing, internet searches)
Interactive group skills – evidenced through conducting student lead presentations and tasks as well as through undertaking group practical sessions.
Problem solving – achieved through the preparation and planning of the sport and exercise promotion event.
Ability to self-appraise and reflect on practice – evidenced within the evaluation section of the reflective nature of the coursework assignment.
Ability to plan and manage learning - through completing the extra self-directed study necessary to successfully complete the required assignments and tasks set during this module.

Method of Assessment

Evaluation – 50%-2000 words
Presentation – 30%-12 min Power Point Presentation
Event – 20%

Preliminary Reading

ACSM (2010) ACSM's Guidelines for Exercise Testing and Prescription, 8th ed. Maryland: Lippincott Williams & Wilkins.
ACSM (2008) ACSM’s Health-Related Physical Fitness Assessment Manual, 2nd ed. Baltimore: Lippincott Williams & Wilkins.
ACSM (2010) ACSM’s Resource Manual for Guidelines for Exercise Testing and Prescription. 6th ed. Maryland: Lippincott Williams & Wilkins.
Biddle, S.J.H. & Mutrie, N. (2006) Psychology of Physical Activity: Determinants, Well-Being and Interventions. 2nd ed. London: Routledge.
Heyward, V.H. (2006) Advanced Fitness Assessment and Exercise Prescription. 5th ed. Illinois: Human Kinetics.
Howley, E.T. & Franks, B.D. (2003) Health Fitness Instructor’s Handbook. 4th ed. Champaign, Illinois: Human Kinetics.

Pre-requisites

None

Synopsis *

The module starts by considering the multi-dimensional nature of health to broaden student's understanding of the many factors – individual or environmental - that could contribute to personal experience of health & what that means to different members of the population. Key aspects of sport and exercise promotion are considered, culminating in students completing a sport or exercise promotion event of their own. Whilst there is an emphasis on theoretical issues in the module, students are encouraged to apply these principles to the various aspects of sport and exercise promotion practice.

Introduction – What is health, sport and exercise?
Determinants of health, sport and exercise
Concepts and theories of health & health promotion
Health promoters & their roles
Sport development agencies and their roles
Guidelines for agencies involved in developmental work
Identifying population needs in relation to health & Sport needs
Motivation & behaviour change
The health and physical activity status of different population groups
Understanding and interpreting epidemiological research
Strategies for promoting sport and exercise participation amongst the population
Exercise guidelines for different population groups and the associated evidence, rationale, issues and implications
Sport and Exercise campaigns and the marketing of physical activity to different population groups, the influence of physical and social environments on engagement
Planning & evaluating a health, sport or exercise promotion activity

SS568 Therapeutic Mobilisations

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Spring	H	30 (15)	100% Coursework	

Contact Hours

This module delivery comprises of a 1 hour weekly lecture and two 2 hour weekly practical seminars.

Learning Outcomes

On successful completion of this module, students will be able to:
12.1 Discuss indications, cautions and contraindications of selected therapeutic interventions.
12.2 Discuss the effects of selected therapeutic interventions.
12.3 Use clinical reasoning and critical analysis to select and evaluate the effectiveness of appropriate interventions.
12.4 Demonstrate the application of appropriate therapeutic interventions.

Method of Assessment

Coursework: Written Assignment 30%
Coursework: Practical Logbook 70%

Preliminary Reading

Maitland, G., D., Hengeveld, E. and Banks, K. (2005) Maitlands Peripheral Manipulation. Elsevier Butterworth Heinmann. ISBN:0-7506-5598-4

Maitland, G., D., Hengeveld, E., Banks, K., and English, K. (2005). Maitland's Vertebral Manipulation. Elsevier Butterworth Heinmann. ISBN: 0-7506-8806-8

Mulligan, B., R. (1999). Manual Therapy "NAGS", "SNAGS", "MWMS"etc. Plane View Services Ltd. ISBN: 0-473-05765-4

Synopsis *

This module develops the students' ability to examine, select and apply appropriate therapeutic interventions for the vertebral and peripheral joints.
This module will continue to build skills in problem solving and clinical reasoning based on the principles of joint mobilisation.

The following topics will be covered in this module:
• Philosophies and principles of manual therapy.
• Kinematics of vertebral and peripheral joints.
• Core stability and its role in trunk rehabilitation.
• Sports injuries of the spine.

