25 School of Biosciences

BI300		Introduction to Biochemistry				
Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	C	15 (7.5)	50% Coursework, 50% Exam	Carden Dr M
1	Canterbury	Autumn	C	15 (7.5)	60% Exam, 40% Coursework	Carden Dr M

Contact Hours

Total contact hours: 41
Private study hours: 109
Total study hours: 150

Learning Outcomes

On successfully completing the module students will be able to have:

A basic understanding of the composition, structure and function of the major groups of molecules in cells; nucleic acids, proteins, carbohydrates and lipids.
A basic understanding of the principles of purification, separation and characterisation of macromolecules.

Method of Assessment

Methods of Assessment:
Practical (20%) 3 hr
Test (20%) 40 min
Exam (60%) 2 hr

Preliminary Reading

Core text:
Nelson DL, Cox MM, Lehninger Principles of Biochemistry, 7th Edition, W.H. Freeman, 2017

Alternative core texts (buy only one of):
Berg JM, Stryer L, Tymoczko JL, Gatto GJ, Biochemistry, 8th Edition, Macmillan HE, 2015
Garrett RH, Grisham CM, Biochemistry, 6th (international) Edition, Cengage, 2017

Background reading:
Alberts B, Essential Cell Biology, 4th Edition, W W Norton (ex Garland Press), 2014
Taylor MR, Simon EJ, Reece JB, Dickey J, Hogan KA, Campbell NA, Campbell Biology: Concepts & Connections, 9th Edition, Pearson, 2018

Recommended Reading:
Catch-Up Reading: Crowe J, Bradshaw T, Chemistry for the Biosciences: The Essential Concepts, 3rd Edition, Oxford University Press, 2014

Pre-requisites

Before taking this module you must have taken A Level Biology or equivalent or BI305 Fundamental Human Biology

Synopsis *

This course will provide an introduction to biomolecules in living matter. The simplicity of the building blocks of macromolecules (amino acids, monosaccharides, fatty acids and purine and pyrimidine bases) will be contrasted with the enormous variety and adaptability that is obtained with the different macromolecules (proteins, carbohydrates, lipids and nucleic acids). The nature of the electronic and molecular structure of macromolecules and the role of non-covalent interactions in an aqueous environment will be highlighted. The unit will be delivered though lectures, formative practicals and related feedback sessions to ensure students fully understand what is expected of them. Short tests (formative assessment) will be used throughout the unit to test students' knowledge and monitor that the right material has been extracted from the lectures.

BI301 Enzymes and Introduction to Metabolism

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

Contact Hours

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

Learning Outcomes

The intended subject specific learning outcomes. On successfully completing the module students will be able to:
1. Analyse kinetic data and understand the principles of enzyme kinetics
2. Discuss the basic structure and functions of enzymes.
3. Perform enzyme assays to determine the kinetic properties of enzymes and to present the data in an appropriate manner.
4. Write down the key pathways of metabolism in animals and micro-organisms.
5. Describe mechanisms of control of these metabolic pathways.

The intended generic learning outcomes. On successfully completing the module students will be able to:
1. Be able to extract and interpret information on a basic level (knowledge management).
2. Be able to use basic computer skills for use in spreadsheet work and data retrieval.
3. Be able to analyse and evaluate data (problem solving) on a basic level.

Method of Assessment

Practical (30%) 1500 words maximum
MCQ test (20%) 30 questions, standard time allowance 40 minutes
Exam, 2hr (50%)

Preliminary Reading

Lehninger principles of biochemistry - Nelson DL, Cox MM. New York : W.H. Freeman and Company Sixth edition, International edition. 2013

Fundamentals of enzymology: the cell and molecular biology of catalytic proteins - Price NC, Stevens L. OUP Third edition 1999, repr. 2000

Pre-requisites

Before taking this module you must take BI300 Introduction to Biochemistry

Synopsis *

This course aims to introduce the 'workers' present in all cells – enzymes, and their role in the chemical reactions that make life possible.

The fundamental characteristics of enzymes will be discussed – that they are types of protein that act as catalysts to speed up reactions, or make unlikely reactions more likely. Methods for analysis of enzymic reactions will be introduced (enzyme kinetics). Control of enzyme activity, and enzyme inhibition will be discussed.

Following on from this the pathways of intermediary metabolism will be introduced. Enzymes catalyse many biochemical transformations in living cells, of which some of the most fundamental are those which capture energy from nutrients. Energy capture by the breakdown (catabolism) of complex molecules and the corresponding formation of NADH, NADPH, FADH2 and ATP will be described. The central roles of the tricarboxylic acid cycle and oxidative phosphorylation in aerobic metabolism will be detailed. The pathways used in animals for catabolism and biosynthesis (anabolism) of some carbohydrates and fat will be covered, as well as their control. Finally how humans adapt their metabolism to survive starvation will be discussed.

BI302 Molecular and Cellular Biology I

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

Contact Hours

Contact Hours 27
Self Study: 123
Total hours 150

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
Demonstrate a basic understanding of cell structure, organisation and division, cellular control by genetic material and the range of techniques used in investigating cell and molecular biology.
Demonstrate a basic understanding of, and practical competence, in research methods in cell and molecular biology and of problem-solving in cell and molecular biology assessed by the multiple choice question format.

Method of Assessment

Laboratory report – 1500-2000 words (20%)
In course test (MCQ) – 40 minutes (20%)
2hr Examination 60%

Preliminary Reading

Alberts B, et al. Essential Cell Biology, 4th Edition, Garland Science Pub., 2013 ISBN: 9780815344551

Pre-requisites

It is required that student's have A level Biology or equivalent or BI305 Fundamental Human Biology

Synopsis *

This module addresses key themes and experimental techniques in molecular and cellular illustrated by examples from a range of microbes animals and plants . It covers basic cell structure, and organisation including organelles and their functions, cytoskeleton, cell cycle control and cell division. The control of all living processes by genetic mechanisms is introduced and an opportunity to handle and manipulate genetic material provided in the laboratory. Monitoring of students' knowledge and progress will be provided by a multi-choice test and the laboratory report, with feedback.

Functional Geography of Cells: Introduction to cell organisation, variety and cell membranes. Molecular traffic in cells. Organelles involved in energy and metabolism. Eukaryotic cell cycle. Chromosome structure & cell division. Meiosis and recombination. Cytoskeleton.

Molecular biology: The structure and function of genetic material. Chromosomes, chromatin structure, mutations, DNA replication, DNA repair and recombination, Basic mechanisms of transcription, mRNA processing and translation.

Techniques in molecular and cellular biology: Methods in cell Biology - light and electron microscopy; cell culture, fractionation and protein isolation/electrophoresis; antibodies, radiolabelling. Gene Cloning – vectors, enzymes, ligation, transformation, screening; hybridisation, probes and blots, PCR, DNA sequencing. Applications of recombinant DNA technology.

Laboratory: PCR amplification of DNA and gel analysis.

BI305 Fundamental Human Biology

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

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 have fundamental knowledge and understanding of:
The components and organisation of cells.
How cells divide and differentiate.
The major physiological systems of the body – musculoskeletal, immune, digestive, excretory, nervous, endocrine.

The intended generic learning outcomes. On successfully completing the module students will be able to have a knowledge and understanding of:
Written communication
Recall and synthesis of information under time constraints

Method of Assessment

IC Test (20%)
IC Test (20%)

Exam (60%), 2 hours

Preliminary Reading

Human Biology by S.S. Mader, McGraw-Hill. Recent editions suitable; latest is 13th edition (2013)

Synopsis *

Cell structure and function: cell organelles; cytoskeleton; DNA/RNA structure; introduction to transcription and translation; introduction to disorders of cells and tissues.

Cell division: mitosis; meiosis; mechanisms of creating genetic variation.

Cell differentiation and body tissues: tissue types; extracellular matrix; cell junctions.

Organ systems of the body including:
Musculoskeletal system: muscle types; mechanism of skeletal muscle contraction; structure, development and maintenance of bone; types of joints.
Circulatory system: overview of circulation; composition of blood; cells of blood.
Immune system: infectious agents; lymphatic system; innate and acquired defences.
Digestive system: digestive tract and accessory organs; types of nutrients; major digestive enzymes; absorption and assimilation.
Urinary system and excretion: kidney and urinary tract; urine formation; functions in waste removal, homeostasis.
Endocrine and Nervous systems: concept of homeostatic loops; endocrine glands and hormones; organization of nervous system; generation and conduction of a nerve impulse; synapses and neurotransmitters; comparison of neural and hormonal signalling.

BI307 Human Physiology and Disease

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

Contact Hours

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

Learning Outcomes

The intended subject specific learning outcomes. On successful completion of this module students will:
1. Be able to describe the main physiological systems of the body and the basic anatomical structure and histology of the principal organs in these systems.
2. Understand the role of the main physiological systems in the maintenance of whole body homeostasis.
3. Be able to describe the consequences of alteration of normal physiological states and the evolution of disease.

The intended generic learning outcomes:
1. To be able to extract and interpret information at a first year undergraduate level.
2. Acquire skills in written communication.

Method of Assessment

Practical Report (20%)
IC Test (20%)
Examination (60%), 2 hours

Preliminary Reading

Human Physiology-An Integrated Approach (7th edition, 2016) by Silverthorn, D. Published by Pearson

Pre-requisites

It is a requirement for taking this module that students have taken an A Level Biology or equivalent or BI305 Fundamental Human Biology

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:

Cells and tissues
Membrane dynamics
Cell communication and homeostasis
Introduction to the nervous system
The cardiovascular system
The respiratory system
The immune system and inflammation
Blood cells and clotting
The Urinary system
The digestive system, liver and pancreas

BI308 Skills for Bioscientists

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

Contact Hours

Total contact hours: 39
Private study hours: 111
Total study hours: 150

Learning Outcomes

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

Skills in the analysis and presentation of information relevant to biosciences.
Understanding of fundamental scientific concepts of use in biosciences, both theoretically and practically.
Understanding and application of the principles of concentration and molarity, pH, spectroscopy, reaction kinetics and statistics.

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

The ability to extract and interpret information on a basic level.
Data analysis and evaluation.
The ability to use basic computing skills in data analysis, spreadsheet work and data retrieval.

Method of Assessment

Practical (20%)
Assignment 1 (15%)
Assignment 2 (15%)
Examination, 2 hr (50%)

Preliminary Reading

Practical Skills in Biomolecular Science, Paperback 5th ed (2016) by Reed, Weyers, Jones, Pearson, ISBN-10: 1292100737

Pre-requisites

None

Synopsis *

Subject-based and communication skills are relevant to all the bioscience courses. This module allows you to become familiar with practical skills, the analysis and presentation of biological data and introduces some basic mathematical and statistical skills as applied to biological problems. It also introduces you to the computer network and its applications and covers essential skills such as note-taking and essay writing.

BI321 Biological Chemistry A

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	C	15 (7.5)	100% Coursework	Xue Dr Wei-Feng

Availability

BI321 is a module for Biology students without A2 Chemistry at grades A-C (or equivalent). If you have A2 Chemistry you are required to attend BI3210.
N.B. Students with A2 Chemistry or equivalent below grade C are required to attend BI321.

Contact Hours

Phase 1+2
Total contact hours: 35
Private study hours: 115
Total study hours: 150

Learning Outcomes

The intended subject specific learning outcomes.
On successful completion of this module students will have a knowledge and understanding of:

Fundamental concepts of atoms, molecules, states of matter, basic valences, bonding and molecular interactions, basic organic compounds, shapes and basic isomerism and reactivity and chemical and the relevance of these concepts toward biomedical science.

The molecular basis of the thermodynamics of chemical and biochemical reactions, an understanding of equilibria and an appreciation of detailed molecular bonding and equilibria applied to biological systems.

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

Understanding and knowledge of problem solving, especially numerical and chemical methods.

Method of Assessment

BI321
Assignment (20%): Phase 1 test with 20 MCQ
Assignment (20%): Phase 2 test with 20 MCQ and 1 Problem Question
Coursework (30%): Phase 1 Coursework Problem question
Coursework (30%): Phase 2 Coursework Problem question

Preliminary Reading

Crowe and Bradshaw. Chemistry for the Biosciences (3rd Ed.). The Essential Concepts. (OUP)

Burrows, Holman, Parsons, Pilling and Price. Chemistry3: Introducing Organic, Inorganic and Physical Chemistry (3rd Ed.). (OUP)

Pre-requisites

None

Synopsis *

Students without A2 Chemistry (equivalent) on entry take Phases 1+2.
N.B. Students with A2 Chemistry or equivalent below grade C will follow Phases 1+2.

