ENGINEERING SCIENCES

UCL brings together
the brightest minds from all over the
world, creating a conducive and
challenging environment for the holistic
development of keen and global minds.
Not only have I met many European
students, I have had the opportunity
to interact with students from Russia,
America and the Middle East. Being
exposed to their cultures and networks
has given me a global perspective
about opportunities, worldwide.

It has been an excellent and memorable experience. I have gained so much from the interactions with professors, teaching assistants and students. The platform that UCL has given me to realise more about myself is priceless and I am grateful for the opportunity to be here.



BIOCHEMICAL ENGINEERING

New discoveries in the field of medicine and science are being made constantly. Transforming these discoveries into benefits such as drug treatments, or improvements in the quality of life, is the job of Biochemical Engineers who can integrate science with processes in an affordable and sustainable way.

Why study Biochemical Engineering at UCL?

UCL was a founding laboratory in the discipline of biochemical engineering and has pioneered teaching of the subject. The department's Advanced Centre for Biochemical Engineering, a £30million facility containing state-of-the-art fermentation and downstream processing equipment, facilitates world-class laboratory training on whole pilot-scale bioprocesses.

What you will gain from study at UCL

Our rigorous but flexible programme allows you to take core elements in conjunction with optional courses in which you can focus on underpinning biological science training, an independent research project or process engineering. Our world-class research is used to extend and develop the taught courses.

Teaching and Assessment

The programme provides a set of courses for one academic year with lectures, case studies and laboratory activities, each assessed through examination, coursework, or written project report. Admission for a single term/semester is not normally possible.



Extended descriptions of the courses available can be found by visiting the web address at the top of this page

Contact Name

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Availability

Year (Fall Term or Spring Term only in exceptional cases)

Tuition Fees

£18,500 (for full explanation of tuition fees please see page 165)

Related courses can be found in these departments:

- Chemical Engineering, page 80
- Molecular Biosciences, page 106



LEVEL 1 COURSES

BENG1001

Introduction to **Biochemical Engineering**

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Introduction to biochemical engineering and its significance to society, including social and ethical issues, and codes of practice. Issues are demonstrated using a conceptual design project for a therapeutic product.

BENG1004

Bioprocess Engineering

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS

This course provides students with the basic principles involved in the bioprocess analysis and design of fermentation and cell culture systems, primary separation processes, chromatography and secondary operations.

LEVEL 2 COURSES

BENG2007

Evaluation and Planning of Business Opportunities in Bioprocessing and Life Sciences

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

The course provides a structured approach to understanding the ways in which a discovery in bioprocessing is taken through a real outcome. Students learn about ways of evaluating potential commercial opportunities.

LEVEL 3 COURSES

BENG3008

Biochemical Reaction Engineering

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

The course provides students with the necessary knowledge of reaction engineering, reactor design and operation with special emphasis on biocatalytic processes. It includes lectures on emerging technology such as microfluidics.

BENG3009

Computer Aided Bioprocess Engineering

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

This course teaches sophisticated computer-based solutions for solving biochemical engineering process design-related problems and develops competence in the use of Office, MATLAB and SuperPro Designer.



LEVEL 4 COURSES

BENGM001

Integrated Downstream Processing

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Covers the processing, purification and preservation of biological materials with emphasis on understanding the interaction of biological materials with the engineering environment.

BENGM002

Design and Control of Biochemical Reactors

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Provides a detailed understanding of bioreactor design, scale up and operation for both multi-step (i.e. fermentation) and single-step (i.e. biotransformation) conversion processes.

BENGM005

Bioprocess Research Project

Availability	Year
Credit Value	8 (US)
	15 (ECTS)

Students undertake an extended period of individual research integrated within one of the department's research teams, including training on experimental design, data collection, research planning.

BENGM010

Bioprocess Validation and Quality Control

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

This course aims to familiarise students with current validation methodology for the licensing of biologically based production processes, including FDA regulations.

BENGM011

Integrated Biochemical **Engineering Design**

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Outlines how discoveries in the life sciences can be translated into commercial products/processes, a key feature being the preparation of a business plan.

BENGM012

Bioprocess Design and Implementation

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

A pilot plant based course that builds upon the study of individual unit operations to specify and perform a whole biological production process from laboratory to pilot scale and includes hands-on experiments.

CHEMICAL ENGINEERING

UCL is a pioneer of the discipline of chemical engineering, having founded the first Chair in the subject in the UK, the Ramsay Memorial Chair in Chemical Engineering. We remain at the forefront, consistently achieving excellent research ratings in governmental assessments.

Why study Chemical Engineering at UCL?

Our academic staff are leaders in their fields. The research is grouped into three main areas: multiphase systems, chemical and catalytic reaction engineering and product and process systems engineering, with many specialised topics in these fields being the focus of teaching and research. The department hosts the Centre for CO₂ Technology.

What you will gain from study at UCL

Our courses provide a flexible training to meet the future demands of the industry and are designed to make you highly employable in the process sector and beyond. You will also benefit from our collaborative links with industry and with other internationally renowned universities.