SS569 Sport & Exercise Psychology

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Spring	I	15 (7.5)	100% Coursework	

Contact Hours

Total contact hours: 24
Private study hours: 126
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Discuss and apply psychological theories relating to sport and exercise
Discuss the influence of cognitive and social psychological factors that influence behaviour in a sport and exercise environment
Discuss the theoretical principles of sports and exercise psychology underpinning applied practice
Discuss and apply knowledge of psychological concepts to group and individual behaviour in sport and exercise environments

The intended generic learning outcomes. On successfully completing the module students will be able to:

Demonstrate information technology: through the compilation of a written assignment (including word processing and internet searches).
Demonstrate communication and presentation skills – evidenced by the ability to communicate learning in coursework.
Demonstrate problem solving – achieved through the ability to interpret theoretical concepts appropriately.
Plan and manage learning - through completing self-directed study necessary to successfully meet the requirements for this module.

Method of Assessment

Written coursework (2,750 words) (100%)

Preliminary Reading

Andersen, M.B. (2000). Doing Sport Psychology. UK: Human Kinetics
Biddle, S.J.H. & Mutrie, N. (2006). Psychology of physical activity determinants, well-being and interventions. London: Routledge.
Buckworth, J. & Dishman, R.K. (2002). Exercise psychology. Champaign, IL: Human Kinetics.
Lavallee, D., Williams, J.M., & Jones, M.V. (2008). Key readings in sport and exercise psychology. New York: McGraw-Hill.
Taylor, J. & Wilson, G. (2005). Applying sport psychology. Champaign, IL: Human Kinetics.
Weinberg, R.S., & Gould, D. (2007). Foundations of Sport and Exercise Psychology. Champaign, IL: Human Kinetics.

Pre-requisites

Prerequisite: SPOR3440 (SS344) Introduction to Sport and Exercise Psychology

Synopsis *

The module aims to provide students with knowledge and understanding of human responses and adaptations to sport and exercise. Using a psychological approach, students acquire knowledge and understanding of sport and exercise performance and exercise adherence to promote health. Lectures and seminars provide forums for discussion and understanding of cognitions, affect and behaviour and the complex interactions between these. A key module aim is to provide an understanding of the application of theory to real 'applied' situations within sport and exercise settings.
Topics include:
Individual differences and personality
Attributions and perceived control
Exercise behaviour
Motivation
Emotions in sport
Attention and focus
Group dynamics
Leadership
Communication
Goal setting
Psychophysiology in sport and exercise

SS570 Fitness Training Methods

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	I	15 (7.5)	100% Coursework	
1	Medway	Autumn	I	15 (7.5)	50% Coursework, 50% Exam	

Contact Hours

Total contact hours: 22
Private study hours: 128
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Apply knowledge and understanding of the different components of physical fitness and their contribution to health and athletic performance.
Demonstrate theoretical knowledge and application of training programme and training methodology design, evaluation and implementation
Administer and evaluate an exercise training programme

The intended generic learning outcomes. On successfully completing the module students will be able to:

Apply knowledge to the solution of familiar and unfamiliar problems.
Demonstrate communication, presentation, numeracy and C & IT skills.
Demonstrate interactive group skills.
Demonstrate problem solving skills.
Demonstrate the ability to self-appraise and reflect on practice.
Demonstrate the ability to plan and manage learning

Method of Assessment

Group practical assessment and individual questioning (20 minutes) – 50%
Examination – 50% (2 hours)
Academic year 2022/23 examined: Time-Bound Online Assessment

Preliminary Reading

ACSM. (2009). ACSM's Guidelines for Exercise Testing and Prescription. 8th Edition. Philadelphia: Lippincott Williams & Wilkins.
ACSM. (2007). Resources for the Personal Trainer. 2nd Edition. Philadelphia: Lippincott Williams & Wilkins.
Bompa, T.O. (2009). Periodization: Theory and Methodology of Training. 5th Edition. Champaign, Illinois: Human Kinetics.
Dick, F.W. (2007). Sports Training Principles. 5th Edition. London: A & C Black.
Foran, B. (2001). High Performance Sports Conditioning. Champaign Illinois: Human Kinetics.
Hoffman, J. (2002). Physiological Aspects of Sports Training and Performance. Champaign, Illinois: Human Kinetics.

Pre-requisites

None

Synopsis *

This module will provide students with a grounding in training theory and application, specifically looking at programme design and implementation in health and athletic performance. It includes: Principles of sport and exercise training; Training methodology; Programme design and organisation; Adaptations to training.

