

COLLEGE OF ENGINEERING

College of Engineering

Coláiste na hInnealtóireachta



National University of Ireland, Galway
Ollscoil na hÉireann, Gaillimh

*Embrace life, embrace knowledge,
embrace the future with NUI Galway!*

UNDERGRADUATE HONOURS DEGREE PROGRAMMES AND ENTRY REQUIREMENTS

The College offers full-time four year programmes leading to the Bachelor of Engineering (B.E.) degree in the specialisations listed, and full-time four year programmes leading to the Bachelor of Science (B.Sc.) in Information Technology and in Project and Construction Management. Students beginning an undergraduate degree programme must satisfy the minimum entry requirements and also any additional programme requirements for particular programmes. For the purpose of allocation of places, eligible applicants are ranked in order of performance at school leaving examinations according to the scoring scheme.



CAO CODE	PROGRAMME	MINIMUM ENTRY REQUIREMENTS	ADDITIONAL REQUIREMENTS
GY401	Engineering (Undenominated)	Minimum Grade HC3 in two subjects and passes in four other subjects at H or O level in the Leaving Certificate including: Irish, English, another language*, Mathematics, a laboratory science subject i.e. Chemistry, Physics, Biology, Physics with Chemistry (joint) or Agricultural Science and any other subject recognised for entry purposes.	In addition, students must pass the Special Engineering Entrance Examination in Mathematics** or be exempted therefrom by obtaining a minimum of Grade C3 in the Higher Level Leaving Certificate paper in Mathematics. (This applies to all Engineering courses except B.Sc. in Information Technology and B.Sc. Project and Construction Management)
GY402	Civil Engineering		
GY403	Electronic Engineering		
GY404	Industrial Engineering		
GY405	Mechanical Engineering		
GY406	Electronic and Computer Engineering		
GY408	Biomedical Engineering		
GY409	Environmental Engineering		
GY410	Project and Construction Management (B.Sc.)		HD3 or OB3 in Mathematics.
GY350	Information Technology		OA2 or HC3 in Mathematics or, alternatively, a pass in a Special Mathematics Entrance Examination approved by the Faculty of Engineering will be acceptable**

*Students who are certified to the University by an appropriate professional authority as having a serious hearing impairment are exempt from the 'third language' requirement, and are permitted to matriculate as follows: Irish or English and any five other subjects recognised for Matriculation registration purposes provided Faculty requirements are otherwise satisfied.

** The University holds an Engineering Mathematics Examination in August each year for entry to the Engineering programmes. Candidates who reach the appropriate standard thereat are deemed to have satisfied the Mathematics requirement. Application forms and details are available from the Admissions Office.



GY401 is offered to students who have decided to pursue their studies in the engineering field and who wish to qualify as professional engineers but are as yet uncertain as to the field in which they wish to specialise. On successful completion of the First University Examination in Engineering such students may apply to transfer to one of the programmes GY402, GY403, GY404, GY405, GY406, GY408 or GY409. Whilst every effort will be made to allow each student to transfer to the programme of his or her choice, allocation of places may be based on overall performance at the First University Examination in Engineering and/or CAO points at entry.

Programmes GY402, GY403, GY404, GY405, GY406, GY408 and GY409 are offered to students who have specific career aspirations and wish to pursue definite courses of study leading directly to professional careers in the fields indicated. The University's B.Sc degree in Information Technology (GY350) is a four year programme that specialises in the theory and practice of Information Technology. The University's B.Sc. degree in Project and Construction Management (GY410) is a four year programme that specializes in the theory and practice of the management of projects, particularly in the construction sphere.

EXAMINATIONS

University examinations are held in each of the four years of all programmes. Second, Third and Fourth Year courses are semesterised and examinations are generally, but not always, held at the end of the semester in which the course is offered. First year examinations may be held at the end of semester I or at the end of semester II. Students must pass the examination in each year before being allowed to proceed to the programme of the following year. In general, a candidate is allowed up to a maximum of two calendar years for the satisfactory completion of each year of the programme.

Professional Experience Programme (PEP)

The College of Engineering at NUI Galway incorporates a Professional Experience Programme (PEP) in all its undergraduate programmes of study. Following completion of their third year of study, students undertake a five-month (April-August) off campus work-based learning programme. In the event that no external placement is available, students will be given projects on campus by their department. PEP gives undergraduate students an opportunity to work on projects, relevant to their course of study. PEP is an integral part of the third year programmes of study and all students must complete a PEP module prior to graduation. Following PEP students return to the University for their final year of study.