Teaching and Assessment

Teaching methods vary, but include lectures, tutorials, laboratory sessions and problem classes. Assessment normally combines written examination and coursework; laboratory and project reports are also important depending on the nature of the course.

Extended descriptions of the courses available can be found by visiting the web address at the top of this page

Contact Name

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Availability

Year

Tuition Fees

£18,500 (for full explanation of tuition fees please see page 165)

Related courses can be found in these departments:

- Biochemical Engineering, page 78
- Chemistry, page 109

LEVEL 1 COURSES

CENG1001

Transport Processes I

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

An introductory course in transport processes, treating momentum. heat and mass transfer as a single unified subject.

CENG1002

Thermodynamics

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

The principles of classical thermodynamics required by the chemical engineer.

CENG1003

Engineering Experimentation

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

A laboratory-based course which develops practical, experimental teamwork and communication skills.

CENG1004

Introduction to **Chemical Engineering**

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

An introduction to chemical engineering, covering many of the laws and processes which underpin the discipline.

CENG1007

Physical Chemistry for Chemical Engineers

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Covering aspects of surface science and physical chemistry essential to chemical engineering.

LEVEL 2 COURSES

CENG2001

Experimentation

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Experiments in chemistry and chemical engineering.

CENG2002

Mass Transfer Operations

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

General methods of phase contacting for the purpose of mass transfer. Mass transfer operations, including absorption, distillation, extraction. Design of mass transfer equipment. Process simulation.

CENG2003

Process Engineering

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

This course aims to give students a basic level of knowledge in process synthesis and in the design of safe and efficient process plant.

CENG2005

Computer-Aided **Process Engineering**

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Simple computer tools: spreadsheets, equation solving packages, etc. Computer-aided design: flowsheeting, physical property prediction. Computer programming. Numerical methods. Linear programming.

CENG2006

Process Heat Transfer

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Process heat transfer including, for example, conduction; convective heat transfer; radiation heat transfer; condensation, evaporation and boiling.

CENG2007

Particulate Systems and **Separation Processes**

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Particulate systems. Characterisation of particles. Flow through packed beds and porous media. Particle formation and separation processes. Colloid and surface chemistry: dispersions, emulsions, coagulation. Humidification, water cooling and solids drying.

LEVEL 3 COURSES

CENG3001

Process Dynamics and Control

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

The feedback concept. Controller types and characteristics. Dynamic testing and controller tuning. Laplace transform. Open and closed loop transfer functions. Control system design and stability.

Chemical Engineering: Research Project

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

An individual research project working under the supervision of a member of the academic staff of the department.

CENG3003

Chemical Reaction Engineering

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Batch, plug flow and CSTRs. Industrial reactors. Conversion and reactor sizing. Rate laws and stoichiometry. Isothermal reactor design. Design of multiple reactor systems.

CENG3005

Transport Processes III

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Prediction of transport properties. Continuity and Navier-Stokes equations. Boundary layer theory. Momentum transfer: single phase laminar and turbulent flow phenomena.

CENG3006

Chemical Engineering Plant Design I

Availability	Year
Credit Value	12 (US)
	22.5 (ECTS)

The course develops and tests students' ability to co-ordinate their knowledge and to apply it to the complete design of a process plant.

CENG3007

Advanced Material Processes and Product Engineering

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

This course aims to give students an understanding of the processes involved in the production of novel materials.



LEVEL 4 COURSES

CENGM001

Chemical Engineering Research Project

Availability	Year
Credit Value	8 (US)
	15 (ECTS)

An individual research project working under the supervision of a member of the academic staff of the department.

CENGM002

Advanced Process Engineering

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Approaches to Process Synthesis and Process Optimisation. Introduction to nonlinear process optimisation. Application to flowsheet optimisation. Discrete modelling of process systems.

CENGM006

Fluid-particle Systems

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Fundamentals of gas-solid and liquid-solid systems. Fluidised bed bubble dynamics, particle mixing and segregation. Crystallization: theories and measurement of nucleation and crystal growth.

CENGM008

Safety and Loss Prevention

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

This course aims to provide students with advanced training in hazard identification, quantification and mitigation as well as risk management.

CENGM010

Energy Systems and Sustainability

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

An introduction to conventional and alternative energy technologies, considering their role in a sustainable energy future.

CENGM011

Advanced Process Modelling and Design

Availability	Year
Credit Value	8 (US)
	15 (ECTS)

Aims to extend existing knowledge and experience to consider advanced design techniques for process dynamics and controllability in the context of sustainability and sustainable development.

CIVIL, ENVIRONMENTAL AND GEOMATIC ENGINEERING

For over 150 years UCL has been at the forefront of Civil, Environmental and Geomatic Engineering, contributing to a discipline which improves quality of life and shapes the world through the design of buildings, bridges, flood and coastal protection, transport systems, and water/wastewater infrastructure.

Why study Civil, Environmental and Geomatic Engineering at UCL?