SS571 Research Design and Planning

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	I	15 (7.5)	100% Coursework	
1	Medway	Autumn	I	15 (7.5)	100% Coursework with Pass/Fail Elements	

Contact Hours

30 hours split into; x12 x 1 hour lectures, x1 1 hour formative test, x12 1 hour seminars and x4 2 hour SPSS workshops, x21 hour supervisor appointments in small groups and pre-study.

Learning Outcomes

On successful completion of the module students will be able:
12.1 Analyse the strengths and weaknesses associated with a range of research methods;
12.2 Interpret descriptive, graphical and inferential statistics that inform answers to specific research questions.
12.3 Demonstrate knowledge of devising a clear specific and testable research question that can be realistically addressed within the limitations of undergraduate study.

Method of Assessment

This module is taught at the Medway campus only
60% Research Proposal, 40% in-class test

Preliminary Reading

Field, A. (2005).Discovering statistics using SPSS. London: Sage.

Burns, R. (2000). Introduction to Research Methods.London: Sage.

Creswell, J. (2009). Research design: qualitative, quantitative, and mixed methods approaches. Thousand Oaks, CA: Sage.

Coakes, S.J. and Steed, L.G. (2003) SPSS: Analysis without anguish version 11.0 for Windows. Australia: Wiley and Sons.

Fallowfield, J. Hale, B. Wilkinson, D. (2005) Using statistics in Sport and Exercise Science Research.Chichester: Lotus Publishing.

Thomas, J.R. and Nelson, J.K. (2005) Research Methods in Physical Activity.(4th Ed.) Champaign, Illinois: Human Kinetics.

Williams, C. Wragg, C. (2004) Data analysis and research for Sport and Exercise Science. London: Routledge.

Synopsis *

The module is intended to provide students with an understanding of research design, planning and data analysis. The first half of the module is dedicated to learning about inferential data analysis and the use of SPSS to understand basic statistical concepts (the normal distribution) and perform parametric and non-parametric statistical tests (e.g., Student's t-test). The second half of the module is dedicated to research design and planning. IN this part of the module, students will develop a research proposal that will ultimately become the basis of their year 3 dissertation.

A synopsis of topics included in this module are:
- A range of statistical tests analysing parametric and non-parametric data
- The process of forming a research question and hypothesis
- Ethics in research
- Scientific writing skills
- Supervisor contact
- Presentation of current dissertation projects

SS572 Sport, Exercise & Health Promotion

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	I	15 (7.5)	100% Coursework	

Contact Hours

Total hours for the module will be 150. This will include 1 hour Lecture per week for 11 weeks. These contact hours will total 11. There will also be a 1 hour seminar for week. These contact hours will total 11. The remainder will be devoted to time spent conducting their sport and exercise promotion activity and for private study for the reinforcement of knowledge.

Learning Outcomes

On successful completion of the module students will be able:

12.1 understand the principles underpinning sport and exercise promotion
12.2 describe and analyse data on the health and activity status of different population groups
12.3 describe the strategies and methods for promoting sport and exercise participation
12.4 evaluate the impact of a sport and/or exercise promotion intervention

Method of Assessment

100% Presentation

Preliminary Reading

ACSM (2010) ACSM's Guidelines for Exercise Testing and Prescription. 8th Ed. Maryland: Lippincott Williams & Wilkins.

ACSM (2008) ACSM's Health-Related Physical Fitness Assessment Manual 2nd Ed. Baltimore: Lippincott Williams & Wilkins.

ACSM (2010) ACSM's Resource Manual for Guidelines for Exercise Testing and Prescription. 6th Ed. Maryland: Lippincott Williams & Wilkins.

Biddle, S.J.H. & Mutrie, N. (2006) Psychology of Physical Activity: Determinants, Well-Being and Interventions. 2nd Ed. London : Routledge.

Ewles, L & Simnett, I. (1992) Promoting Health: A Practical Guide. Oxford: Bailliere Tindall.

Heyward, V.H. (2006) Advanced Fitness Assessment & Exercise Prescription. 5th Ed. Illinois: Human Kinetics.

Howley, E.T. & Franks, B.D. (2003) Health Fitness Instructor's Handbook. 4th Ed. Champaign, Illinois: Human Kinetics.