Phase 1: Autumn Term (5 lectures, 6 x 2 hr Workshops)
Basic chemical concepts for biology will be taught and applied through examples in a workshop atmosphere. The five workshop topics covered are: (i) Atoms and states of matter (ii) valence and bonding (iii) basic organic chemistry for biologists (iv) molecular shapes and isomerism in biology and (iv) chemical reactivity and chemical equations.
Assessment feedback of basic chemistry (1 session/lecture)

Phase 2: Autumn Term (9 lectures, 2 x 2 hr Workshop, 3 extra support lectures)
Chemical and biochemical thermodynamics. Topics covered are: (i) energetic and work, (ii) enthalpy, entropy and the laws of thermodynamics (iii) Gibbs free energy, equilibrium and spontaneous reactions, (iv) Chemical and biochemical equilibrium (including activity versus concentration and Le Chatelier's principle). The two hour workshop is designed to be delivered as small group sessions to cover the applications and practice of thermodynamics concepts.
Chemistry applied to biological concepts: bonding, valence, hybridisation as well as biological applied thermodynamic process (biomolecular association/dissociation).
Assessment feedback (1 session/lecture)

BI3210 Biological Chemistry A

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	C	15 (7.5)	50% Coursework, 50% Exam	Xue Dr Wei-Feng

Availability

BI3210 is a module for Biology students with A2 Chemistry at grades A-C (or equivalent). If you do not have A2 Chemistry you are required to attend BI321.
N.B. Students with A2 Chemistry or equivalent below grade C are required to attend BI321.

Contact Hours

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

Learning Outcomes

The intended subject specific learning outcomes.
On successful completion of this module students will have understanding and knowledge of:

Fundamental concepts of atoms, molecules, states of matter, basic valences, bonding and molecular interactions, basic organic compounds, shapes and basic isomerism and reactivity and chemical and the relevance of these concepts toward biomedical science.

The molecular basis of the thermodynamics of chemical and biochemical reactions, an understanding of equilibria and an appreciation of detailed molecular bonding and equilibria applied to biological systems.

Fundamental concepts of organic chemistry related to biological systems including carbon functional group chemistry (alkanes, alkyl halides, alkenes, alkynes, aromatics, heterocyclics and carbonyl compounds), bioorganic chemistry including the role of chemistry to understand biochemical processes

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

Understanding and knowledge of problem solving, especially numerical and chemical methods.

Method of Assessment

BI3210
Assignment (20%): Phase 2 test with 20 MCQ and 1 Problem Question
Assignment (30%): Phase 2 Coursework Problem question
Examination (50%): 30 MCQ and 1 Problem Question from choice of 3

Preliminary Reading

Crowe and Bradshaw. Chemistry for the Biosciences (3rd Ed.). The Essential Concepts. (OUP)

Burrows, Holman, Parsons, Pilling and Price. Chemistry3: Introducing Organic, Inorganic and Physical Chemistry (3rd Ed.). (OUP)

Pre-requisites

None

Synopsis *

Students with A2 Chemistry (equivalent) on entry take Phases 2+3.

Biology students with A2 Chemistry (or equivalent) will obtain additional chemical concepts (Phase 3) as their chemistry qualification at A2 will already furnish them with concepts from Phase 1. All students will participate in the core section: Phase 2.

Phases 2+3 students will use the Phase 1 coursework test as a formative assessment to recognise their required chemical knowledgebase as obtained at A2 level. This provides an opportunity to identify students requiring additional support.
This module links to Biological Chemistry B with identically designed phases (1, 2 and 3) to maximise teaching efficiency across all programs in the School of Biosciences.

Phase 2: Autumn Term (9 lectures, 2 x 2 hr Workshop, 3 extra support lectures)
Chemical and biochemical thermodynamics. Topics covered are: (i) energetic and work, (ii) enthalpy, entropy and the laws of thermodynamics (iii) Gibbs free energy, equilibrium and spontaneous reactions, (iv) Chemical and biochemical equilibrium (including activity versus concentration and Le Chatelier's principle). The two hour workshop is designed to be delivered as small group sessions to cover the applications and practice of thermodynamics concepts.
Chemistry applied to biological concepts: bonding, valence, hybridisation as well as biological applied thermodynamic process (biomolecular association/dissociation).
Assessment feedback (1 session/lecture)

Phase 3: Spring Term (17 lectures, 2 x 2 hr workshop)
Fundamental organic chemistry with biological examples. Topics covered: (i) Introduction and basic functional chemistry, (ii) Isomerism and stereochemistry, (iii) Reaction mechanisms, (iv) Alkanes/alkyl halides/alkenes/alkynes, (v) Aromatic compounds, (vi) Heterocyclic compounds, (vii) Amines and alcohols (viii) Carbonyl compounds and carboxylic acids and (ix) Biological inorganic chemistry. The two hour workshop is designed to be delivered as small group sessions to cover the applications of reaction mechanisms and reaction schemes.

BI322 Biological Chemistry B

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	C	30 (15)	50% Coursework, 50% Exam	Xue Dr Wei-Feng

Availability

BI322 is a module for Biochemistry and Biomedical Science students without A2 Chemistry at grades A-C (or equivalent). If you have A2 Chemistry you are required to attend BI3220.
N.B. Students with A2 Chemistry or equivalent below grade C are required to attend BI322.

Contact Hours

Total contact hours: 56
Private study hours: 244
Total study hours: 300

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to have a knowledge and understanding of:

Fundamental concepts of atoms, molecules, states of matter, basic valences, bonding and molecular interactions, basic organic compounds, shapes and basic isomerism and reactivity and chemical and the relevance of these concepts toward biomedical science. (Phase 1)

The molecular basis of the thermodynamics of chemical and biochemical reactions, an understanding of equilibria and an appreciation of detailed molecular bonding and equilibria applied to biological systems. (Phase 2)

Fundamental concepts of organic chemistry related to biological systems including carbon functional group chemistry (alkanes, alkyl halides, alkenes, alkynes, aromatics, heterocyclics and carbonyl compounds), bioinorganic chemistry including the role of chemistry to understand biochemical processes. (Phase 3)

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

Understanding and knowledge of problem solving, especially numerical and chemical methods.

Method of Assessment

Coursework 50% consisting of:
Assignment (20%): Phase 1 test with 20 MCQ
Assignment (20%): Phase 2 test with 20 MCQ and 1 Problem Question
Coursework (30%): Phase 1 Coursework Problem question
Coursework (30%): Phase 2 Coursework Problem question

Exam (50%) 30 MCQ and 1 Problem Question from choice of 3

Preliminary Reading

Phase 1+2: Crowe and Bradshaw. Chemistry for the Biosciences (3rd Ed.). The essential concepts. (OUP)

Phase 2+3: Burrows, Holman, Parsons, Pilling and Price. Chemistry3: Introducing Organic, Inorganic and Physical Chemistry (3rd Ed.). (OUP)

Pre-requisites

None

Synopsis *

Students without A2 Chemistry (equivalent) on entry take Phases 1+2+3
N.B. Students with A2 Chemistry or equivalent below grade C will follow Phases 1+2+3

This approach allows fundamental concepts (Phase 1) to be taught to non-A2 Chemistry students. All students will participate in the core section: Phase 2.

This module links to Biological Chemistry A with identically designed phases (1, 2 and 3) to maximise teaching efficiency across all programs in the School of Biosciences.

Phase 1: Autumn Term (5 lectures, 6 x 2 hr Workshops)
Basic chemical concepts for biology will be taught and applied through examples in a workshop atmosphere. The five workshop topics covered are: (i) Atoms and states of matter (ii) valence and bonding (iii) basic organic chemistry for biologists (iv) molecular shapes and isomerism in biology and (iv) chemical reactivity and chemical equations.
Assessment feedback of basic chemistry (1 session/lecture)

Phase 2: Autumn Term (9 lectures, 2 x 2 hr Workshop, 3 extra support lectures)
Chemical and biochemical thermodynamics. Topics covered are: (i) energetic and work, (ii) enthalpy, entropy and the laws of thermodynamics (iii) Gibbs free energy, equilibrium and spontaneous reactions, (iv) Chemical and biochemical equilibrium (including activity versus concentration and Le Chatelier's principle). The two hour workshop is designed to be delivered as small group sessions to cover the applications and practice of thermodynamics concepts.
Chemistry applied to biological concepts: bonding, valence, hybridisation as well as biological applied thermodynamic process (biomolecular association/dissociation).
Assessment feedback (1 session/lecture)

Phase 3: Spring Term (17 lectures, 2 x 2 hr workshop)
Fundamental organic chemistry with biological examples. Topics covered: (i) Introduction and basic functional chemistry, (ii) Isomerism and stereochemistry, (iii) Reaction mechanisms, (iv) Alkanes/alkyl halides/alkenes/alkynes, (v) Aromatic compounds, (vi) Heterocyclic compounds, (vii) Amines and alcohols (viii) Carbonyl compounds and carboxylic acids and (ix) Biological inorganic chemistry. The two workshops is designed to be delivered as small group sessions to cover the applications of reaction mechanisms and reaction schemes.

BI3220 Biological Chemistry B

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	C	30 (15)	50% Coursework, 50% Exam	Xue Dr Wei-Feng

Availability

BI3220 is a module for Biochemistry and Biomedical Science students with A2 Chemistry at grades A-C (or equivalent). If you do not have A2 Chemistry you are required to attend BI322.
N.B. Students with A2 Chemistry or equivalent below grade C are required to attend BI322.

Contact Hours

Total contact hours: 50
Private study hours: 250
Total study hours: 300

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 molecular basis of the thermodynamics of chemical and biochemical reactions, an understanding of equilibria and an appreciation of detailed molecular bonding and equilibria applied to biological systems. (Phase 2)

Fundamental concepts of organic chemistry related to biological systems including carbon functional group chemistry (alkanes, alkyl halides, alkenes, alkynes, aromatics, heterocyclics and carbonyl compounds), bioinorganic chemistry including the role of chemistry to understand biochemical processes. (Phase 3)

Analytical spectroscopy and Chemical Biology. The use of spin-resonance spectroscopies in biology, amino acid, protein and enzyme chemistry and chemical biology concepts including metabolic function of globins, sugars, phosphates. (Phase 4)

Method of Assessment

Assignment (10%): Phase 2 test with 20 MCQ and 1 Problem Question
Assignment (15%): Phase 2 Coursework Problem question
Coursework (25%): Phase 4 Coursework Problem Questions

Exam (50%) 30 MCQ and 1 Problem Question from choice of 3

Preliminary Reading

Phase 2: Crowe and Bradshaw. Chemistry for the Biosciences (3rd Ed.). The essential concepts. (OUP)

Phase 2+3: Burrows, Holman, Parsons, Pilling and Price. Chemistry3: Introducing Organic, Inorganic and Physical Chemistry (3rd Ed.). (OUP)

Phase 4: Dobson, Gerrard and Pratt. Foundations of Chemical Biology. (OUP Primer)

Pre-requisites

None

Synopsis *

Students with A2 Chemistry (equivalent) on entry take Phases 2+3+4

Biology students with A2 Chemistry (or equivalent) will obtain additional chemical concepts (Phase 4) as their chemistry qualification at A2 will already furnish them with concepts from Phase 1. All students will participate in the core section: Phase 2.

Phases 2+3+4 students will use the Phase 1 coursework test as a formative assessment to recognise their required chemical knowledgebase as obtained at A2 level. This provides an opportunity to identify students requiring additional support.

This module links to Biological Chemistry A with identically designed phases (1, 2 and 3) to maximise teaching efficiency across all programs in the School of Biosciences.

Phase 2: Autumn Term (9 lectures, 2 x 2 hr Workshop, 3 extra support lectures)
Chemical and biochemical thermodynamics. Topics covered are: (i) energetic and work, (ii) enthalpy, entropy and the laws of thermodynamics (iii) Gibbs free energy, equilibrium and spontaneous reactions, (iv) Chemical and biochemical equilibrium (including activity versus concentration and Le Chatelier's principle). The two hour workshop is designed to be delivered as small group sessions to cover the applications and practice of thermodynamics concepts.
Chemistry applied to biological concepts: bonding, valence, hybridisation as well as biological applied thermodynamic process (biomolecular association/dissociation).
Assessment feedback (1 session/lecture)

Phase 3: Spring Term (17 lectures, 2 x 2 hr workshop)
Fundamental organic chemistry with biological examples. Topics covered: (i) Introduction and basic functional chemistry, (ii) Isomerism and stereochemistry, (iii) Reaction mechanisms, (iv) Alkanes/alkyl halides/alkenes/alkynes, (v) Aromatic compounds, (vi) Heterocyclic compounds, (vii) Amines and alcohols (viii) Carbonyl compounds and carboxylic acids and (ix) Biological inorganic chemistry. The two workshops is designed to be delivered as small group sessions to cover the applications of reaction mechanisms and reaction schemes.