Courses at Levels 1 and 2 are based around a series of one-week team projects addressing realistic engineering scenarios placed in their national and international contexts. These are underpinned by lectures and laboratory classes in the core disciplines of Structures, Soils, Materials, Fluids, Chemistry and Biology, and in enabling topics such as Systems Engineering, Design and Project Management.

What you will gain from study at UCL

You will have the chance to specialise in a range of core and advanced topics such as Transport Studies, Water and Wastewater Treatment, Seismic Risk Assessment and Coastal Engineering, to take part in multidisciplinary real-life projects working in teams, and to undertake an individual research project of your choice.

Teaching and Assessment

Teaching is by lectures, laboratory classes, tutorials, seminars and field trips, with one-week projects every five weeks for students on Level 1 and Level 2 courses. Assessment is by examination or coursework, and alternative assessment is available for students only at UCL for one term.



Extended descriptions of the courses available can be found by visiting the web address at the top of this page

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Availability

Fall Term Spring Term

Tuition Fees

£18,500 (for full explanation of tuition fees please see page 165)

Related courses can be found in these departments:

- Planning, page 73
- Project Management for Construction, page 75
- Geography, page 151



LEVEL 1 COURSES

CEGE1009

Introduction to Civil and **Environmental Engineering**

Availability	Year
Credit Value	32 (US)
60 (ECTS	S) (full year)

A full year of study introducing civil engineering, environmental engineering and geoinformatics, the context in which they are applied, and the scientific principles underpinning them.

LEVEL 2 COURSES

CEGE2007

Civil Engineering II

Availability	Year
Credit Value	32 (US)
60 (EC	TS) (full year)

Covers the core engineering and relevant contextual subjects at intermediate level. It is taught around four one-week multidisciplinary projects.

CEGE2009W

Civil Engineering Studies: Fluids, Soils and Structures

Availability	Year
Credit Value	8 (US)
	15 (ECTS)

Based on lectures from CEGE2007, this course covers fluids, soils and structures theory aimed at Level 2 students.

CEGE2010

Civil Engineering Methods II

Availability	Year
Credit Value	8 (US)
	15 (ECTS)

This course covers geology, maths, design, systems engineering, and laboratory classes for fluids, materials, soils and structures at Level 2.

CEGE2011

Civil Engineering Mechanisms II

Availability	Year
Credit Value	8 (US)
	15 (ECTS)

This course covers structures, materials, soils, fluids, geoinformatics and environmental engineering appropriate for civil engineers at Level 2.

CEGE2012W

Civil Engineering Studies: Fluids, Soils and Structures B

Availability	Year
Credit Value	12 (US)
	22.5 (ECTS)

Fluids, soils and structures mechanisms for affiliate students.

CEGE2014W

Environmental Science and Pollution

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Introduces basic concepts of hydrology, water quality, environmental pollution, waste management and remediation of contaminated land. Laboratory classes reinforce theoretical concepts and provide practical work experience.

CEGE2015W

Environmental **Engineering Design**

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Introduces basic principles of GIS, digital elevation terrains (DEM), triangularised irregular networks, and ArcGIS. The design problem focuses on material and energy balances, water quality modelling using reactor models, and water distribution systems.

LEVEL 3 COURSES

CEGE3002

Transport Studies

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Provides an insight into how transport systems work, how they fit together with the needs of society and how they can be evaluated.

CEGE3003

Emerging Commercial Landscapes

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Introduction to concepts of entrepreneurship and commercial applications of engineering.

CEGE3005

Civil Engineering Materials

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Provides a detailed consideration of those aspects of materials science and engineering which are of current importance in construction design and practice.

CEGE3010

Financial Aspects of Project Engineering and Contracting

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

The course covers financial constraints involved in planning and executing projects, with emphasis on those in the contracting business.

CEGE3012

Environmental Engineering Project

Availability	Year, Fall Term,
	Spring Term
Credit Value	4/8 (US)
	7.5/15 (ECTS)

A research project aimed at developing independence in problem solving by experiment, calculation or field studies.



CEGE3013

Civil Engineering Project

Availability	Year, Fall Term
	Spring Term
Credit Value	4/8 (US)
	7.5/15 (ECTS)

A research project aimed at developing independence in problem solving by experiment, calculation or field studies

CEGE3015

Coastal Engineering

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

The course develops fundamental concepts of fluid behaviour relevant to the coastal environment, and applies them to the solution of practical problems in coastal engineering.

Advanced Soil Mechanics

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

The course develops fundamental principles of soils to solve problems of complex slopes and to apply plasticity methods.

CEGE3020

Water and **Wastewater Treatment**

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

A general introduction to water and wastewater treatment. Students should have a sound background in chemistry and biology and prior knowledge of environmental engineering.



CEGE3021

Fluids and **Engineering Analysis**

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Introduction to concepts of advanced fluid mechanics and mathematical methods.

CEGE3022

Structural Mechanics III

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

An advanced level course in structural mechanics covering indeterminate structures.

LEVEL 4 COURSES

CEGEM001

Structural Dynamics and Earthquake Engineering

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Covers the fundamental concepts of structural dynamics, seismology and building design for earthquake resistance.