The NUI Galway work-based training programme gives participating students a practical appreciation of the needs and modus operandi of industry and so improves significantly their prospects of obtaining employment after graduation. Companies and organisations from the Building and Civil Engineering, Local Authorities, Consulting Engineers, Healthcare, Electronic, Software, Insurance, Banking and Financial sectors partake in the programme. The majority of students are placed within Irish companies and enterprises; however in approved circumstances overseas placement is possible.

Structure of Programmes

CIVIL ENGINEERING

Civil Engineering is concerned with our living environment, with making the world habitable.

The work of the Civil Engineer is most visible in the structures in which we live and work. These are sometimes dramatic and exciting, as in the case of the Sydney Opera House, the Millennium Dome, or ever longer and lighter bridges. Equally important to society is the less visible contribution of the Civil Engineer in the form of complex water supply and sanitation systems for our ever growing cities, and transportation systems - subways, highways, railways, airports, harbours. These call for the professional skills of the Civil Engineer in their planning, design, construction, management, maintenance and renewal. These works reflect the creativity, understanding of forces, materials and construction technology developed during the education and training of the Civil Engineer. Imagination, scientific, technical and organisational skills all play a part in the formation of the Civil Engineer, with Information Technology making an increasingly important contribution. Communication and presentation skills are central: Civil Engineering entails a high degree of interaction with clients, other professionals and the public.

The Civil Engineering degree programme at NUI Galway sets out to develop the scientific, technical, organisational, IT and communication skills needed for a satisfying and rewarding career as a Civil Engineer.

THE CIVIL ENGINEERING PROGRAMME AT NUI Galway

In your first year, the mathematical and scientific basis for a career in Civil Engineering will be established through lectures

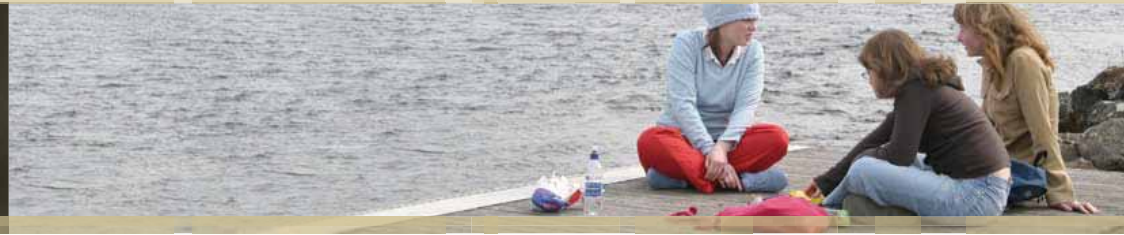
and practical work in Physics, Chemistry, Mathematics and Mathematical Physics. Civil Engineering is introduced through courses in Fundamentals of Civil Engineering, Surveying, Engineering Graphics, Computing and Computer Aided Drawing.

Your practical and theoretical basis in Civil Engineering is expanded in second year through courses relating to structures and buildings, as well as courses on Hydraulics and Geology. You have the option of taking French or German courses to broaden your career opportunities, and your practical work will include extensive use of CAD - Computer Aided Design.

In third year Civil Engineering, you are introduced to Highway and Traffic Engineering, Construction Operations, Soil Mechanics and Environmental Engineering, as well as the Design of Structures in steel and concrete. The academic session in the third year finishes early - at Easter - to permit you to start a 21 week placement in the Professional Experience Programme (PEP). You will be employed by a company, in Ireland or overseas, and given an opportunity to apply the knowledge you have acquired in your programme at NUI Galway in a practical business or industry setting. The PEP provides you with a taste of the world of Civil Engineering, allowing you to work alongside qualified Civil Engineers, providing solutions to real problems - and being paid for it!

In the final year of your programme, you will be able to choose from a range of optional subjects, depending on your interests. These options include Offshore and Coastal Engineering, Project Management, Highway and Traffic Engineering, Computational Methods, Hydrology and further Structures courses.

Throughout the four years, lecture courses are supplemented by laboratory and project work, culminating in a major project in final year on a subject of your own choosing. There is an emphasis throughout on the development of communication



and presentation skills. From first year onwards your Information Technology skills are developed, through applications in report writing, data presentation, engineering analysis, CAD and engineering programming.