Phase 4: Spring Term (8 lectures, 2 x 1 hr workshop)

BI323 Diversity of Living Organisms

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Spring	C	15 (7.5)	50% Coursework, 50% Exam	Mansfield Dr F

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 have:

An appreciation of the diversity of microbial life (bacteria, fungi unicellular and simple multicellular eukaryotes).
An understanding of plant structural and reproductive diversity and the colonisation of the land by plants.
An understanding that animals are multicellular heterotrophic eukaryotes with tissues that develop from embryonic layers.
An understanding of basic concepts in ecology and the conservation of biodiversity.
The ability to safely handle and conduct experiments on a range of organisms under defined laboratory conditions.

Method of Assessment

Practical (25%)
Practical (25%)
Examination (50%), 2 hours

Preliminary Reading

Biology: A Global Approach. Campbell, N.A., Reece, J.B., Urry, L., Wasserman, S.A., Minorsky, P.V. and Jackson, R.B. Global edition. 10th edition. 2015, Pearson

Pre-requisites

None

Synopsis *

The aim of this module is to introduce the diversity of life, evolution and development of body form in a wide variety of organisms, including prokaryotes, animals and plants.

BI324 Genetics and Evolution

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

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:

The ability to predict outcomes in monohybrid and dihybrid crosses using Mendelian genetics.
An understanding of patterns of inheritance that do not obey Mendelian Principles.
The ability to analyse pedigrees and predict the inheritance of human genetic disease.
An understanding of DNA mutation and of horizontal gene transfer and their role in evolution.
An understanding of Darwin's observations and the role of genetics in speciation and evolution.
An ability to quantify the distribution of genes in populations.

The intended generic learning outcomes.
On successfully completing the module students will be able to have a knowledge and understanding of:

Retrieval and interpretation of information.
Experimentation, data acquisition, analysis and presentation.
Computational analysis.

Method of Assessment

Lab report (20%)
Test (20%)
Exam (60%), 2 hours

Preliminary Reading

Campbell Biology Reece, J., Urry, L. Cain, M., Wasserman, S., Minorsky, P. & Jackson, R. 10th edition

Synopsis *

This module is an introduction to Mendelian genetics and also includes human pedigrees, quantitative genetics, and mechanisms of evolution.

CH308 Molecules Matter & Energy

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	C	15 (7.5)	60% Exam, 40% Coursework	Clark Dr E
1	Canterbury	Whole Year	C	15 (7.5)	70% Exam, 30% Coursework	Clark Dr E

Availability

This is not available as a wild module.

Contact Hours

Lectures 22h provide an introduction to the basic concepts of chemistry including: atomic structure; molecular structure and bonding; properties of gases, liquids and solids; and thermodynamics. The module provides corequisite and prerequisite material for level 4 and 5 modules in Forensic Science and Chemistry.

Learning Outcomes

Major aspects of chemical terminology, conventions and units.

The nature of electrons and the structures of atoms and molecules.

The characteristics of the states of matter and the theories used to describe them.

The principles of thermodynamics.

Demonstrate knowledge and understanding of essential facts, concepts, principles and theories.

Solve qualitative and quantitative problems.

Method of Assessment

4 coursework assessments: 26%, 2 tests 14%, examination: 60%

Preliminary Reading

Winter, Chemical Bonding. 2nd edn, OUP, 2016, ISBN: 9780198700951
Jones, Clemmet, Higton and Golding, Access to Chemistry. Royal Society of Chemistry, 1999. ISBN: 0854045643.
Chang and Thoman Jr, Physical Chemistry for the Chemical Sciences. University Science Books, US, 2014. ISBN: 1782620877
Atkins & de Paula, The Elements of Physical Chemistry, 6th edition. OUP, 2012. ISBN: 0199608113.

Pre-requisites

None.

Synopsis *

This module introduces and revises the basic concepts of chemistry that underpin our understanding of the stability of matter. This starts with introducing atomic and molecular structure, with a focus on understanding the electronics of bonding in the molecular compounds around us. You will then study the laws governing the behavior of gases and origins of other interactions that hold solids and liquids together, alongside describing some of their basic properties such as conductivity, viscosity, and the way in which ions behave in solution. In the final aspect of this module we cover the critical role thermodynamics plays in determining the stability of matter, including the fundamental laws of thermodynamics and the importance of equilibrium in reversible reactions.

CH309 Fundamental Organic Chemistry for Physical Scientists

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
3	Canterbury	Autumn	C	15 (7.5)	60% Exam, 40% Coursework	Holder Dr S

Availability

This is not available as a wild module.

Contact Hours

24 hours of Lectures,
10 hours of drop-in sessions/workshops,
2 hours revision session.

Learning Outcomes

Knowledge and understanding of core and foundation scientific physical and chemical concepts, terminology, theory, units and conventions to chemistry and forensic science.
Knowledge and understanding of areas of organic chemistry (organic functional groups, organic materials and compounds, synthetic pathways) as applied to chemistry and forensic science.
An ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to Chemistry and to apply such knowledge and understanding to the solution of qualitative and quantitative problems.
An ability to recognise and analyse novel problems and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data.
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 skills, including such aspects as correct use of units, significant figures, decimal places etc.
Information-retrieval skills, in relation to primary and secondary information sources, including information retrieval through on-line computer searches.
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.
Study skills needed for continuing professional development and professional employment.

Method of Assessment

Coursework: 40%; Examination: 60%.

Preliminary Reading

Compulsory reading:
McMurry, Fundamentals of Organic Chemistry, 7th Edition, 2011 (ISBN-10 1439049718).
Earlier editions entirely acceptable. It is expected and necessary that you read this textbook as an accompaniment to all lecture notes and coursework for CH309.

Recommended for all students but particularly Chemistry and Forensic Chemistry Students:
Solomons, Fryhle, Snyder, S. A, Organic Chemistry 11th Ed., 2013 (ISBN-13 9781118133576, 9781118323793).Earlier editions entirely acceptable.

Recommended for any students new to, or uncertain about, chemistry:
A V Jones, M Clemmet, A Higton, E Golding, Access to Chemistry, Royal Society of Chemistry, 1999 (ISBN 0 85404 564 3).

Pre-requisites

Co-requisite modules: CH308, CH314, as well as PS381 or CH382.

Synopsis *

This module reintroduces the basic concepts of organic chemistry that are vital in understanding pharmaceutical and biological substances. You will study the basics of the chemistry of carbon, the element critical to underpinning life, including its basic building blocks and functional groups. We also cover the mechanisms by which basic organic reactions including elimination, substitution and oxidation processes occur. This module concludes with studying aromatic compounds and chirality, which crucially influence how organic molecules interact within living systems.

CH314 Introduction to Biochemistry and Drug Chemistry

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

Availability

This is not available as a wild module.

Contact Hours

24 x 1hr lectures and 4 x 2hr drop-in sessions. This module is expected to occupy 150 total study hours, including contact hours.

Learning Outcomes

Knowledge and understanding:
Core and foundation scientific biological and chemical concepts, terminology, theory, units, conventions and methods in relation to the biochemical sciences.
Areas of chemistry including organic functional groups, medicinal chemistry, biochemistry and applications in drug chemistry.

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.

Transferable skills:
Generic skills needed for students to undertake further training of a professional nature.
Problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information.
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.
Study skills needed for continuing professional development and professional employment.

Method of Assessment

Examination 60%, coursework 40% (comprising 4 assignments).

Preliminary Reading

Core Text: An Introduction to Medicinal Chemistry, Patrick, Graham L, Oxford University Press 5th Edition, 2013 (ISBN 0199697396)

Recommended: McMurry/Simanek, Fundamentals of Organic Chemistry. 6th Edition, 2006 (ISBN 0495125903). 5th Edition is also acceptable.

Recommended for Biosciences Students: Wade, Organic Chemistry, International Edition 4th Edition, 1998 (ISBN 0-13-010339-X).

Recommended for Forensic Science & Chemistry Students: Solomons & Fryhle, Organic Chemistry 7th Edition, 1998 (ISBN 0-471-19095-0).

Recommended: Bruce Alberts, Essential cell biology, 2010.

Pre-requisites

None.

Synopsis *

Chemistry in context
Using an organic chemistry perspective, you will study the fundamentals of biochemistry, the chemistry of life, including enzyme reactions, protein chemistry, DNA, lipids and carbohydrates. These topics are underpinned by the role chemical phenomena such as thermodynamics and intermolecular interactions play in a biological context. We then explore the nature and discovery of drugs, how they work, and the potential effects of their misuse.

CH315 Disasters

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	C	15 (7.5)	100% Coursework	Berko Dr A

Availability

This is not available as a wild module.

Contact Hours

13 contact hours and 137 hours of private study. This module is expected to occupy 150 total study hours, including contact hours.

Learning Outcomes

Subject specific learning outcomes. On successfully completing the module students will have:

A knowledge and understanding of core and foundation scientific chemical, physical and biological concepts, terminology, theory, units, conventions, and laboratory practice and methods in relation to the chemical sciences.
The ability to recognise and analyse problems and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data.
The ability to use computational methods for the practical application of theory and to use information technology and data-processing skills to search for, assess and interpret chemical information and data.
Skills in essay writing and presenting scientific material and arguments clearly and correctly, in writing and orally, to a range of audiences. The ability to communicate complex scientific argument to a lay audience.
The ability to collate, interpret and explain the significance and underlying theory of experimental data, including an assessment of limits of accuracy.

Generic learning outcomes. On successfully completing the module students will have:
Communication skills, covering both written and oral communication.
Generic skills needed for students to undertake further training of a professional nature.
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.
Interpersonal skills, relating to the ability to interact with other people and to engage in team working within a professional environment.
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.
Study skills needed for continuing professional development and professional employment.

Method of Assessment

Coursework (100%), No exam.

Preliminary Reading

Limitations of Science; Sullivan, J.W.N. (1933)
Slide Rule; The Autobiography of an Engineer; Shute, N. (1956)
War and Peace; Tolstoy, L. (1993) (NB. Epilogue ONLY)

Pre-requisites

None

Synopsis *

Chemistry in context:

In this module, you will study particular cases in which disasters occur (for example, explosions, volcanic eruptions, exposure to chemical warfare agents and accidents in the chemical industry), either as a result of human participation or in the natural course of events. We will explore how science, and in particular chemistry, is integral to the understanding and mitigation of such events. You will then focus on an aspect particular disaster and give a short oral presentation on it alongside a written report and press release. Note: this module constitutes the writing component required by the Royal Society of Chemistry.

CH316 Computing Skills

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	C	15 (7.5)	100% Coursework	Kinnear Dr T

Availability

This is not available as a wild module.

Contact Hours

34 contact hours and 116 hours of private study. This module is expected to occupy 150 total study hours, including contact hours.

Learning Outcomes

Subject specific learning outcomes:
On successfully completing the module students will have:
A systematic understanding of how computers work according to human's instructions.
Knowledge and understanding of computing programme F90 and principles, and their application to diverse areas of applications.
An ability to solve problems in physics/mathematics/chemistry using appropriate mathematical tools. Ability to use computational methods for the practical application of theory and to use information technology and data-processing skills to search for, assess and interpret chemical information and data.
An ability to use mathematical techniques and analysis to model physical behaviour using computer programming.
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 using a computer.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning, and develop simple algorithms.
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 adapt and apply methodology above to solve advanced and unfamiliar problems found in computer programming.

Intended generic learning outcomes.
On successfully completing the module students will have:
Programming 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.
Personal and interpersonal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people within a professional environment. Including the ability to communicate and interact with professionals from other disciplines.
Problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information .Including the demonstration of self-direction and originality.
Information-retrieval skills, in relation to primary and secondary information sources, including information retrieval through on-line computer searches.

Method of Assessment

Coursework (100%), No exam.

Preliminary Reading

Introduction to Programming with Fortran: With Coverage of Fortran 90, 95, 2003, 2008, 77; Chivers, Ian & Sleightholme, Jane, (2012) ISBN 9780857292322. Copies in library and online
Programming in Fortran 90: A First Course for Engineers and Scientists; Smith, I., (1995) ISBN 0471941859

Pre-requisites

None

Synopsis *

Introduction to the concept of programming languages, and to Fortran 90 in particular.

Introduction to the UNIX operating system: including text editors, the directory system, basic utilities, the edit-compile-run cycle.
Introduction to Fortran 90, including the use of variables, constants, arrays and the different Fortran data types; iteration (do-loops) and conditional branching (if statements).

Modular design: subroutines and functions, the intrinsic functions.

Simple input/output, such as the use of format statements for reading and writing, File handling, including the Fortran open and close statements, practical read/write of data files. The handling of character variables.