CEGEM007

Design Of Roads, Rail, Bridges, **Tunnels and Embankments**

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Aims to provide a sound background to the decision making, design and implementation of major transport structures.

CEGEM010

Environmental Systems

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

This course provides an integrated overview of water, energy and material elements of environmental systems, including biological, physical, industrial and built systems and their interaction.

CEGEM011

Systems, Society and Sustainability

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

A critical examination of systems theory, its origins, application to sustainability issues and limitations.

CEGEM022

Seismic Risk Assessment

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Addresses a broad range of issues in relation to seismic risk to buildings and geotechnical structures, as well as human populations. Also methodologies and theories of risk assessment.

CEGEM068

Finite Element Modelling and **Numerical Analysis**

Availability	Spring Term
Credit Value	4 (US)
	7.5 (FCTS)

Introduces the fundamentals of finite-element (FE) modelling and its limitations in engineering applications, discretisation methods for solving differential equations, concepts of natural frequency, natural mode shape and resonance in the vibration analysis of multi-degree-offreedom systems, and FE software tools.

CEGEM070

Urban Flooding and Drainage

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Introduces techniques for managing surface water in the urban environment, focusing on flood risk mapping, flood defence and flood mitigation.

COMPUTER SCIENCE

Technology continues to advance and its effects are ever more present in our everyday lives. As a result, there is an increasing demand for skilled people trained in computer science and related disciplines, who can apply their knowledge and experience to the technological challenges of the future.

Why study Computer Science at UCL?

UCL Computer Science has an excellent record of high-quality research and teaching. We have contributed significantly to the research that has brought the internet to its current state, and continue to make and teach about innovations in distributed computing and multimedia. Our other strengths lie in intelligent systems, software engineering, virtual environments, computer vision and image processing.

What you will gain from study at UCL

As a student here you will be able to benefit from our expertise, and our extensive computing facilities all housed in new purpose-built accommodation. Our teaching offers you opportunities to specialise and extend your skills and knowledge: a combination that will make you very employable.

Teaching and Assessment

Most courses are assessed by coursework and a written examination. You are strongly advised to follow links from the website above to consult our online information for affiliate students.

Extended descriptions of the courses available can be found by visiting the web address at the top of this page

Contact Name

Dr Jens Krinke EMAIL j.krinke@cs.ucl.ac.uk TEL +44 (0)20 7679 7754

Availability

Year Fall Term Spring Term

Tuition Fees

£18,500 (for full explanation of tuition fees please see page 165)

Related courses can be found in these departments:

Electronic and Electrical Engineering, page 88

LEVEL 1 COURSES

COMP1002 Theory 1 Fall Term Availability Credit Value 4 (US) 7.5 (ECTS)

This course introduces formal methods for reasoning about algorithms and, more generally, formalises the reasoning process.

COMP1004

Theory 2

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course develops your programming and problem solving skills, and encourages you to develop a thoughtful approach to analysis and design problems.

COMP1009

Cognitive Systems and Intelligent Technologies

Availability	Fall Term
Credit Value	4 (US)
	7.5 (FCTS)

This course addresses the concepts and language of intelligent systems, and the ability to relate human and artificial intelligences.

COMP6008

Multimedia Computing

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course teaches you how to create websites, 2D and 3D media, audio and video, animation, involving a variety of media, through the use of a number of key professional tools.

LEVEL 2 COURSES

COMP2003

Mathematics and Statistics

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

The course aims to provide a grounding in mathematics and statistics most relevant for a Computer Science undergraduate degree.

COMP2007

Concurrent Programming

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

This course will introduce you to the wider application of Java, and the construction of more sophisticated programmes, most notably concurrent programmes.



COMP2008 Logic and Database Theory

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

This course is designed to teach you about logical and mathematical inference and database theory.

COMP2009

Software Engineering and **Human Computer Interaction**

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

This course will introduce you to the basics of software engineering design and analysis, plus essential knowledge and methods of designing effective and efficient systems and interactions.

COMP2010

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Com	pilers

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This is a practical course whose primary goal is to develop your understanding of the operation of compilers and the development and specification of computerbased languages.

COMP2011

Networks and Graphics

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course will extend your skills and knowledge in architecture, programming, networking and 2D graphics.

COMPC018

Entrepreneurship: Theory and Practice

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course provides students with the theory and practice necessary to launch a new business making maximum use of the eCommerce strategies and software tools for entrepreneurs.

LEVEL 3 COURSES

COMP3001

Technology Management and **Professional Issues**

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Provides an understanding of the issues relating to the management of computer technology systems and organisations, and the key management skills required in their effective utilisation and operation.

COMP3004

Computational Complexity

Availability	Fall Term
Credit Value	4 (US)
	7.5 (FCTS)

The course addresses the theoretical and practical limitations of computation and provides a theoretical framework for modelling computation.

COMP3005

Operating Systems

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

This is a practical course whose primary goal is to develop your understanding of operating systems, building on and showing the utility of basic material covered previously.