CAREER OPPORTUNITIES

There are world wide, and enormously varied and exciting career opportunities for the Civil Engineering graduate of NUI Galway. Civil Engineers are needed to meet the constant demand for Structures, Transportation and Public Health Systems as well as in areas such as Offshore and Coastal engineering. Civil Engineers are employed in the private sector - as consultants or contractors - and in the public sector in Government Departments, Semi-State Organisations and Local Authorities.

ENVIRONMENTAL ENGINEERING

Environmental Engineering is concerned with one of the most basic requirements of civilised living - the provision of clean water. The Environmental Engineer is involved in all aspects of the cycle of water supply and purification, and is also concerned with the treatment and safe disposal of the large quantities of waste generated in our society. The Environmental Engineering programme reflects the industry requirement for a greater number of suitably qualified graduates in this area.

THE ENVIRONMENTAL ENGINEERING PROGRAMME AT NUI Galway

In your first year, the mathematical and scientific basis for a career in Environmental Engineering will be established through lectures and practical work in Physics, Chemistry, Mathematics and Mathematical Physics. Environmental Engineering is introduced through courses in Fundamentals of Environmental Engineering, Surveying, Engineering Graphics, Computing and Computer Aided Drawing.

Your practical and theoretical basis in Environmental Engineering is expanded in second year through courses in Microbiology, Hydraulics and Geology, as well as courses relating to structures and buildings. Your practical work will include extensive use of CAD - Computer Aided Drawing.

In the later years, Environmental Engineering focuses more closely on the disciplines required in the rapidly growing specialism of Environmental Engineering.

Some of the courses in Environmental Engineering are: Design of Water, Wastewater and Waste Systems, Water Management, Airborne Pollution, Analytical and Environmental Chemistry, Planning and Law and Environmental Engineering Systems. In addition, the programme includes courses dealing with Structural Analysis and Design.

The academic session in the third year finishes early - at Easter - to permit you to start a 21-week placement in the Professional Experience Programme (PEP). You will be employed by a company, in Ireland or overseas, and given an opportunity to apply the knowledge you have acquired in your programme at NUI Galway in a practical business or industry setting.

The PEP provides you with a taste of the world of Environmental Engineering allowing you to work alongside qualified Environmental Engineers, providing solutions to real problems - and being paid for it!

Throughout the four years, lecture courses are supplemented by laboratory and project work, culminating in a major project in final year on a subject of your own choosing. There is an emphasis throughout on the development of communication and presentation skills. From first year onwards your Information Technology skills are developed, through applications in report writing, data presentation, engineering analysis, CAD and engineering programming.

CAREER OPPORTUNITIES

There are world wide, and enormously varied and exciting career opportunities for the Environmental Engineering graduate of NUI Galway. Environmental Engineers are needed to meet the constant demand for Public Health Systems. Environmental Engineers are employed in the private sector - as consultants or contractors - and in the public sector in Government Departments, Semi-State Organisations and Local Authorities.

ELECTRONIC ENGINEERING

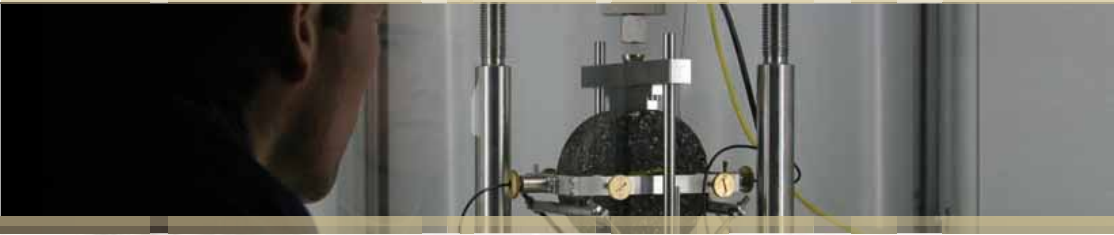
Of all professions, Electronic Engineering is the one that provides the best opportunities for defining the technologies required for our future needs, including communication, entertainment, energy and healthcare. Whether it's the design of new computer chips or communication systems to control the ever increasing flow of information between mobile phone users around the world, or the development of power and electronic circuits to increase the length of time that batteries for the same mobile phones last, Electronic Engineers have a wide range of career options to choose from - and that's only for the future of mobile phones !

Electronics covers a wide range of exciting modern developments ranging from microscopic electronic circuits and machines, mobile and computer communications, advances in medical diagnosis and treatment, development in the latest audio and video technologies, through to pursuit of energy efficient devices, use of natural resources for electricity generation, and technological advances in power distribution.