Naidoo, J. Wills, J. (2000). Health Promotion: Foundations for Practice. Oxford: Elsevier

Seedhouse, D. (2001). Health: The Foundations for Achievement. NJ, USA: Wiley-Blackwell

Synopsis *

The health and physical activity status of different population groups

Understanding and interpreting epidemiological research

Strategies for promoting sport and exercise participation amongst the population

Exercise guidelines for different population groups and the associated evidence, rationale, issues and implications

Sport and Exercise campaigns and the marketing of physical activity to different population groups, the influence of physical and social environments on engagement

SS573 Research Study Preparation

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	I	15 (7.5)	100% Coursework	
1	Canterbury	Spring	I	15 (7.5)	100% Coursework	
1	Medway	Spring	I	15 (7.5)	100% Coursework	

1	Medway	Spring	I	15 (7.5)	100% Coursework with Pass/Fail Elements

Contact Hours

Total Contact Hours: 22
Total Private Study Hours: 128
Total Study Hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Complete an appropriate literature search associated with the chosen topic of study relating to sport and exercise or sports therapy and rehabilitation, using primary and secondary sources.
Demonstrate theoretical knowledge of devising a clear specific and testable research question that can be realistically addressed within the limitations of undergraduate study relating to sport and exercise or sports therapy and rehabilitation.
Work collaboratively with a recognised expert in the area of research interest relating to sport and exercise or sports therapy and rehabilitation.
Demonstrate an awareness of the ethical concerns of research within the subject specialism relating to sport and exercise or sports therapy and rehabilitation.

The intended generic learning outcomes. On successfully completing the module students will be able to:

Demonstrate numeracy and information technology via working with study design, power calculations and the synthesis of a complex project proposal.
Demonstrate problem solving through the identification of a research question and the generation of a hypothesis, followed by the design of an appropriate study to test this.
Demonstrate the ability to plan and manage learning by completing a proposal for a dissertation, with consultancy from a supervisor, which is achievable, manageable and suitable for Honours level study.
Demonstrate the ability to plan and manage their own learning skills through the need to complete a thorough and realistic dissertation proposal.

Method of Assessment

Written Research Proposal (2,000 words) – 100%

Preliminary Reading

Burns, R. (2000). Introduction to Research Methods. London: Sage.
Creswell, J. (2009). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Thousand Oaks, CA: Sage.
Field, A., Hole, G. (2003). How to Design and Report Experiments. London: Sage.
Lynch, C. (2010). Doing Your Research Project in Sport. Exeter: Swales and Willis.

Pre-requisites

None

Synopsis *

This module will cover the following topics:

Introduction to staff research areas in the CSS
The process of forming a research question and hypothesis
Writing an introduction
Writing a literature review
Writing a methodology
Writing a discussion
Justification of resources
Ethics in research
Writing clinics
Supervisor contact
Presentation of current dissertation projects

SS574 Human Resources Management in Sport

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	I	15 (7.5)	100% Coursework	
1	Medway	Spring	I	15 (7.5)	100% Coursework	

Contact Hours

Total contact hours: 22
Private study hours: 128
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Discuss the role of the Human Resource function.
Propose human resource management procedures including recruitment and selection for a small business.
Investigate and discuss the human resource procedures for a business of your choice within the sports industry

The intended generic learning outcomes. On successfully completing the module students will be able to:

Communication and presentation skills - via the use of student led practical sessions and presentations on a variety of subject specific material with both individual and group settings used.
Ability to self-appraise and reflect on practice – evidenced within the evaluation section of the reflective nature of the coursework assignment.
Ability to plan and manage learning - through completing the extra self-directed study necessary to successfully complete the required assignments and tasks set during this module.

Method of Assessment

Written report (3500 words) -100%

Preliminary Reading

Chelladurai, P. (2006). Human Resource Management in Sport and Recreation. (2nd ed). Human Kinetics.
Cuskelly, G; Hoye R and Auld, C. (2006). Working with Volunteers in Sport: Theory and Practice. Routledge.
Dessler, G (2005). Human Resource Management (10th ed) New Jersey Prentice Hall
Gardiner, S. et al. (2005). Sports Law London Cavendish Publishing
Robinson, L. and Palmer D. (2011). Managing Voluntary Sport Organisations. Routledge
Torkildsen, G (2005). Leisure and Recreation Management (5th ed) London E & FN Spon
Torrington, D. Hall, L. Taylor, S. (2005). Human Resource Management. (6th ed) Harlow Prentice Hall
Tyson, S. (2006). Essentials of Human Resource Management (5th ed) London Butterworth Heinemann

Pre-requisites

None

Synopsis *

To discuss human resource/personnel policies specifically in relation to recruitment and selection activities in sport settings. Designing job descriptions, Working with volunteers in sport. Discuss performance management/appraisal processes. Explore legislation and equality issues, investigate induction, training and development activities to include graduate training programmes, development assessment centres, job shadowing and succession planning. Explore rewards and models of motivation as well as retention strategies applied to the context of Human Resources Management in sport.