Programming to solve physical/chemistry problems.

CH320 Chemical Reactions

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	C	15 (7.5)	60% Exam, 40% Coursework with Compulsory Numeric Elements	Corrias Prof A

Availability

This is not available as a wild module.

Contact Hours

30 lectures, 36 laboratory hours and 2 assignments. This module is expected to occupy 150 total study hours, including contact hours.

Learning Outcomes

Knowledge and understanding of:
Core and foundation scientific chemical concepts, terminology, theory and conventions.
Areas of chemistry including properties of chemical elements, organic functional groups, physiochemical principles and synthetic pathways.

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.

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 carrying out documented standard laboratory procedures involved in synthetic and analytical work in relation to organic and inorganic systems. Skills in observational and instrumental monitoring of physiochemical events and changes. The systematic and reliable documentation of the above. Operation of standard analytical instruments employed in the chemical sciences.
The ability to collate, interpret and explain the significance and underlying theory of experimental data, including an assessment of limits of accuracy.

Generic learning outcomes:
Generic skills needed for students to undertake further training of a professional nature.
Numeracy and computational skills, including such aspects as error analysis, order-of-magnitude estimations, correct use of units and modes of data presentation.
Study skills needed for continuing professional development and professional employment.

Method of Assessment

Examination 60% and coursework 40% (comprising of compulsory weekly online maths assessments 10%, 2 chemistry assignments 10%, and Lab reports 20%). Students must obtain an average of at least 40% in the weekly online maths assessments to pass module.

Preliminary Reading

P. Monk, Mathematics for Chemistry

P. Atkins, Elements of Physical Chemistry

J. Kotz, Chemistry and Chemical Reactivity

Pre-requisites

None.

Synopsis *

This module will introduce you to core scientific chemical concepts including chemical equations and stoichiometry, kinetics and activation energies for reactions in solutions and acid and base chemistry. You will learn the theoretical background and terminology needed to understand these core concepts, along with the mathematical skills required by a practicing chemist. Hands-on laboratory experimentation is a key component of this module, teaching you the basic methodology used for understanding the physical chemistry of reactions, with a particular focus on their kinetics and thermodynamics. As part of this you will be taught how to effectively use fundamental laboratory equipment and instrumentation (Lab component).

CH382 Chemical Skills

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	C	30 (15)	60% Coursework, 40% Exam	McCabe Dr E
1	Canterbury	Whole Year	C	30 (15)	60% Coursework, 40% Exam with Compulsory Numeric Elements	McCabe Dr E

Availability

This is not a wild module.

Contact Hours

36 lectures, 36 hrs of laboratory sessions, 10 hrs terminal sessions.
This module is expected to occupy 300 total study hours, including 82 contact hours.

Learning Outcomes

Specific learning outcomes:
The knowledge and skills base to allow progression to further studies in the areas of chemistry and forensic science, with a sense of enthusiasm for chemistry and its applications.
Acquired and developed key skills, concepts, theories and practice which underpin practical chemistry problem solving.
Acquired and developed necessary practical laboratory skills, problem-solving skills and work-related safety skills, including chemical handling, scientific data presentation and standard laboratory procedures.
Acquired skills in data presentation methods pertaining to scientific results dissemination.
The ability to recognise trends within groups and across periods of the periodic table and describe chemical and physical properties of elements within those groups.
Developed knowledge and skills in the identification of behavioural periodic and group trends of the elements.
The ability to explain, with the aid of diagrams and using software tools, typical structures of common compounds.
Developed numerical and mathematical skills, critical for the study of chemistry and forensic science.
Generic learning outcomes:
To develop transferable skills including information and communication technology.

Method of Assessment

60% coursework, testing all learning outcomes, and 40% written (unseen, compulsory pass element) exam on the Periodic table and inorganic chemistry.

Preliminary Reading

Burrows, Holman, Parsons, Pilling and Price, Chemistry3, Oxford University Press, 2009
Chang, Chemistry, McGraw-Hill, 1998
Monk, Mathematics for Chemistry, Oxford University Press, 2006
Saferstein, Criminalistics – an introduction to forensic science, Prentice Hall, 2001
Higher Education Academy Physical Sciences Center, Quantitative skills in Forensic Science: http://www.physsci.ltsn.ac.uk/Resources/DevelopmentProjectsReport.aspx?id=204
Langford, Dean, Reed, Holmes, Weyers, and Jones, Practical skills in forensic science, Pearson/Prentice Hall, 2005
Inorganic Chemistry, Shriver & Atkins, OUP 1999, ISBN: 978-019850331-8
Inorganic Chemistry, Housecroft & Sharpe, Prentice Hall 2001, ISBN: 978-058231080-3

Pre-requisites

CH308 (and appropriate A level qualifications or equivalent)

Synopsis *

In this module you will be introduced to the key concept of periodicity and how, through a deeper knowledge of the periodic table, chemists are able to understand and predict the chemical properties, reactivity and compounds formed by the elements. You will also be introduced to redox chemistry, which plays a key role in the reactivity of the elements and the forms in which they are found.

This module also has a significant focus on experimental chemistry. You will therefore complete a set of laboratory practicals, enabling you to develop the laboratory skills and knowledge to work safely in an experimental environment and carry out fundamental organic and analytical chemistry procedures, including basic spectroscopy. This will be supplemented by teaching you the essentials of laboratory safety awareness and the skills needed to write scientific reports, including ways to clearly present data arising from experiments. To enable you to achieve this you will learn, through examples of physical science applications, the basic mathematics required to understand, plot and analyse graphical information, including differentiation and integration. This will be supported by lessons in how to use simple computer programs for drawing molecular and crystal structures and carry out basic calculations on the energy levels of chemical systems (Lab component.)

PH020 Algebra and Arithmetic

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	F	15 (7.5)	70% Exam, 30% Coursework	
2	Canterbury	Autumn	F	15 (7.5)	70% Exam, 30% Coursework	Shepherd Dr C

Availability

This is not available as a wild module.

Contact Hours

36 hours of lectures; 8 hours of workshops.

Learning Outcomes

To understand mathematics in relation to arithmetic and other basic numerical manipulations.
To deal with the accuracy of numbers in terms of decimal places and significant figures.
To obtain a good understanding in the areas of logarithmic and exponential mathematics.
To Learn to solve a large of equations including linear, quadratic, simultaneous logarithmic and exponential.
To split complex fractions by the method of partial fractions.
To obtain a basic understanding of series and binomial expansions.
To lay a firm foundation in maths (in combination with similar modules) to facilitate entry into year 1 of maths-based degree programmes in the Faculty of Sciences.
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. 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.
Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact with other people.
Numeracy and computational skills, including such aspects as error analysis, order-of-magnitude estimations, correct use of units and modes of data presentation.
Generic skills needed for students to undertake further training of a professional nature.
Study skills needed for continuing professional development and professional employment.

Method of Assessment

Class Tests 30%; Final Examination 70%

Preliminary Reading

Core Text:
Maths: The Core Mathematics for A Level, by Bostock and Chandler, ISBN 0-85950306-2. Copies are in the library
Supplementary texts:
Foundations Maths by Croft and Davison, 2nd ed., pub. Addison-Wesley, ISBN 0-201-17804-4. Copies are in the library.
Foundation Mathematics, Stroud & Booth, (2009) ISBN 0230579078. Copies are in the library.

Pre-requisites

None.

Synopsis *

Arithmetic
Calculations
Significant figures
Standard form
Fractions
Simplification of fractions
Percentages and fractional changes
Indices
Logarithmic and exponential functions

Algebra
Basic rules (operations and indices).
Solving equations (substitution and order of operation).
Changing subject of a formula
Inverse operations
Rules of indices
Long division
Expansion and Factorisation
Quadratic equations
Solving linear and simultaneous equations
Partial fractions
Binomial Theorem

PH023 Motion & Mechanics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	F	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Spring	F	15 (7.5)	70% Exam, 30% Coursework	Mason Dr V

Availability

This is not available as a wild module.

Contact Hours

24 hours of lectures.

Learning Outcomes

Knowledge and understanding of:
Physical laws and principles relating to motion and mechanics (including the necessary mathematics), and their application to diverse areas of physics.

Intellectual skills:
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 use mathematical techniques and analysis to model physical behaviour.

Subject-specific skills:
An ability to present and interpret information graphically.

Transferable skills:
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. 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.
Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.
An ability to make use of appropriate texts, or other learning resources as part of managing their own learning.

Method of Assessment

Coursework including class tests and homework 30%; Final Examination 70%.

Preliminary Reading

Core Texts:
Physics For Scientists and Engineers, by P Tipler and G Mosca, pub. W. H. Freeman and Co, ISBN-10: 0-7167-8964-7

Supplementary texts:
Applied Mathematics I, by L. Bostock and S. Chandler, pub. Stanley Thornes Ltd., ISBN 0-85950-019-5. Copies are in the library.

Maths: The Core Mathematics for A Level, by Bostock and Chandler, ISBN 0-85950306-2. Copies are in the library.

Pre-requisites

None.

Synopsis *

Lectures:
Introduction; units and dimensions.
Dimensional analysis. Dynamics; distance, velocity and acceleration time graphs.

Newton's Laws of Motion applied to single objects.
Newton's Laws applied to coupled objects.
Friction.

Work; scalar product.
Work against gravity.
Power.
Energy; potential energy and kinetic energy.
Conservation of energy.

Linear momentum.
Conservation of linear momentum
Circular motion.
Rotational systems.
Moment of inertia.

Rotational forces.
Resolution of forces.
Triangle of forces; moments.
Force fields; gravitational, etc.
Potential energy in fields

PH025 Waves and Vibrations

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	F	15 (7.5)	70% Exam, 30% Coursework	Roch Dr G
1	Canterbury	Spring	F	15 (7.5)	70% Exam, 30% Coursework	

Availability

This is not available as a wild module.

Contact Hours

24 hours of lectures.

Learning Outcomes

Knowledge and understanding of:
Physical laws and principles, and their application to diverse areas of physics (this will include laws of motion, electromagnetism, wave phenomena and the properties of matter), with modules covering the necessary mathematics.

Intellectual skills:
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 use mathematical techniques and analysis to model physical behaviour.

Subject-specific skills:
An ability to present and interpret information graphically.
An ability to make use of appropriate texts, or other learning resources as part of managing their own learning.

Transferable skills:
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. 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.
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

30% coursework including class tests and homework; 70% final exam.

Preliminary Reading

Core text:
New Understanding Physics for Advanced Level 4th edition, by J. Breithaupt. (Copies of the 4th edition are in the library, + copies of earlier editions).

Background text:
Physics by J. Breithaupt (Copies of 2003 edition in the library).

Pre-requisites

None.

Synopsis *

Lectures
(i) Types of waves. Characteristics of a wave:- frequency, period, amplitude, wavelength and velocity. Introduction to transverse and longitudinal waves and polarisation. $c = f\lambda$
(ii) Properties of Waves. Qualitative description of the properties of waves; motion, reflection, refraction (Snell's law), dispersion, diffraction, interference, standing waves.
(iii) Sound Waves. Description of sound - loudness, noise, note, pitch, intensity, intensity level. Properties of sound - reflection, refraction, interference (interference pattern produced by two speakers), beats, resonance in a vibrating wire, including overtones/harmonics. Qualitative treatment of Doppler effect.
(iv) Electromagnetic (em) Waves. Electromagnetic spectrum. Qualitative treatment of em waves from different parts of the spectrum. Refraction of light - critical angle and optical fibres. Polarisation of light, microwaves and radio waves. Interference. Young's double slit experiment. The Michelson interferometer. Transmission diffraction grating - orders of diffraction, application in spectroscopy.
(v) Simple Harmonic Motion (SHM). Displacement, velocity and acceleration of a body undergoing S.H.M. Link between SHM. and circular motion. Force acting on a body undergoing SHM. Qualitative description of systems displaying SHM. Detailed description of pendulum and mass on a spring. Energy in SHM. General expression for SHM.
(vi) Damping and Forced Oscillations. Qualitative treatment of light, heavy and critical damping. Qualitative discussion of the concepts of natural frequency, resonance and the behaviour of vibratory systems driven by a periodic force.

PH026 Properties of Matter

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	F	15 (7.5)	70% Exam, 30% Coursework	
1	Canterbury	Spring	F	15 (7.5)	70% Exam, 30% Coursework	Roch Dr G

Availability

This is not available as a wild module.

Contact Hours

24 lectures.

Learning Outcomes

Knowledge and understanding of:
Physical laws and principles, and their application to diverse areas of physics (this will include laws of motion, electromagnetism, wave phenomena and the properties of matter), with modules covering the necessary mathematics.

Intellectual skills:
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 use mathematical techniques and analysis to model physical behaviour.