The Electronic Engineering and Electronic & Computer Engineering degree programmes at NUI Galway provide graduates with an excellent foundation in all the important areas of science, engineering and technology required to design and develop such existing products and to invent future products that are yet to be created.

While the manufacture of electronic products offers several significant and interesting challenges, this is not the primary role of an Electronic Engineer. Nor is it the focus of government in attracting future jobs and investment to Ireland. Instead, the government's new strategy for Science, Technology and Innovation aims to devote significant resources to supporting enterprise research and development, in both the indigenous and multinational sectors. Clearly, in this high-tech environment, there is an increasing need for Electronic Engineers, who focus on the knowledge-based design and development of electronic circuits at a range of different levels. For example, many graduates work in the area of computer hardware, designing the insides of tiny micro-chips that are the heart of every electronic device. Others are responsible for developing electronic systems, such as PCs, robotics and consumer electronic equipment such as mobile phones. Electronic engineers are also responsible for writing the computer programmes - or software - that control the operation of computer and electronic systems. Telecommunications is an important application area of electronic engineering; it involves the development of new computer hardware and software to allow people or computers to communicate and exchange information. Mobile telephone networks, the Internet and video phones are all examples of appliances and systems in the telecommunications field that have been designed and built by electronic engineers, and which have fuelled Ireland's growing economy in the recent past.

Courses covering all topics described above are provided in common to both degree programmes available at the Department of Electronic Engineering. In relation to energy, the programme in Electronic Engineering also covers the area of Electrical Engineering, which includes the understanding of how electricity is generated in power stations and then distributed around the country. It also involves the design of associated electrical equipment. Graduates can find careers in the design of new electricity generating systems that are more efficient or more



ecologically friendly than existing ones, and in the development of new methods for distributing electricity around the country while minimising the risk of supply failure. Power Electronics and Control Systems are other specialities of the Electronic Engineering programme. Power Electronics deals with the control and processing of electrical energy in a wide range of situations, such as powering micro-processors for computing applications to providing a reliable supply of electrical energy to all the automotive electronics that are present in the modern car. Control systems involves the design of electronic circuitry, components and software to control the movement and operation of many types of engineering systems; e.g. the Anti-lock Braking Systems (ABS) found on most modern cars or the sophisticated electronic systems found on all modern air and space craft, which effectively control the motion of the craft, and hence the comfort and safety of the passengers !

With such a wide range of application areas, a degree in Electronic Engineering from NUI, Galway will provide you with diverse and varied career options in the rapidly changing area of electronics and technology. The degree is accredited by Engineers Ireland, which means that it is recognised professionally throughout the world. It is particularly suited to those who have strong mathematical and analytic skills, and who enjoy problem solving.

THE ELECTRONIC ENGINEERING PROGRAMME AT NUI Galway

FIRST YEAR

The first year of the Electronic Engineering programme at NUI Galway is primarily aimed at equipping you with a basic knowledge of Physics, Chemistry and Mathematics. You will also be given a comprehensive introduction to computer programming and electronic circuitry. The practical skills associated with each of these subjects will be put into practice through interesting and challenging laboratory exercises.

SECOND AND SUBSEQUENT YEARS

As you progress through the Degree Programme you will be exposed to more and more advanced electronic engineering concepts. Your design skills in the areas of both analogue and digital electronics will be developed. These skills will be coupled with advanced topics such as microelectronic chip design, computer network and telecommunication systems and microprocessor systems. Electrical power and machines, power electronics and control systems are specialist subjects of the Electronic Engineering programme. Project and laboratory work will allow you to apply this knowledge to real engineering problems.

You will also be introduced to a variety of software packages and programming languages (e.g. Visual C++ and Visual Basic) and many of your projects will involve both software and hardware elements. The Electronic Engineering programme at NUI Galway prepares you to work as an individual and as part of a team. The need for good management skills along with the ability to communicate professionally with supervisors and other project team members is emphasised throughout the programme and you will be given instructions in both oral and written presentation techniques.

At the end of your third year, you will spend 5 months taking part in a Professional Experience Programme (PEP). You will be employed by a company, in Ireland or overseas, and given an opportunity to apply the skills and knowledge you have learned at NUI Galway in a practical business or industry setting. The PEP gives you a taste of what the real world of Electronic Engineering is all about and allows you to see Electronic Engineers at work, designing solutions to real problems.