COMP3011

Functional Programming

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course introduces you to the functional programming paradigm and the implementation technology for functional programming languages.

COMP3012

Interaction Design

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course studies the design of users' interactions with softwarebased systems. It includes practical interaction design skills and an appreciation of emerging interactive technologies.

COMP3013

Database and Information Management Systems

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

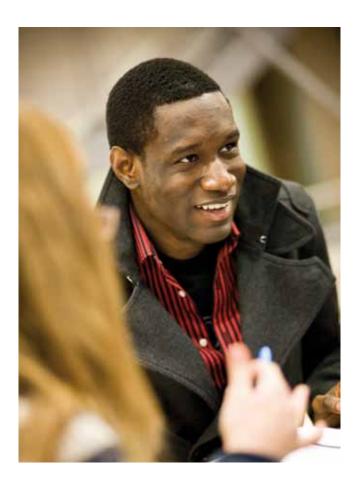
This course addresses issues of data organisation and the technology which realises efficiency of data manipulation.

COMP3035

Networked Systems

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

The course provides a theoretical background and practical understanding of the techniques and technologies that are used to build data communications networks and the applications which use them.



COMP3058

Artificial Intelligence and **Neural Computing**

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course introduces artificial intelligence and neural computing both as technical subjects and as fields of intellectual activity.

COMP3072

Image Processing

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

This course introduces the digital image, and how digital images are represented, manipulated, encoded and processed, with emphasis on algorithm design, implementation and performance evaluation.

COMP3080

Computer Graphics

Availability	Fall Term
Credit Value	4 (US)
	7.5 (FCTS)

This course introduces the fundamental concepts of 3D computer graphics and gives you all the knowledge needed for creating an image of a virtual world from first principles.

COMP3085

Computational Photography and Capture

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course introduces the recent field of computational photography, which enhances or extends digital image formation using computational methods, and presents ways to acquire digital models of the real world.

COMP6006

Financial Computing

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course introduces you to investment banking, financial instruments, financial software systems and IT used in banking.

ELECTRONIC AND ELECTRICAL ENGINEERING

UCL Electronic and Electrical Engineering pioneered the development of modern electronics, following the construction in 1889 of the thermionic valve by the first Head of Department. Professor Ambrose Fleming. Current research activities centre upon communications and information systems; electronic materials and devices; sensors, systems and circuits; photonics; and optical networks.

Why study Electronic and Electrical Engineering at UCL?

The department has been a leader in its education and research field for over a century. Consequently, we can offer you the wide choice and intellectual stimulation that comes from world-class research activity.

What you will gain from study at UCL

Our approach to the teaching of electronics focuses on the rigorous study of the fundamentals of the subject, balanced with effective practical application and communication, developing skills which are highly valued by employers within the engineering industries and beyond.

Teaching and Assessment

Teaching is carried out by a mixture of lectures, laboratory classes and tutorials. Assessment may be by examination, coursework and assessed practicals and tests.



Extended descriptions of the courses available can be found by visiting the web address at the top of this page

Contact Name

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Availability

Year Fall Term Spring Term

Tuition Fees

£18,500 (for full explanation of tuition fees please see page 165)

Related courses can be found in these departments:

- Computer Science, page 85
- Physics and Astronomy, page 117

LEVEL 1 COURSES

ELEC1001

Electronic Circuits I

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

An introduction to modern electronics. Theory of solid state devices and their incorporation into circuits. Techniques for circuit design of amplifiers, power supplies and feedback control.

ELEC1002

Circuit Analysis and Synthesis I

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Fundamentals of DC and AC circuits. Network geometrics, Kirchhoff's Laws, superposition, Norton and Thévenin theorems. Phasors and the use of complex numbers, elements of transformers and three-phase systems.

ELEC1003

Digital Circuits

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Theoretical and practical aspects of digital circuits. Boolean algebra, design of basic combinatorial circuits and interconnection considerations, present-day logic systems, basic sequential circuits, digital instruments.

ELEC1005

Electromagnetics

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Electrostatics and magnetostatics; also electro and magneto-dynamics. Inductors, ferromagnetic materials. Simple motors and generators. Maxwell's equations, Boundary conditions. Waves on transmission lines and in free space.

ELEC1006

Mathematics for Electronic Engineers

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

An introduction to engineering mathematics including complex numbers, differential equations, vector algebra and elementary numerical methods. Fourier series and Laplace transforms.

ELEC1009

Communication Systems I

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Signals and spectra. Information and bandwidth. Frequency translation, Amplitude modulation and demodulation. Frequency modulation and demodulation. Sampling, pulse and pulse code modulation.

ELEC1010

Electronic Engineering Design Principles

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Runs over two terms. The course provides an introduction to practical laboratory, programming and critical thinking skills.

ELEC1012

Object-oriented Programming

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Availability	Spring	Term
Credit Value	4	1 (US)
	7.5 (E	ECTS)

Provides knowledge in the fundamental elements of object-oriented programming in particular and programming, in general - assuming no initial knowledge of the subject.