Subject-specific skills:
An ability to present and interpret information graphically.
An ability to make use of appropriate texts, or other learning resources as part of managing their own learning.

Transferable skills:
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. 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.
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

30% coursework including class tests and homework; 70% final exam.

Preliminary Reading

Core texts:
New Understanding Physics for Advanced Level 4th edition, by J. Breithaupt. (Copies of the 4th edition are in the library, + copies of earlier editions).

Background text:
Physics by J. Breithaupt (Copies of 2003 edition in the library).

Synopsis *

Lectures
(i) Simple model of nuclear atom. Atomic number and mass. The periodic table. The mole and Avogadro's number. Solids, liquids and gases. Interatomic forces. Excitation and ionization. The electron volt.
(ii) Spectra and energy levels. E = hf. Relation of spectra to transitions between energy levels. Bohr atom quantitatively. Photoelectric effect. Crystalline lattices. Amorphous materials. X-ray diffraction. Polymers and plastics.
(iii) Gases, liquids and solids. Pressure. Archimedes principle. Hydrostatics. Heat and temperature scales. Thermometers. Latent heat. Thermal expansion. Perfect gas laws.
(iv) Thermal equilibrium and temperature. Thermal conduction. Radiation laws. Kinetic theory of gases.
(v) Introduction to radioactivity.

PH027 Introductory Physics Laboratory and Communication Skills

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Whole Year	F	15 (7.5)	100% Coursework with Compulsory Numeric Elements	Roch Dr G

Availability

This is not available as a wild module.

Contact Hours

Lectures 3 hours; Laboratory sessions 27 hours.

Laboratory sessions 27 hours.

Learning Outcomes

Knowledge and understanding of physical laws and principles, and their application to diverse areas of physics (this will include laws of motion, electromagnetism, wave phenomena and the properties of matter), with modules covering the necessary mathematics.

B. Intellectual skills:
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.

C. Subject-specific skills:
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, or other learning resources as part of managing their own learning.

D. Transferable skills:
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. Numeracy is subsumed within this area.
Investigative skills in the context of independent investigation including the use of textbooks and other available literature, 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.
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

100% coursework:
8 laboratory reports (80%);
assignment on uncertainty analysis (10%); Powerpoint presentation (10%).

Preliminary Reading

Core texts:
New Understanding Physics for Advanced Level 4th edition, by J. Breithaupt. (Copies of the 4th edition are in the library, + copies of earlier editions).
L. Kirkup, Experimental Methods John Wiley & Sons, Australia, 1994
Supplementary texts:
Physics by J. Breithaupt (Copies of 2003 edition in the library).
J. R. Taylor, An Introduction to Error Analysis (Second Edition), University Science Books, US. 1997.
J. Topping, Errors of Observation and Their Treatment (Third Edition), Chapman and Hall, London, 1962

Pre-requisites

None.

Synopsis *

There will be laboratory sessions with eight experiments relating to both general skills and to the syllabus of the Physics lecture modules PH023, PH025 and PH026.
There will be lecture tutorials on:
 Introduction to the module
 Analysing experimental uncertainties
 Writing reports on laboratory work

PH302 Computing Skills

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

Availability

This is not available as a wild module.

Contact Hours

Workshops (34 hours).
Total study time 150 hrs (including private study time).

Learning Outcomes

A systematic understanding of how computers work according to human's instructions.
Knowledge and understanding of computing programme F90 and principles, and their application to diverse areas of applications.
An ability to solve problems in physics/mathematics/chemistry using appropriate mathematical tools. Ability to use computational methods for the practical application of theory and to use information technology and data-processing skills to search for, assess and interpret chemical information and data.
An ability to use mathematical techniques and analysis to model physical behaviour using computer programming.
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 using a computer.
An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning, and develop simple algorithms.
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 adapt and apply methodology above to solve advanced and unfamiliar problems found in computer programming.
Programming 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.
Personal and interpersonal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people within a professional environment. Including the ability to communicate and interact with professionals from other disciplines.
Problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information .Including the demonstration of self-direction and originality.
Information-retrieval skills, in relation to primary and secondary information sources, including information retrieval through on-line computer searches.

Method of Assessment

Coursework 100% including class tests and homework

Preliminary Reading

Introduction to Programming with Fortran: With Coverage of Fortran 90, 95, 2003, 2008, 77; Chivers, Ian & Sleightholme, Jane, (2012) ISBN 9780857292322. Copies in library and online.

Programming in Fortran 90: A First Course for Engineers and Scientists; Smith, I., (1995) ISBN 0471941859

Pre-requisites

None.

Synopsis *

Introduction to the concept of programming languages, and to Fortran 90 in particular.

Introduction to the UNIX operating system: including text editors, the directory system, basic utilities, the edit-compile-run cycle.

Introduction to Fortran 90, including the use of variables, constants, arrays and the different Fortran data types; iteration (do-loops) and conditional branching (if statements).

Modular design : subroutines and functions, the intrinsic functions.

Simple input/output, such as the use of format statements for reading and writing, File handling, including the Fortran open and close statements, practical read/write of data files. The handling of character variables.

Programming to solve physical/chemistry problems.

PH304 Introduction to Astronomy and Special Relativity

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
2	Canterbury	Autumn	C	15 (7.5)	80% Exam, 20% Coursework	Hughes Dr M (SPS)

Availability

This is not available as a wild module.

Contact Hours

Lectures (30 hours); workshop/revision session (3 hours).

Total study time 150 hrs (including private study time).

Learning Outcomes

Knowledge and understanding of physical laws and principles in Astrophysics (including Cosmology) and Space Science, and their application to diverse areas of physics.
An ability to identify relevant principles and laws when dealing with problems in Astrophysics (including Cosmology) and Space Science, and to make approximations necessary to obtain solutions.
An ability to solve problems in Astrophysics (including Cosmology) and Space Science using appropriate mathematical tools.
An ability to use mathematical techniques and analysis to model physical behaviour in Astrophysics (including Cosmology) and Space Science.
An ability to present and interpret information about Astrophysics (including Cosmology) and Space Science graphically.

An ability to make use of appropriate texts, research-based materials or other learning resources as part of managing their own learning.
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

Coursework 30% comprising at least one ICT (in-course test) and at least one piece of independent work involving problem solving. Final (written, unseen, length 2 hours) exam 70%.

Preliminary Reading

Physics (fifth edition), Tipler, P.S, Mosca, G., 2008
Introduction to Astronomy and Cosmology, Morison I., 2008
An introduction to Modern Astrophysics, Carrol and Ostlie, 2013
Recommended:
Introduction to Special Relativity, Rindler, W. 1991
Introduction to Planetary Science, Faure, G. & Mensing, T.M., 2008

Pre-requisites

UK Advanced Level Physics Examinations with a normal minimum attainment of a Grade C on the main Physics A - Level. Any generally accepted equivalent of this content and attainment is regarded as an acceptable prerequisite.
Co-requisites: PH321 Mechanics, PH322 Electricity and Light, PH323 Thermodynamics and Matter, PS370 Skills for Physicists.

Synopsis *

Introduction to Special Relativity:
Inadequacy of Galilean Transformation; Postulates of Relativity; Lorentz transformation; Time dilation, length contraction and simultaneity; Special relativity paradoxes; Invariant intervals; Momentum and energy in special relativity; Equivalence of mass and energy.

Introduction to Astronomy:
Astronomical coordinate systems and conversions; Positions and motions of stars; Timekeeping systems; Introduction to the distance scale.

Introduction to Astrophysics and Cosmology:
Stellar luminosity and magnitudes; Magnitude systems; Colour of stars; Stellar spectral classification; Evolution of stars, Hertzsprung-Russell diagram; Cosmological principle; Redshift; Hubble constant; Space expansion.

PH307 Disasters

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

Availability

This is not available as a wild module.

Contact Hours

11 lectures and 1 x 2hr presentation exercise.

Learning Outcomes

Core and foundation scientific chemical, physical and biological concepts, terminology, theory, units, conventions, and laboratory practice and methods in relation to the chemical sciences.
Ability to recognise and analyse problems and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data.
The ability to use computational methods for the practical application of theory and to use information technology and data-processing skills to search for, assess and interpret chemical information and data.
Skills in essay writing and presenting scientific material and arguments clearly and correctly, in writing and orally, to a range of audiences. The ability to communicate complex scientific argument to a lay audience.
The ability to collate, interpret and explain the significance and underlying theory of experimental data, including an assessment of limits of accuracy.
Communication skills, covering both written and oral communication.
Generic skills needed for students to undertake further training of a professional nature.
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.
Interpersonal skills, relating to the ability to interact with other people and to engage in team working within a professional environment.
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.
Study skills needed for continuing professional development and professional employment.

Method of Assessment

100% coursework consisting of: (1) Press release 20%; (2) Seminar performance/presentation 20%; (3) Essay 60%.

Preliminary Reading

Limitations of Science; Sullivan, J.W.N. (1933)
Slide Rule: The Autobiography of an Engineer; Shute, N. (1956)
War and Peace; Tolstoy, L. (1993) (NB. Epilogue ONLY)

Pre-requisites

None.

Synopsis *

Chemistry in context
In this module, you will study particular cases in which disasters occur (for example, explosions, volcanic eruptions, exposure to chemical warfare agents and accidents in the chemical industry), either as a result of human participation or in the natural course of events. We will explore how science, and in particular chemistry, is integral to the understanding and mitigation of such events. You will then focus on an aspect particular disaster and give a short oral presentation on it alongside a written report and press release. Note: this module constitutes the writing component required by the Royal Society of Chemistry.

PS021 Molecules and Analysis

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

Availability

This is not available as a wild module.

Contact Hours

55 lectures in 11 units of 5 lectures each, 24 hours of laboratory sessions.

Learning Outcomes

Acquire knowledge and understanding of a range of chemistry-based topics
Acquire experimental laboratory skills
Acquire problem-solving skills
Acquire data interpretation skills,
Be able to receive and respond to a variety of sources of information (e.g. textual, numerical, verbal, graphical).
Be able to solve problems by a variety of methods (especially numerical) including the use of computers.
Have self-management plus organisational skills and the capacity to support life-long learning.

Method of Assessment

Assessment of the module will be by coursework (40%) and end-of-year examination (60%).
The coursework will comprise the following components:
Laboratory work (20%)
Class examinations (20%)

Preliminary Reading

Core Text:
Matthews, Philip: "Advanced Chemistry", Cambridge University Press (1992); Foundation Books (2008) [UKC library shelfmark lrg QD 31.2 mat]
Burrows, Andy et al., "Chemistry3: Introducing inorganic, organic and physical chemistry", 2nd Edition, Oxford Press (2013) [UKC library shelfmark lrg QD 33.2 bur]

Pre-requisites

None.

Synopsis *

The mole; chemical equations; titrations; atoms and molecules; energy levels; acids and bases; orbitals; bonds; molecular shapes; spectra; bond energies, hydrogen bonding.

PS022 Chemical Reactivity

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	F	30 (15)	60% Exam, 40% Coursework	Berko Dr A

Availability

This is not available as a wild module.

Contact Hours

55 lectures in 11 units of 5 lectures, 28 hours of practicals.

Learning Outcomes

Acquire knowledge and understanding of a range of chemistry-based topics.
Acquire experimental laboratory skills.
Acquire problem-solving skills.
Acquire data interpretation skills.
Be able to receive and respond to a variety of sources of information (e.g. textual, numerical, verbal, graphical).
Be able to solve problems by a variety of methods (especially numerical) including the use of computers .
Have self-management plus organisational skills and the capacity to support life-long learning.

Method of Assessment

Assessment of the module will be by coursework (40%) and end-of-year examination (60%).
The coursework will comprise the following components:
Laboratory work (20%)
Class examinations (20%)

Preliminary Reading

Core Text:
Burrows, Andy et al., "Chemistry3: Introducing inorganic, organic and physical chemistry", Oxford Press (2009)
Recommended reading:
Matthews, Philip: "Advanced Chemistry", Cambridge University Press (1992).[UKC library shelfmark qQD 453.2]
Stoker, H. Stephen: 'General Organic and Biological Chemistry' Houghton Miffin Company (2004), ISBN 0-618-26597-X.

Pre-requisites

None.

Synopsis *

Lattice energy; polymorphism; chemical equilibrium; the Periodic Table; solubilities; transition metals; isomerism; organic chemicals; shapes of organic molecules; organic analysis; optical activity; basic reactions of organic compounds; organic problem-solving; reaction kinetics.

PS023 Properties of Matter

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	F	30 (15)	60% Exam, 40% Coursework	Berko Dr A

Availability

This is not available as a wild module.

Contact Hours

55 lectures in 11 units of 5 lectures each, 24 hours of laboratory sessions.