SS575 Research Methods

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Autumn	I	15 (7.5)	100% Coursework	
1	Medway	Autumn	I	15 (7.5)	100% Coursework with Pass/Fail Elements	

Contact Hours

Total contact hours: 21
Private study hours: 129
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Analyse the strengths and weaknesses associated with selected research methods;
Identify and interpret descriptive, graphical and inferential statistics that inform answers to specific research questions concerned with both simple and complex research designs;
Conduct a variety of statistical analyses using the computer software SPSS and communicate an interpretation of the output in a written research report format

The intended generic learning outcomes. On successfully completing the module students will be able to:

Demonstrate skills in numeracy and information technology;
Demonstrate skills in problem solving;
Demonstrate the ability to plan and manage learning.

Method of Assessment

Data Analysis and Reporting Exercise – 100%

Preliminary Reading

Creswell, J. (2013). Research design: qualitative, quantitative, and mixed methods approaches. 4th Ed. London: Sage.
Dancey, C. P., Reidy, J. & Rowe, R. (2012) Statistics for the Health Sciences: A Non-Mathematical Introduction. London: Sage.
Field, A. (2013). Discovering statistics using IBM SPSS Statistics. 4th Ed. London: Sage.
Vincent, W. J. & Weir, J. (2012) Statistics in Kinesiology. 4th Ed. Leeds: Human Kinetics.

Pre-requisites

None

Synopsis *

This module introduces students to the analysis techniques required for their dissertation module. The analysis techniques to be covered are as follows:
Independent and paired t-tests
Overview of Regression and Correlation
Qualitative analysis techniques
One way ANOVA
Factorial ANOVA
Repeated measures ANOVA
Non-parametric tests

SS578 Event Management

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	H	30 (15)	100% Coursework	

Contact Hours

Total contact hours: 18
Private study hours: 282
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

Relate and apply the theoretical knowledge gained in order to successfully propose an event (relevant to the undergraduate degree being studied).
Relate and apply the theoretical knowledge gained in order to implement an event (relevant to the undergraduate degree being studied).
Critically assess and evaluate the planning and implementation of the event (relevant to the undergraduate degree being studied).

The intended generic learning outcomes. On successfully completing the module students will be able to:

Communication and presentation skills – achieved through effective written, verbal and non-verbal communication skills.
Information Technology and numeracy - through the preparation of event planning and proposals, budgets and presentations.
Interactive group skills – evidenced through working with a range of groups throughout the planning and implementation of the event.
Problem solving – achieved through the event planning and implementation stages and through completing the self-directed study necessary to complete this module.
Ability to self-appraise and reflect on practice – achieved through the event implementation and evaluation stages and specifically the defence interview

Method of Assessment

Event Proposal Presentation – 35%-20 minutes presentation including Q&A
Event Observation – 30%
Event Defence – 35%- 20 minutes presentation including Q&A

Preliminary Reading

Bladen. C et al (2012), Events Mangement an Introduction, Routledge London
Bowdin, G.A.J., Getz, D., & Lashley, C. (2011). Events Management (3rd Ed). Oxford: Butterworth-Heinemann.
Health and Safety Executive (1999). The Event Safety Guide (2nd Ed) HMSO. http://www.hse.gov.uk/event-safety/index.htm
Mallen. C Adams. L.J. (2013) Event Management in Sport, Recreation and Tourism Theoretical and Practical Dimensions (2nd ed), Routledge London
Masterman. G. (2014), Strategic Sports Event Management (3rd Ed) Routledge London
Parent.M.M and Smith-Swan.S (2013) Managing Major Sports Events Theory and Practice, Routledge London
Robinson, L. & Palmer, D. (2011) Managing Voluntary Sport Organisation. Abington: Routledge.

Pre-requisites

None

Synopsis *

The module provides a structured opportunity to put into practice theoretical and practical knowledge and skills that students have acquired during their studies, in the context of delivering an event relevant to their programme of study. As such, this module will provide opportunities for students to develop appropriate vocational and applied academic knowledge. Students will work as part of a small group in the process of proposing, planning, implementing, reviewing and evaluating an actual event, students will need to integrate market research, marketing, human resource management, leadership, health and safety issues, security, logistical and financial management in an appropriate way. The emphasis is on the processes that surround the actual event itself.