LEVEL 2 COURSES

ELEC2002

Electronic Circuits II

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

This course provides analysis of standard circuit configurations including feedback circuits and the design of advanced circuits such as operational-amplifiers, oscillators, and output stages.

ELEC2003

Circuit Analysis and Synthesis II

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Continuous time and discrete time signals and systems. Convolution, Fourier transform Laplace transform, Fourier series, Discrete Fourier transform, Z-transform. Realisability. Digital filters. Fast Fourier transform.

ELEC2005

Optoelectronics

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Provides an introduction to the interaction of optical signals with materials, and to optoelectronic devices and systems.

ELEC2006

Fields and Waves in **Electronic Systems**

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Transmission line theory. Characteristic impedance, phase velocity, dispersion. Terminated lines. Vector calculus. Maxwell's equations in integral and differential form. Plane waves. Polarisation. Dialectric and conducting media.

ELEC2008

Semiconductor Devices

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Band structure, metals, dielectrics, semiconductors, doping, holes, effective mass of electronics, Fermi energy. Electrons in energy states, Einstein relations.

ELEC2009

Mathematics for Electronic Engineers II

Availability	Year
Credit Value	2/4 (US)
	3.75/7.5 (ECTS)

Runs over two terms. This extends prior study to consider engineering problems requiring complex functions, linear algebra, vector calculus and partial differential equations.

ELEC2010

Digital Design

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Gate level minimization; logic design with MSI components; Basic sequential logic components; Registers and counters; Synchronous sequential circuits; Asynchronous sequential circuits; Memory and programmable logic.

ELEC2011

Object-oriented Programming II

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Extends competence in object oriented programming to encompass those aspects critical to engineering simulation, network practice and data analysis. Introduction to software engineering.



LEVEL 3 COURSES

ELEC3002

Power Electronics

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

The course identifies the major classes of active devices deployed in power electronics systems and shows how the active device limits the performance of all power electronic systems.

ELEC3003

Control Systems I

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Analysis of linear systems; feedback; Steady state response; Transient response; PID control; Non-linear systems.

Digital Signal Processing

Availability	Spring Term
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Credit Value	4 (US)
	7.5 (ECTS)

Revision of transform methods; Sampled data systems; The DFT and FFT; Analysis of random signals; Introduction to digital filters; FIR digital filter design; IIR Digital Filter Design.

ELEC3006

Optoelectronics II

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Review of optical absorption processes in semiconductors; Review of detectors; Junction photodiodes; Carrier recombination processes; Lasers: Electro-optic modulators: Bit error rate and signal-to-noise ratio in optical systems.

ELEC3016

Electronic Circuits III

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Analogue CMOS Integrated Circuits; High Speed Techniques; Phase-Locked Loops.

ELEC3027

Advanced Digital Design

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Digital Design Methodology; Integrated Circuit Design; Verilog Hardware Description Language; Logic Synthesis; Programmable Logic and Storage Devices; Test and Verification.

Electronic Devices and Nanotechnology

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Electronic Device Materials; Advanced Device Technology; Advanced Devices; Emerging Device Technologies.

ELEC3030

Numerical Methods

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Introduces: functions of a complex variable with applications to integration, summing series and transform theory; fundamental numerical tools for the solution of common problems.

ELEC3915

Renewable Energy

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Gives an introduction to and overview of existing energy sources and means of generation and, in particular, considers emerging new energy technologies and how they may be used to make an increasing contribution in the future.

LEVEL 4 COURSES

All Level 4 courses are intensive modular courses (each runs over a whole week).

ELECM001

Antennas and Propagation

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

An in-depth exploration of the theory and application of antennas, covering basic definitions, antenna theory and different types of antenna.

ELECM004

Radar Systems

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

The emphasis is on physical principles, and on modern radar systems and signal processing techniques, for both civilian and defence applications.

ELECM006

Optical Transmission and Networks

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Topics covered include optically amplified systems, power levels and noise accumulation in amplifier cascades, sources of signal impairment (fibre dispersion, PMD, fibre nonlinearity), dispersion management and submarine optical fibre systems.

ELECM007

RF Circuits and Sub-Systems

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Topics covered include RF transmitters and receivers, device choices for circuits, RF circuit design techniques in MIC and MMIC form, passive and ferrite components, microwave filters and amplifier design.

ELECM009

Satellite Communications

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course covers all the fundamentals of satellite communication systems prior to a study of satellite channels characteristics.

ELECMT26

Advanced Photonic Devices

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course features several key advanced devices used in all areas of photonics such as high bit rate fibre, security imaging, waveguide and free space digital communications.

MANAGEMENT SCIENCE AND INNOVATION

UCL Management Science and Innovation offers a research and education programme focusing on technology management, innovation, creation/growth of technology-intensive organisations, operations research and entrepreneurship, as well as courses on other management and business topics.

Why study Management Science and Innovation at UCL?

UCL's location in the heart of the capital provides easy access to the financial and other businesses of the City of London. Many of our students go on to take up positions in globally known firms which have their base in London. Our central location also allows you to attend lectures provided by guest speakers from diverse industries and professions.