Learning Outcomes

Students will acquire knowledge and understanding of a range of chemistry-based topics, experimental laboratory skills, problem-solving and data interpretation skills, which are required for entry into Stage 1 of a Forensic Science degree course.
Students will be able to receive and respond to a variety of sources of information (e.g. textual, numerical, verbal, graphical). Problem solving by a variety of methods (especially numerical) including the use of computers. Have self-management plus organisational skills and the capacity to support life-long learning.

Method of Assessment

Assessment of the module will be by coursework (40%) and end-of-year examination (60%).
The coursework will comprise the following components:
Laboratory work (20%)
Class examinations (20%)

Preliminary Reading

Matthews, Philip, "Advanced Chemistry", Cambridge University Press (1992). [UKC library shelfmark qQD 453.2]
Jackson, Andrew R.W.and Jackson, Julie M., "Forensic Science", Pearson Prentice Hall, (2004). [UKC library shelfmark: HV 8073]
White, Peter (editor), "Crime Scene to Court: the essentials of Forensic Science", Royal Society of Chemistry, (1998, reprinted 1999). [UKC library shelfmark KB 290]
Core Text: Burrows, Andy et al., "Chemistry3: Introducing inorganic, organic and physical chemistry", Oxford Press (2009) [UKC library shelfmark q QD 33.2]

Pre-requisites

None.

Synopsis *

States of matter; radioactivity; real and ideal gases; water. main group inorganic chemistry; phase diagrams, ideal solutions; miscibility, electrochemistry, forensic science techniques.

PS301 Introduction to Forensic Science

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	C	15 (7.5)	100% Coursework	Green Mr R(PS)
1	Canterbury	Spring	C	15 (7.5)	75% Exam, 25% Coursework	Green Mr R(PS)

Availability

This is available as a wild module.

Contact Hours

28 hours of lectures.

Learning Outcomes

Knowledge and understanding of core and foundation scientific physical, biological, and chemical concepts, terminology, theory, units, conventions, and laboratory methods in relation to forensic science.
Areas of chemistry (including analytical chemistry, fires and explosions,) as applied to forensic analysis.
Areas of bioscience including cells, biochemistry, human DNA.
Numeracy (including data analysis and statistics), forensic investigation and interpretation (including image analysis, forensic archaeology, ballistics, interrogation, and the extraction, analysis, interpretation of physical evidence) and apply them to forensic examination and analysis.
Incident investigation, evidence recovery, preservation, and presentation as an expert witness within the judicial environment.
Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to forensic science and to apply such knowledge and understanding to the solution of qualitative and quantitative problems.
Ability to recognise and analyse novel problems involving forensic science and plan strategies for their solution by the evaluation, interpretation and synthesis of scientific information and data by a variety of computational methods.
Safe handling of firearms, ammunition, and propellants. Analysis of forensic evidence related to firearms, firearm discharge, and ballistic theory.
Evidence recovery, preservation, analysis, and presentation to professional standards.
Communication skills, covering both written and oral communication. Self-management and organisational skills with the capacity to support life-long learning.
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.

Method of Assessment

Examination (Length 2 hours) 75%; Coursework 25% including on-line assignments.

Preliminary Reading

Crime Scene to Court, the Essentials of Forensic Science, 3rd edition, ed. P. White. Royal Society of Chemistry, 2010. ISBN:1847558828.

Forensic Science, 3rd edition, A.R.W. Jackson & J. M. Jackson. Pearson, 2011. ISBN: 9780273738404.

Criminalistics, 10th edition, R. Saferstein. Prentice Hall, 2010. ISBN: 0132545799.

Pre-requisites

As well as preparing forensic science students for specialist forensic modules in Stages 2 and 3, the module is designed to be accessible to Social Sciences and Humanities students with an intelligent interest in science. For these students, no physical/natural science qualifications at A-level are necessary, but a C-grade or above in GCSE double science or equivalent is desirable.

Synopsis *

Forensic Science; Evidence and the Scene of the Crime
What is forensic science? Historical and legal background of forensic science – exchange principles and linkage theory. Forensic science in the U.K – inductive and deductive reasoning. Identification, characterisation, recovery and weighting of trace evidence types. Crime scene searching methodologies; the integrity and continuity of evidence. Introduction to laboratory testing dealing with glass, tool-mark, shoe-mark and tyre impressions. The management of scientific support at crime scenes. Procedures at crime scenes illustrated by reference to crimes of burglary, murder and sexual offences. Fingerprint history, classification, recovery and chemical enhancement of fingerprints. Blood pattern analysis supporting the advances in DNA techniques. Firearms classification, internal & external ballistics, trajectory, mass and velocity. Firearms injuries at crime scenes. Introduction to DNA analysis and the functioning of the National DNA Database. Sexual offence investigation and body fluid identification. Clinical indicators of death and murder scene investigation.
Drug Abuse, Alcohol and Forensic Toxicology
Drugs of abuse and their identification. Drugs, alcohol poisons and their metabolism. Toxicology and the role of the forensic toxicologist. Qualitative and quantitative laboratory analysis.
Document Examination:
Signature and handwriting identification. Paper, inks and printed documents. Damage characterisation.
Fires and Explosions:
Arson. Fire and combustion. Types of explosives and the nature of explosions. The crime scene investigation: sampling and laboratory analysis.

PS318 Skills for Forensic Scientists

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	C	15 (7.5)	100% Coursework with Compulsory Numeric Elements	Green Mr R(PS)

Availability

This is not available as a wild module.

Contact Hours

Lectures 29h; Laboratory classes 18h.

Learning Outcomes

Core and foundation scientific physical, biological, and terminology, units, conventions, in relation to forensic science.

Areas of bioscience including cells and human DNA.

Numeracy (including data analysis and statistics).

Incident investigation, evidence recovery, preservation.

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.

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-technology skills such as word-processing and spreadsheet use, data-logging and storage, Internet communication, etc.

Interpersonal skills, relating to the ability to interact with other people and to engage in team working within a legal or other professional environment.

Time-management and organisational skills, as evidenced by the ability to plan and implement efficient and effective modes of working.

Method of Assessment

The module will be assessed on the basis of 100% coursework: DNA Assignment (20%);
Quantitative Skills (30%) (Students must obtain an average of at least 40% in the maths assessments to pass the module);
Forensic Science practical work (30%) - compulsory element;
Law Assignment (20%).

Preliminary Reading

C. Adam, Essential Mathematics and Statistics for Forensic Science

Paul Monk, Mathematics for Chemistry

Richard Saferstein, Criminalistics - An Introduction to Forensic Science

Roderick Munday, Evidence

Goodwin, Linacre & Hadi, Forensic Genetics

Pre-requisites

None.

Synopsis *

Quantitative skills beginning with GCSE mathematics through to algebra, data analysis, graphical treatment of errors, logarithms, basic probability, trigonometry and applications in forensic science.
Incident scene assessment, management and mapping, including working in our new crime scene house and garden.
Induction to the English legal system and laws of evidence.
The structure and composition of DNA, genetic analysis and applications relevant to forensic science.

PS324 Introduction to Ballistics

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

Availability

This is not available as a wild module.

Contact Hours

20 hours of Ballistics lectures, 2 x 3hr laboratory classes, 1 x 2hr presentation session.

Learning Outcomes

Knowledge and understanding of:
Newtonian mechanics relating to the flight of projectiles.
Energy considerations in ballistics.
Weapon mechanisms.
Ammunition.
Overview of the main stages of ballistics (internal, intermediate, external and terminal).
The 1968 Firearms Act.
How ammunition and firearms fit into the UK firearms legislation.
Applications of forensic science to ballistics.

Generic learning outcomes:
Increasing of students' general mathematical abilities.
The application of mechanics to different scenarios.
The application of law to ballistics.
Development of practical skills in ballistics.
Writing of reports for different audiences.
Development of oral presentation skills.
Development of the skills required for higher level ballistics modules.
Development of research skills and the use of scientific literature.

Method of Assessment

Assessment is 100% by continual assessment consisting of 2 lab reports (20% of the module each), a presentation (20% of the module), and a 1100 word essay (40% of the module).

Preliminary Reading

Understanding Firearm Ballistics, R.A. Rinker. Mulberry Hs, USA. ISBN 0-9645598-4-6
Handbook of Firearms and Ballistics, Brian Heard, Wiley Blackwell. ISBN 0470694602
Small Arms, Derek Allsop & M Toomey, Brassey's (UK) Ltd. ISBN 1857532503

Pre-requisites

None.

Synopsis *

Mathematical Concepts for Impact Studies
Newton's laws of motion
Vectors
Energy considerations

Introduction to ballistics
Categories of weapons
Weapon mechanisms
Ammunition construction
Internal ballistics
External ballistics
Terminal ballistics

Overview of Forensic Ballistics
The 1968 Firearms Act (as amended)
Categorisation of firearms and ammunition
Shooting case studies

PS370 Skills for Physicists

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	C	15 (7.5)	100% Coursework	
1	Canterbury	Autumn	C	15 (7.5)	100% Coursework with Compulsory Numeric Elements	

Availability

This is not available as a wild module.

Contact Hours

14 hours of lectures, 30 laboratory hours.

Total study hours: 150.

Learning Outcomes

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 use mathematical techniques and analysis to model physical behaviour.
Subject-specific skills:
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.
Transferable skills:
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

100% coursework with must-pass components:
24% for non-lab components [Library Quiz, Prob. & Stats, Errors and Graphical Data Representation, Doing well in Tests, IT Skills]
Must-pass component: average mark of 40% required for the lab report component.
(The lab report component contributes a weight of 50% to the final module mark)
26% for other lab-related components [Lab dilligence, Keeping a well-organised lab book, Online lab assessments on Moodle, compulsory end of year presentation]

Preliminary Reading

J. Taylor "An Introduction to Error Analysis" Q182.3, 3 copies (Sausalito, California: University Science Books, 1997, ISBN 093570275X).
L. Kirkup "Experimental methods" Q182.3, 3 copies (John Wiley and Sons, 1994, ISBN 0471335797).
David C van Aken, William F Hosford, Reporting Results, 0521723485 (Cambridge University Press, 2008)

Pre-requisites

UK Advanced Level Physics Examinations with a normal minimum attainment of a
Grade C on the main Physics A - Level. Any generally accepted equivalent of this
content and attainment is regarded as an acceptable prerequisite.
Co-requisites: PH304 Astrophysics, Space Science and Cosmology, PH321 Mechanics, PH322 Electricity and Light, PH323 Thermodynamics and Matter.

Synopsis *

Standard Lectures
How Physical Sciences are taught at Kent.
Library use. Bibliographic database searches.
Error analysis and data presentation. Types of errors; combining errors; Normal distribution; Poisson distribution; graphs – linear and logarithmic.
Probability and Statistics. Probability distributions, laws of probability, permutations and combinations, mean and variance.
Academic integrity and report writing skills.

Laboratory experiments
A choice of experiments in weekly sessions. Some of the experiments require two consecutive sessions to complete.

Choice of (among others): Deduction of a law, Wind tunnel, Probability distributions, Geometrical optics on the magnetic board, Computer–aided study of electrical and electronic circuits, Heat engines, Waves, Firing projectiles with the model catapult, mechanical simulation of stabbing action, etc.

PS381 Chemical Skills For Forensic Scientists

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	C	30 (15)	100% Coursework with Compulsory Numeric Elements	McCabe Dr E

Availability

This is not available as a wild module.

Contact Hours

36 lectures, 36 hrs of laboratory sessions, 10 hrs terminal sessions.
This module is expected to occupy 300 total study hours, including 82 contact hours.

Learning Outcomes

Specific learning outcomes:
The knowledge and skills base to allow progression to further studies in the areas of chemistry and forensic science, with a sense of enthusiasm for chemistry and its applications.
Acquired and developed key skills, concepts, theories and practice which underpin practical chemistry problem solving.
Acquired and developed necessary practical laboratory skills, problem-solving skills and work-related safety skills, including chemical handling, scientific data presentation and standard laboratory procedures.
Acquired skills in data presentation methods pertaining to scientific results dissemination.
The ability to recognise trends within groups and across periods of the periodic table and describe chemical and physical properties of elements within those groups.
Developed knowledge and skills in the identification of behavioural periodic and group trends of the elements.
The ability to explain, with the aid of diagrams and using software tools, typical structures of common compounds.
Developed numerical and mathematical skills, critical for the study of chemistry and forensic science.
Generic learning outcomes:
Developed basic experimental and communication skills required for physical and forensic science.
Developed a transferable skills set including the use of information and communication technology.
Acquired knowledge and understanding of elementary practical physical chemistry.

Method of Assessment

100% coursework.