- An introduction to the events industry
- The planning cycle for major events
- Market research and the development of an event concept
- Human resource planning and management required for running an event
- Financial planning and management of an event
- Marketing the event
- Health, safety and security legislation and procedures
- Establishing timelines and checklists.
- Event implementation
- Event evaluation

SS579 Industry Placement

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Whole Year	H	30 (15)	100% Coursework	

Contact Hours

Total contact hours: 10.5
Private study: 89.5
Placement hours: 200
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:

demonstrate a comprehensive and systematic understanding and knowledge of the procedures, processes and disciplines of working within a department or organisation relevant to the students main programme of study.
demonstrate application of a number of the intellectual skills specified for the main programme of study.
undertake independent research beneficial to the placement department or organisation utilising appropriate methodologies and analysis
review, analyse, contextualise, record and reflectively evaluate the related activities of the department or organisation.

The intended generic learning outcomes. On successfully completing the module students will be able to:

demonstrate the development of skills associated with their chosen sport organisation or department.
communicate effectively, orally and in writing, about management and/or professional/technical matters, using media appropriate to the purpose.
demonstrate independence in initiating and executing work.
become responsible for the management of their own time, and the prioritising of their workloads.
develop an ability to individually conduct research into business/management and/or relevant programme discipline issues.

Method of Assessment

Industry placement report (3,500 words) – 100%

Preliminary Reading

Beech, J. & Chadwick, S. (2012) The Business of Sport Management, Pearson Education Limited.
Dessler, G (2017) Human Resource Management (15thed) London Pearson
Fill, C. Turnball, S. (2016) Hello Marketing Communications (7th ed) Harlow Pearson Education ltd.
Hartley, H. (2009) Sport, Physical Recreation and the Law, Abingdon, Routledge
Robinson, L. Palmer, D. (2011) Managing Voluntary Sport Organisations, Abingdon, Routledge

Pre-requisites

None

Synopsis *

The module provides a structured opportunity to combine appropriate developmental work experience with academic study. The placement will provide the opportunity for students to develop appropriate vocational and applied academic knowledge. In order for the student to take this module they must secure a placement. The placement should be appropriate to the student's degree, experience and potential career aspirations. All placements will be subject to the module convenor's authorisation.

SS585 Injury Prevention and Return to Play

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Medway	Spring	H	15 (7.5)	100% Coursework	
1	Medway	Spring	H	15 (7.5)	100% Coursework with Pass/Fail Elements	

Availability

Not available as an elective module.

Contact Hours

Private Study: 117
Contact Hours: 33
Total: 150

Learning Outcomes

On successfully completing the module students will be able to:

1. Recognise and evaluate risk factors for injury in specific populations and critically evaluate the epidemiological patterns of injury in differing sports and exercise activities, and critically discuss theories and research surrounding techniques used in injury prevention.
2. Design and plan an injury prevention programme based on a needs analysis and the profile of the sport or exercise activity.
3. Critically discuss the theories of return to play and research surrounding techniques used in return to sport, and discuss the use of return-to-sport criteria and tests used to return athletes to sport.
4. Design and plan a return-to-play programme based on a needs analysis and the profile of the sport or exercise activity.
5. Demonstrate detailed knowledge and competence in the application of injury prevention and return to sport testing.

Method of Assessment

• Written Assignment (2,000 words) – 50%*
• Practical Assessment (30 minutes) – 50%*

* Both Assessments must be passed in order to complete the module.

Preliminary Reading

The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices. The most up to date reading list for each module can be found on the university's reading list pages.

Pre-requisites

None.

Synopsis *

This module will allow students to develop knowledge in epidemiological analysis of common injuries in different sports and exercise activities and risk factors for injury in specific populations. Students will develop an understanding of an athlete's needs analysis and profiles of specific sports and athletic populations. Students will apply this knowledge to design and implement screening and prevention programmes. Students will evaluate injury prevention and return to play programmes by using outcome measures. Students will learn about return to sport criteria for different components of fitness and rehabilitation. These will include strength, proprioception, speed, agility, Range of Movement (ROM), flexibility, cardiovascular. A range of both clinical/lab and field-based tests will be covered during the module. Specialised issues relating to specific sports and body regions will also be covered.