What you will gain from study at UCL

Studying with us will give you a unique experience in one of the world's business capitals. Courses provided by award-winning lecturers and an exposure to an international educational environment provide the knowledge and tools you need to excel in, and lead, the industries of

Teaching and Assessment

Most courses consist of weekly lectures and seminars in which students are encouraged to participate in class discussions and other activities. Assessment typically involves a coursework component and a written end-of-year examination; all students must be available to take examinations in April/May.



Extended descriptions of the courses available can be found by visiting the web address at the top of this page

Contact Name

Dr Alan Parkinson EMAIL a.t.parkinson@ucl.ac.uk TEL +44 (0)20 7679 2000 (extension 35474)

Availability

Spring Term

Tuition Fees

£18,500 (for full explanation of tuition fees please see page 165)

LEVEL 1 COURSES

MSIN1002

Communication and Behaviour in Organisations

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

The course is designed to help students to appreciate how individual and group behaviour can improve the quality of working life and effectiveness of organisations.

MSIN6001A

Management Principles

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

This is an introductory course on business and management. It covers subjects such as marketing, finance, organisational behaviour, human resource management and business strategy.

MSIN6001B

Management Principles

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This is an introductory course on business and management. It covers subjects such as marketing, finance, organisational behaviour, human resource management and business strategy.

MSIN6004

Accounting for Business

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

A broad introduction to the need for external and internal accounting systems, the principles explicit and implicit within such systems, strengths and weaknesses in such systems.

LEVEL 2 COURSES

MSIN7002

Business in a Competitive Environment

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

The objective of the course is to help students understand the way in which organisations relate to their environments and the competitive forces that affect them.

MSIN7003

Organisational Change

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Considers both how a company or organisation can respond to change and how the 'change agent' can lead change.

MSIN7004

E-Business Environment and Management

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Introduces students to the opportunities that e-Business presents for business development. Examples of e-Business are exemplified through illustrative case studies.

MSIN7005

Law for Managers

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

The course applies legal considerations to the activities of organisations. It is structured around an analysis of how the activities in the value chain are affected by law.

MSIN7014

Strategic Human **Resource Management**

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

The purpose of the course is to introduce the students to the nature and content of strategic and operational human resource (HR) management.

MSIN7016

Managerial Accounting for Decision Making

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Includes issues related to overhead recovery, costing and pricing, incremental cash flows, investment appraisal, budgetary control and issues in strategic management accounting.

LEVEL 3 COURSES

MSIN3001

Project Management

Availability	Fall Term,
	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

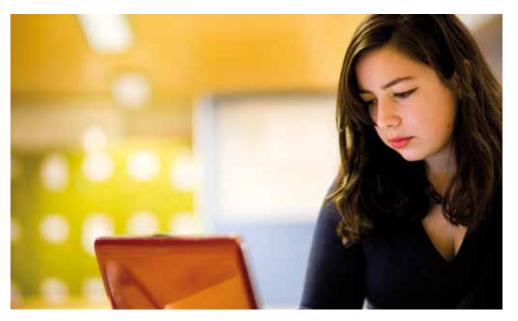
This course defines projects and the role of project managers by assessing the needs, tools and the success/failure indicators for managing projects.

MSIN3002

Marketing Communications

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Aims to treat students as practising managers, by using theory and practical activities, to enable them to gain an understanding of the core principles of marketing.



MSIN3004

Mergers and Valuation

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Looks at motivations for acquistions, valuation methods. financial analysis, tax and accounting issues and strategic considerations of mergers and acquisitions.

MSIN3017

Corporate Financial Strategy

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

This course identifies key finance issues and associated challenges encountered by finance directors, managers involved in strategic financial decision-making, and internal and external analysts and other.

MSIN7007A

Mastering Entrepreneurship

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

A course for those who are considering forming their own business or who envisage having a role promoting new initiatives within existing organisations.

MSIN7007B

Mastering Entrepreneurship

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

A course for those who are considering forming their own business or who envisage having a role promoting new initiatives within existing organisations.

MSIN7011

International Business

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

Provides a framework for understanding and dealing with the major issues faced by companies with special attention paid to strategies for entering emerging markets.

MSIN7013

Innovation Management

Availability	Fall Term
Credit Value	4 (US)
	7.5 (ECTS)

Provides an understanding of the main issues in innovation management, an awareness of the key features of success, and an appreciation of the skills needed to manage innovation.

MSIN7015

Operations and **Technology Management**

Availability	Spring Term
Credit Value	4 (US)
	7.5 (ECTS)

This course provides a foundation for understanding the operations of a firm including the design and management of the processes that transform inputs into finished goods or services.

MECHANICAL ENGINEERING

The department is known for its informal style of teaching. We aim to take students of a high standard and equip them with skills of analysis and design such that they can be employed as professional engineers in virtually any sector of the mechanical engineering industry.

Why study Mechanical Engineering at UCL?