Preliminary Reading

Burrows, Holman, Parsons, Pilling and Price, Chemistry3, Oxford University Press, 2009

Chang, Chemistry, McGraw-Hill, 1998

Monk, Mathematics for Chemistry, Oxford University Press, 2006
Saferstein, Criminalistics – an introduction to forensic science, Prentice Hall, 2001

Higher Education Academy Physical Sciences Center, Quantitative skills in Forensic Science: http://www.physsci.ltsn.ac.uk/Resources/DevelopmentProjectsReport.aspx?id=204

Langford, Dean, Reed, Holmes, Weyers, and Jones, Practical skills in forensic science, Pearson/Prentice Hall, 2005.

Inorganic Chemistry, Shriver & Atkins, OUP 1999, ISBN: 978-019850331-8
Inorganic Chemistry, Housecroft & Sharpe, Prentice Hall 2001, ISBN: 978-058231080-3

Pre-requisites

CH308 (and appropriate A level qualifications or equivalent)

Synopsis *

Laboratory safety: lectures on laboratory safety including safe handling of chemicals, electrical supplies, solvents and gases both within and outside fume cupboards, safe disposal of chemicals, CoSHH and risk assessment, accident prevention.

Laboratory skills: the completion of a set of experiments in a lab environment within the safety structure as laid out by lab risk assessments. To include: fundamental organic chemistry methodology, chemical handling, use of equipment (including calibration and accuracy), infra-red spectroscopy, analytical chemistry and titrations, colorimetry, gravimetric analysis, solvent extraction.

Data presentation methods: the correct and succinct planning and preparation of scientific reports, correct referencing, data manipulation and presentation, literature searches and library catalogues, academic integrity and referencing styles.

Periodic table and inorganic chemistry: Periodic trends in the periodic table: chemical properties, reactivity and compounds across periods 1 and 2, introduction to diagonal relationships; hydrogen and its compounds; Group 1 – the alkali metals, their compounds and reactivity; Group 2 – the alkaline earth metals, their compounds and reactivity; introduction to redox chemistry; the p-block: Group 13 elements, their properties and reactivity, the inert pair effect, the chemistry of boron; Group 14 elements, properties, compounds and reactivities, carbon and its allotropes; Group 15: the chemistry of the pnictogens, nitrogen, phosphorus and its allotropes; Group 16: the chemistry of the chalcogens; Group 17: the chemistry of the halogens; extension to MO and VSEPR theory; introduction to groups 12 and 18.
Molecular graphics: use of MarvinSketch to represent and draw chemical structures and calculate molecular properties, using J-mol and J-ice to present molecular and crystal structures graphically, use of HULIS software to calculate energy levels from Hückel theory.

Maths for physical scientists: basic mathematics and functions used in physical sciences, curve sketching and plotting simple functions, differentiation and integration, examples of physical science applications including chemical reaction rates.

PS717 Modern Approaches to Incident Management

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
3	Canterbury	Whole Year	M	30 (15)	100% Coursework	Barker Dr R

Availability

This is not available as a wild module.

Contact Hours

 24 hours of lectures
• Table top major incident planning exercise
• Critical case evaluation and report
• Live Incident briefing, preparation, and execution
• Court report preparation and presentation

Learning Outcomes

Understand the processes involved with emergency management.
Imparting an understanding of how major incidents are managed at local, national, and international levels.
Develop skills in managing major incidents from a forensic perspective at local and national levels.
Management of finite resources in order to achieve set goals.
Understand evidential prioritisation in relation to major incidents
Develop the ability to manage personnel in live incidents.
Develop the ability to manage logistics in live and simulated incidents.
Management of evidence recovery, storage and analysis.
Understand the reporting requirements associated with major incidents.
Develop skills in the writing of such reports as evidential submissions.
Understand the challenges associated with presenting such reports at court under hostile cross examination.
Management of time, resources, and personnel.
Problem solving in real time incidents and in simulated exercises.
Ability to gather information and data from numerous sources and to use such information to synthesis a response to highly fluid forensic investigations.
Ability to interact with personnel in order to extract accurate information and to take command of a major incident.
Presentation skills to professional level.

Method of Assessment

Critical evaluation of a historic case study: 35%
Tabletop major incident planning exercise: 15%
Monitored real time management of a limited incident: 15%
Preparation of incident management report: 20%
Tribunal presentation of incident management report: 15%

Preliminary Reading

Core text: Introduction to Emergency Management, Haddow. 2008. ISBN: 978-0-7506-8514-6

Recommended reading:
Aircraft Safety, Kraues. 2003 ISBN: 0-07-140974-2
Maritime Safety: The Human Factors. Trafford. 2009. Book Guild Publishing ISBN-13: 978-1846243790
Homeland Security in the UK: Future Preparedness for Terrorist Attack since 9/11: Wilkinson.2007 ISBN-13: 978-0415383752
Blackstone's Counter-Terrorism Handbook: Stainforth. 2010 OUP: ISBN-13: 978- 0199597109
Derail: Why Trains Crash. Faith: 2000. Channel 4 Publishing: ISBN-13: 978-0752271651
Air Accident Investigation. Owen. 2001. ISBN: 1 85206 607 X
The Terrorism Reader: 4th Edition. Whittaker. 2012. ISBN. 978 0 415 68731 7

Pre-requisites

None.

Synopsis *

The module will cover incident management from a tactical/regional and national/strategic perspective using the four stage model: Identification, preparation, mitigation, and recovery.
A range of actual and potential incidents will be covered including air accidents, marine accidents, rail accidents, terrorist attacks, and industrial, nuclear and chemical incidents.
This will be achieved using lectures, critical evaluation of case studies, real time and simulated incident exercises using our new crime scene house and garden, and the preparation and presentation at court of incident command reports.
Students will be required to examine all aspects of scene and major incident management, disaster planning and related legislation. This will encompass emergency management and planning legislation, damage limitation, evacuation plans, logistical support, inter-agency operation and cooperation, personnel management, evidence prioritisation, preparing incident reports, and presenting such reports at court.

15 School of Computing

CO320		Introduction to Object-Oriented Programming				
Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	C	15 (7.5)	100% Coursework	Barnes Mr D
1	Canterbury	Autumn	C	15 (7.5)	100% Coursework with Pass/Fail Elements & Compulsory Numeric Elements	Barnes Mr D
1	Canterbury	Autumn	C	15 (7.5)	50% Coursework, 50% Exam	Barnes Mr D
1	Canterbury	Autumn	C	15 (7.5)	70% Exam, 30% Coursework	Barnes Mr D
1	Canterbury	Spring	C	15 (7.5)	100% Coursework	
1	Canterbury	Spring	C	15 (7.5)	100% Coursework with Pass/Fail Elements & Compulsory Numeric Elements	
1	Canterbury	Spring	C	15 (7.5)	50% Coursework, 50% Exam	
1	Canterbury	Spring	C	15 (7.5)	70% Exam, 30% Coursework	
1	Medway	Autumn	C	15 (7.5)	100% Coursework	He Dr Y
1	Medway	Autumn	C	15 (7.5)	50% Coursework, 50% Exam	He Dr Y

Contact Hours

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

Learning Outcomes

8. The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
8.1 Have gained the algebraic understanding and manipulation skills required for the mathematics that underpins computer science.
8.2 Have developed a knowledge and understanding of, and the ability to apply the mathematical principles and concepts behind topics that comprise the CS programmes.
8.3 Have developed formal reasoning skills that will be required elsewhere in the degree programmes in which this module is taken.
Whilst not being directly applicable to programme learning outcomes these learning outcomes are vital to students' ability to achieve the programme learning outcomes.

9. The intended generic learning outcomes.
On successfully completing the module students will be able to:
9.1 Have developed mathematical problem solving and analysis skills.
9.2 Have developed numeracy skills to understand and explain the quantitative dimensions of a problem (programme outcome D4).
9.3 Have exercised self-management of their own learning (programme outcome D5).
9.4 Have developed generic skills relating to computational thinking (programme outcome B7).

Method of Assessment

Canterbury

Coursework 100% :
Class definition (Programming) (15%)
Collections (Programming) (15%)
Inheritance (Programming) (20%)
Class exercises (Weekly class exercises) (20%)
Timed assessment (Programming) (30%)

Medway

Coursework 100% :
Class Exercises (Assessment) (10%)
Quiz (Assessment) (15%)
Writing and Using Classes (Assessment) (20%)
Collection and Testing (Assessment) (25%)
In-class Test (Test) (30%)

Preliminary Reading

Reading list (Indicative list, current at time of publication. Reading lists will be published annually)
"Objects first with Java – A practical introduction using BlueJ", David J. Barnes and Michael Kölling, Pearson Education, 2016, ISBN 978-1292159041.

Pre-requisites

None

Synopsis *

This module provides an introduction to object-oriented software development. Software pervades many aspects of most professional fields and sciences, and an understanding of the development of software applications is useful as a basis for many disciplines. This module covers the development of simple software systems. Students will gain an understanding of the software development process, and learn to design and implement applications in a popular object-oriented programming language. Fundamentals of classes and objects are introduced and key features of class descriptions: constructors, methods and fields. Method implementation through assignment, selection control structures, iterative control structures and other statements is introduced. Collection objects are also covered and the availability of library classes as building blocks. Throughout the course, the quality of class design and the need for a professional approach to software development is emphasised and forms part of the assessment criteria.

CO322 Foundations of Computing I

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Autumn	C	15 (7.5)	50% Coursework, 50% Exam	Carter Ms J
1	Canterbury	Autumn	C	15 (7.5)	70% Exam, 30% Coursework	Carter Ms J
1	Medway	Autumn	C	15 (7.5)	50% Coursework, 50% Exam	Li Dr C

Contact Hours

Total contact hours: 50
Private study hours: 100
Total study hours: 150

Learning Outcomes

Have gained the algebraic understanding and manipulation skills required for the mathematics that underpins computer science.
Have developed a knowledge and understanding of, and the ability to apply the mathematical principles and concepts behind topics that comprise the CS programmes.
Have developed formal reasoning skills that will be required elsewhere in the degree programmes in which this module is taken.
Whilst not being directly applicable to programme learning outcomes these learning outcomes are vital to students' ability to achieve the programme learning outcomes.

Method of Assessment

Main assessment methods
Canterbury
Coursework: 4 assessments taking 10 hours each (50%)
(Written) Algebra (10%)
(Written) Statistics (15%)
(Written) Proof (12.5%)
(Written) Set Theory (12.5%)

2 hour Examination (50%)

Medway
Coursework: 4 assessments taking 10 hours each (50%)
(Assessment) Algebra 10%)
(Assessment) Stats (15%)
(Assessment) Proof (12.5%)
(Assessment) Set Theory (12.5%)

2 hour Examination (50%)

Preliminary Reading

Clarke G & Cook D, A basic course in statistics, Hodder Arnold, 1998.
Croft & Davison, Foundation Maths, Prentice Hall, 2003.
Dean N, The Essence of Discrete mathematics, Prentice Hall.
Nissanke N, Introductory Logic and Sets for Computer Scientists, Addison Wesley.
Page SG, Mathematics: a second start, Ellis Horwood, 1986.

Pre-requisites

None

Synopsis *

Mathematical reasoning underpins many aspects of computer science and this module aims to provide the skills needed for other modules on the degree programme; we are not teaching mathematics for its own sake. Topics will include algebra, reasoning and proof, set theory, functions, statistics and computer arithmetic.

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	Wang Prof F
1	Medway	Autumn	C	15 (7.5)	80% Exam, 20% Coursework	Wang Prof F

Contact Hours

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

Learning Outcomes

Describe the purpose of, and the interaction between, the functional hardware and software components of a typical computer system.
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.
Appreciate the principles and technologies behind the Internet, including layered architectures, and how this can be used to deliver effective network services.
Describe how networks and other computer hardware interact with operating systems, and can be shared between different programs and computers.
Assess the likely environmental impact of basic decisions involving computer hardware.

Method of Assessment

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%

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.

CO325 Foundations of Computing II

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	C	15 (7.5)	50% Coursework, 50% Exam	Carter Ms J
1	Canterbury	Spring	C	15 (7.5)	70% Exam, 30% Coursework	Carter Ms J

Contact Hours

For those who have A level mathematics
Total contact hours: 30
Private study hours: 120
Total study hours: 150

For those who do not have A level mathematics
Total contact hours: 40
Private study hours: 110
Total study hours: 150

Learning Outcomes

Have developed a knowledge and understanding of, and the ability to apply the mathematical principles and concepts behind topics that comprise the CS programmes.
Have developed formal reasoning skills that will be required elsewhere in the degree programmes in which this module is taken.
Have basic understanding of Propositional and Predicate Logic: their syntax (connectives, quanitifiers) and their semantics (truth tables, logical equivalences).
Be able to write and evaluate expressions in Propositional and Predicate Logic.

Method of Assessment

Main assessment methods
2 hour Examination (50%)
Vectors (15%)
Logic (20%)
Probability (15%)

Preliminary Reading

Clarke G & Cook D, A basic course in statistics, Hodder Arnold, 1998.
Croft & Davison, Foundation Maths, Prentice Hall, 2003.
Dean N, The Essence of Discrete mathematics, Prentice Hall.
Nissanke N, Introductory Logic and Sets for Computer Scientists, Addison Wesley.
Page SG, Mathematics: a second start, Ellis Horwood, 1986.
Truss, J.K., Discrete Mathematics for Computer Scientists.

Pre-requisites

Pre-requisite: COMP3220: Foundations of Computing I

Synopsis *

This module follows from CO322 and aims to provide students with more understanding of the theory behind the formal underpinnings of computing. It will build upon the abstract reasoning skills introduced in CO322. Matrices, vectors, differential calculus, probability and logic will be introduced.

CO520 Further Object-Oriented Programming

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

Contact Hours

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

Learning Outcomes

On successfully completing the module students will be able to:

Use advanced features of an object-oriented programming language, such as inheritance and graphical libraries, to write programs.
Use object-oriented analysis, design and implementation with a minimum of guidance, to recognise and solve practical programming problems involving inheritance hierarchies.
Design appropriate interfaces between modular components.
Evaluate the quality of competing solutions to programming problems.
Evaluate possible trade-offs between alternative solutions, for instance those involving time and space differences.
Thoroughly test solutions to programming problems.
Discuss the quality of solutions through consideration of issues such as encapsulation, cohesion and coupling.

Method of Assessment

Canterbury

90 min in course test (30%)
Coursework (30 hours) (70%)

Medway
Assessment 1 - Class Exercises (10%)
Assessment 2- Quiz (15%)
Assessment 3 - Inheritance & Polymorphism (20%)
Assessment 4 - GUI & Exception (25%)
Assessment 5 - In-class Test (30%)

Preliminary Reading

Indicative list, current at time of publication. Reading lists will be published annually)
"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.

EL021 Calculus

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	F	15 (7.5)	90% Exam, 10% Coursework	Yan Dr X

Availability

Contact Hours

Contact hours 44

The total student workload will be 150 hours.

Department Checked

09/07/2018

Learning Outcomes

1 demonstrate a knowledge of Calculus to a level suitable for Level 4 courses;
2 apply this knowledge to elementary problem solving;
3 undertake more advanced study of these subjects.

Method of Assessment

Examination 90%
Homework 10%

Preliminary Reading

See http://readinglists.kent.ac.uk

Pre-requisites

Co-requisites:
MAST0022 (MA022) - GRAPHS AND GEOMETRY
PH7S0020 (PH020) - ALGEBRA AND ARITHMETIC

Restrictions

None

Synopsis *

This module introduces students to the mathematics of calculus and its applications in engineering. Examples classes are provided to support the student learning.

EL024 Electromagnetics for Engineers

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

Contact Hours

Total contact hours: 42
Private study hours: 108
Total study hours: 150

Department Checked

09/07/2018

Learning Outcomes

1. Understand basic laws of electrostatics and magnetism;
2. Be able to perform simple calculations on electromagnetic phenomena.

Method of Assessment

Examination 70%
Coursework 24%
Homework 3%
In course test 3%

Preliminary Reading

See http://readinglists.kent.ac.uk

Pre-requisites

Co-requisites:
EENG0021 (EL021) - CALCULUS
EENG0025 (EL025) - ELECTRICAL PRINCIPLES AND MEASUREMENTS
MAST0022 (MA022) - GRAPHS AND GEOMETRY
PH7S0020 (PH020) - ALGEBRA AND ARITHMETIC

Restrictions

None

Synopsis *

This module introduces students to the basic principles of electro-magnetism and electrostatics that are necessary in order to understand modern electronic and communications systems. Practical work and examples classes are included to assist the student learning.

MA022 Graphs, Geometry and Trigonometry

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	F	15 (7.5)	70% Exam, 30% Coursework	Woodcock Dr C
1	Canterbury	Whole Year	F	15 (7.5)	80% Exam, 20% Coursework	Woodcock Dr C
1	Canterbury	Whole Year	F	15 (7.5)	85% Exam, 15% Coursework	Woodcock Dr C
1	Canterbury	Whole Year	F	15 (7.5)	90% Exam, 10% Coursework	Woodcock Dr C

Contact Hours

44 hours

Learning Outcomes

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

1 demonstrate understanding of the basic body of knowledge associated with standard functions and their graphical interpretation, geometry, trigonometry and vectors;
2 demonstrate the capability to solve problems in accordance with the basic theories and concepts of functions, trigonometry and geometry, whilst demonstrating a reasonable level of skill in calculation and manipulation of the material;
3 apply the basic techniques associated with functions, trigonometry and geometry in several well-defined contexts;
4 demonstrate mathematical proficiency suitable for Stage 1 entry.

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 demonstrate an increased level of skill in numeracy and computation.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

Core Maths for Advanced Level, L Bostock and S Chandler, Nelson Thornes Ltd, 2013.

Synopsis *

This module introduces fundamental methods needed for the study of mathematical subjects at degree level.

a) Functions and graphs: plotting, roots, intercepts, turning points, area (graphical methods), co-ordinate geometry of straight lines, parallel and perpendicular lines, applications to plots of experimental data, quadratics, introduction to the trigonometric functions

b) Trigonometry: radians, properties of sine and cosine functions, other trigonometric functions, compound angle formulae and subsequent results, solving trigonometric equations

c) Geometry: circles and ellipses, right-angled triangles, SOHCAHTOA, trigonometric functions, inverse trigonometric functions, sine and cosine rule, opposite and alternate angle theorems, applications to geometry problems

d) Vectors: notion of a vector, representation of vectors, addition, subtraction and scaling, magnitude, scalar product, basis vectors in 2 and 3 dimensions

MA306 Statistics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Spring	C	15 (7.5)	100% Exam	Laurence Dr A
1	Canterbury	Spring	C	15 (7.5)	80% Exam, 20% Coursework	Laurence Dr A
1	Canterbury	Spring	C	15 (7.5)	90% Exam, 10% Coursework	Laurence Dr A

Contact Hours

47 hours

Learning Outcomes

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

1 demonstrate knowledge of the underlying concepts and principles associated with statistics;
2 demonstrate the capability to make sound judgements in accordance with the basic theories and concepts in the following areas, whilst demonstrating a reasonable level of skill in calculation and manipulation of the material: graphical and numerical summaries of data using R, point estimation, including maximum likelihood estimation for discrete data, interval estimation, hypothesis testing, association between variables;
3 apply the underlying concepts and principles associated with introductory statistics in several well-defined contexts, showing an ability to evaluate the appropriateness of different approaches to solving problems in this area;
4 make appropriate use of the statistical computer package R.

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 R, online resources (moodle), internet communication;
7 communicate technical and non-technical material competently.
8 demonstrate an increased level of skill in numeracy and computation;
9 give an oral presentation;
10 work in small groups.

Method of Assessment

80% examination and 20% coursework.

Preliminary Reading

J. Devore and R. Peck. Introductory Statistics. (West 1990)
F. Daly et al. Elements of Statistics. (The Open University 1995)
G.M. Clarke and D. Cooke. A Basic Course in Statistics. (5th edition. Arnold. 2004)
D.V. Lindley and W.F. Scott. New Cambridge Statistical Tables (2nd edition. C.U.P. 1995)
J. Verzani. Using R for Introductory Statistics (2nd edition, CRC Press, 2014)

Pre-requisites

MAST4006 (Mathematical Methods 1), MAST4009 (Probability)

Synopsis *

Introduction to R and investigating data sets. Basic use of R (Input and manipulation of data). Graphical representations of data. Numerical summaries of data.

Sampling and sampling distributions. χ^2 distribution. t-distribution. F-distribution. Definition of sampling distribution. Standard error. Sampling distribution of sample mean (for arbitrary distributions) and sample variance (for normal distribution) .

Point estimation. Principles. Unbiased estimators. Bias, Likelihood estimation for samples of discrete r.v.s

Interval estimation. Concept. One-sided/two-sided confidence intervals. Examples for population mean, population variance (with normal data) and proportion.

Hypothesis testing. Concept. Type I and II errors, size, p-values and power function. One-sample test, two sample test and paired sample test. Examples for population mean and population variance for normal data. Testing hypotheses for a proportion with large n. Link between hypothesis test and confidence interval. Goodness-of-fit testing.

Association between variables. Product moment and rank correlation coefficients. Two-way contingency tables. χ^2 test of independence.

MA309 Business Economics

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

Contact Hours

60 hours

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1 show a systematic knowledge, understanding and critical awareness of key areas of economic theory;
2 show comprehensive understanding of the complex techniques used to solve problems in economics;
3 demonstrate appreciation of recent developments and methodologies in economics and the links between economic theory and its practical application in business and to critically evaluate such methodologies.

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1 demonstrate a logical mathematical approach to solving complex problems including cases where information/data is not complete;
2 apply skills in written communication to both technical and non-technical audiences;
3 apply skills in the use of relevant information technology;
4 apply skills in time management, organisation and studying so that tasks can be planned and implemented at a professional level.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

John Sloman, Dean Garratt, Jon Guest, Elizabeth Jones (2016) Economics for Business 7th Ed (Pearson)
The Actuarial Education Company Subject CT7 (CB2 from 2019) study notes support the synopsis.

Synopsis *

The aim of this module is to introduce students to core economic principles and how these could be used in a business environment to understand economic behaviour and aid decision making. The coverage is sufficient to enable students to gain exemption from the Actuarial profession's Business Economics examination (CT7 up to 2018, CB2 from 2019), whilst giving a coherent coverage of economic concepts and principles. The syllabus includes: the working of competitive markets, consumer demand and behaviour, product selection, marketing and advertising strategies, costs of production, production function, revenue and profit, profit maximisation under perfect competition and monopoly, imperfect competition, business strategy, the objectives of strategic management, firms' growth strategy, pricing strategies, government intervention, international trade, balance of payment and exchange rates, the role of money and interest rates in the economy, the level of business activity, unemployment, inflation and macroeconomic policy.

MA315 Financial Mathematics

Version	Campus	Term(s)	Level	Credit (ECTS)	Assessment	Convenor
1	Canterbury	Whole Year	C	30 (15)	80% Exam, 20% Coursework	

Contact Hours

100 hours

Learning Outcomes

The intended subject specific learning outcomes.
On successfully completing the module students will be able to:
1 describe how to use a generalized cashflow model to describe financial transactions, making allowances for the probability of payment;
2 describe how to take into account the time value of money using the concepts of compound interest and discounting;
3 show how interest rates or discount rates may be expressed in terms of different time periods;
4 demonstrate a knowledge and understanding of real and money interest rates;
5 calculate the present value and the accumulated value of a stream of equal or unequal payments using specified rates of interest and the net present value at a real rate of interest, assuming a constant rate of inflation;
6 define and use the more important compound interest functions including annuities certain;
7 define an equation of value;
8 describe how a loan may be repaid by regular instalments of interest and capital;
9 show how discounted cashflow techniques can be used in investment project appraisal;
10 describe the investment and risk characteristics of typical assets available for investment purposes;
11 analyse elementary compound interest problems;
12 calculate the delivery price and the value of a forward contract using arbitrage free pricing methods;
13 show an understanding of the term structure of interest rates;
14 show an understanding of simple stochastic interest rate models;
15 appreciate recent developments in Financial Mathematics and the links between the theory of Financial Mathematics and their practical application.

The intended generic learning outcomes.
On successfully completing the module students will be able to:
1 demonstrate a logical mathematical approach to solving problems;
2 demonstrate enhanced skills in written communication;
3 demonstrate skills in time management and organisation;
4 demonstrate enhanced study skills.

Method of Assessment

80% Examination, 20% Coursework

Preliminary Reading

The material is covered by the Actuarial Education Company’s notes for Subject CT1 – Financial Mathematics.

Synopsis *

The aim of this module is to provide a grounding in financial mathematics and its simple applications. The idea of interest, which may be regarded as a price for the use of money, is fundamental to all long-term financial contracts. The module deals with accumulation of past payments and the discounting of future payments at fixed and varying rates of interest; it is fundamental to the financial aspects of Actuarial Science. The syllabus will cover: Generalised cashflow models, the time value of money, real and money interest rates, discounting and accumulating, compound interest functions, equations of value, loan schedules, project appraisal, investments, elementary compound interest problems, arbitrage-free pricing and the pricing and valuation of forward contracts, the term structure of interest rates, stochastic interest rate models.