The first professor of engineering in the UK was appointed at UCL in 1827 with the Department of Mechanical Engineering being the first to be established in England in 1847. Since this time the department has made many lasting contributions in areas ranging from aerospace and automotive engineering to naval architecture and bioengineering, continuing to this day through collaboration with industry and research establishments.

What you will gain from study at UCL

The expertise and range of courses we offer is very diverse, with major branches in mechanical engineering, naval architecture, marine engineering, engineering with business finance and bioengineering. With an international reputation for research you can be certain our courses are relevant to current and future needs.

Teaching and Assessment

Most courses consist of a lecture and tutorial each week, in the first and second terms, as well as two or three laboratory practicals scheduled throughout the year. A three-hour written examination is scheduled in the third term. Alternative assessment is offered for semester-only students.



Extended descriptions of the courses available can be found by visiting the web address at the top of this page

Contact Name

Dr Adam Wojcik **EMAIL**

ugadmissions@meng.ucl.ac.uk TEL +44 (0)20 7679 7178

Availability

Year Fall Term

Tuition Fees

£18,500 (for full explanation of tuition fees please see page 165)

STUDENT VIEW

Thomas Friberg

University of Western Australia

My primary reason for choosing UCL was its central London location and the music opportunities that are available there. I sing a lot in my spare time and having culture at my fingertips is an amazing addition to the quality education of UCL

Having some grades from the UK from such a well-regarded university will put me in good stead for future employment, as not only does it show that I am comfortable in new study environments, it will also prove that I can compete amongst the best.



LEVEL 1 COURSES

MECH1001

Mechanics of Fluids

Year, Fall Term Availability 2/4 (US) Credit Value 3.75/7.5 (ECTS)

Covers the basic equations of motion for fluid flow and applies them to flows in pipes and channels, and past bodies immersed in flowing fluids.

MECH1002

Thermodynamics

Year, Fall Term Availability Credit Value 2/4 (US) 3.75/7.5 (ECTS)

This course deals with fundamental theories governing engine, heat pump and refrigerator behaviour.

MECH1003

Engineering Drawing

Availability	Fall Term
Credit Value	2 (US)
	3.75 (ECTS)

This course will develop your skills in producing engineering drawings, by hand and using CAD software, and teaches you about basic components such as bearings and screws.

MECH1004

Computing

Availability	Year, Fall Term
Credit Value	2/4 (US)
	3.75/7.5 (ECTS)

Introduces the principles of digital computing, the elements of computer hardware and the nature of different types of software and computer languages.

MECH1005

Engineering Design

Availability	Spring Term
Credit Value	2 (US)
	3.75 (ECTS)

This course deals with the philosophy and processes of designing engineering components and systems from concept to realisation.

MECH1006

Materials and Mechanics of Deformable Bodies

Availability	Year, Fall Term
Credit Value	2/4 (US)
	3.75/7.5 (ECTS)

This is an introductory course in materials science and in the mechanics of materials, with the content split evenly between these two topics.

MECH1007

Applied Electricity

Availability	Year, Fall Term
Credit Value	2/4 (US)
	3 75/7 5 (FCTS)

Covers basic electric circuit theory, power distribution, motors and initial discussion of instruments and transducers; some previous exposure to some of these topics is desirable.

MECH1008

Applied Mechanics

Availability	Year, Fall Term
Credit Value	2/4 (US)
	3.75/7.5 (ECTS)

Applied Mechanics continues the topics of statics and dynamics that you will be familiar with, dealing with more realistic examples rather than idealised systems.

MECH1010

Modelling and Analysis in Engineering I

Availability	Year, Fall Term
Credit Value	2/4 (US)
	3.75/7.5 (ECTS)

Teaches the basic mathematical tools required for engineering with the emphasis placed on the application rather than addressing the topics as abstract mathematics.

LEVEL 2 COURSES

MECH2002

Applied Electricity and Instrumentation

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

This course addresses aspects of instrumentation in mechanical engineering and a prerequisite for this course is a pass in MECH1007 or similar experience.

MECH2003

Engineering Design

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

This course concentrates on design methods applied to systems. Teaching includes how to choose the best combination of components to form an engineering system.

MECH2004

Mechanics of Fluids and Thermodynamics

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

This course builds on the knowledge gained from the introductory courses: MECH1001 and MECH1002; passes in these courses or similar experience are prerequisites.



MECH2005

Stress Analysis

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

This course builds on the knowledge gained from the statics component of MECH1008; a pass in this course or similar experience is a prerequisite.

MECH2006

Dynamics and Control

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

Builds on the dynamics covered in MECH1008 and covers, at an introductory level, control theory; a pass in MECH1008 or similar experience is a prerequisite.

MECH2011

Materials and Design Studies

Availability	Year
Credit Value	4 (US)
	7.5 (ECTS)

An intermediate level course in materials science, failure of materials and how these relate to design. It is possible to take this course simultaneously with the introductory level course: MECH1006 if required.

Please note: Some Level 3 and Level 4 courses may be available on consultation with the Affiliate Tutor (see page 93 for contact details).