In final year each student will carry out a major design project. This project often involves an extension of work carried out during the PEP or, alternatively, a new design task. Your project in Final Year Electronic Engineering at NUI Galway can involve hardware or software or, as often is the case, a mixture of the two. The project

culminates in the production of a bound report presented to the highest professional standard detailing a technical description of your project and your achievements in addressing the overall aims of the project. This type of project work primarily develops your technical skills but also tests your ability to manage projects and communicate your thoughts and ideas to others - skills that are essential for a successful career in industry after you graduate from the Electronic Engineering programme.

CAREER OPPORTUNITIES

A degree in Electronic Engineering from NUI Galway offers a passport to career opportunities in the world's largest and fastest growing industries. Graduates of the Electronic Engineering degree programme have excellent fundamental knowledge of all of the major areas in the electronics industry, ranging from electrical engineering and power electronics, to computer programming and telecommunications. These graduates are in very high demand from companies working in all of these industry sectors. With recent government commitments to increased research funding, it is expected that this demand will become even greater as Ireland develops a knowledge based economy.

INDUSTRIAL ENGINEERING

So what does an industrial engineer do?

There is no such thing as a typical industrial engineer. While many people might have an idea of the type of work involved in the other branches of engineering, industrial engineering is more elusive. In many ways, however, it is that elusiveness that makes it so attractive as a career. Broadly speaking, an industrial engineer's task is to create the conditions in which industry and business can thrive. That can involve designing more efficient equipment and processes; creating safer and more pleasant working environments; maximising productivity; setting quality standards; or researching new products.

Employers love industrial engineers because their skills can be applied in so many different areas. This flexibility is reflected in the varied paths that our graduates have taken. They have built successful careers in the areas of, healthcare, aeronautics, pharmaceuticals, biotechnology, human resources, the environment, telecommunications, information technology, management. To see some graduate career profiles go to our web site at <http://indeng.nuigalway.ie> and click on 'Career Profiles' on the left side of the home page.

THE INDUSTRIAL ENGINEERING PROGRAMME AT NUI Galway

FIRST YEAR

In common with all other NUI Galway engineering programmes, first year is largely a pre-engineering year, with a focus on the basic sciences, drawing and computing. There are also factory visits, laboratory practicals and tutorials. Students take an induction course that allows them to get to know each other, the Industrial Engineering Department and various research activities.



SECOND AND SUBSEQUENT YEARS

The following is a sample of courses/subjects in the other 3 years of the programme:

- Production Systems
- Work Study
- Engineering Design
- Organisational Behaviour
- Strength of Materials
- Logistics
- Database Applications
- e-Systems
- Operations Research
- Quality
- Ergonomic Design of the Workplace
- Microprocessor Systems
- Human Body Structure
- Networks & Communications
- Computer Integrated Manufacturing
- Systems Simulation
- Oral & Visual Communication
- Human and Systems Reliability
- Management Accountancy
- French/German
- Industrial Psychology
- Marketing Principles
- Business Finance

CAREER OPPORTUNITIES

Many of the top corporations have one thing in common. Every one has employed graduates of NUI Galway's Industrial Engineering Programme. Not only does the programme offer graduates excellent employment prospects but it also gives them the opportunity to work in a variety of exciting areas. The programme is long established and highly regarded by employers. Because of its broad nature, and the resultant flexibility of the students, there has always been a strong demand for

graduates. Recent significant growth in the industrial sector has led to even greater opportunities. Employers of Industrial Engineering graduates include: multinational manufacturers in the Electronics, Telecommunications, Food, Biomedical & Healthcare and Engineering sectors; small indigenous Irish suppliers to these companies; Computer Hardware and Software companies and the Services sector - Banking, Management Consultants, Recruitment Agencies, Tourism, Teaching, etc. Graduates have secured jobs as Industrial Engineers, Productivity Specialists, Industrial Designers, Manufacturing Engineers, Process Engineers, Quality Managers, Safety Engineers, Systems Analysts, Software Programmers and Training Managers. Many go on to set up their own businesses. Some graduates choose to complete postgraduate programmes before embarking on their professional careers. (as seen on our web site under career profiles). The Industrial Engineering Department has a wide range of postgraduate programmes on offer. Again, because of the broad nature of the programme, graduates of the Industrial Engineering programme can also participate in postgraduate activity in many other NUI Galway academic departments, and further afield. The programme in Industrial Engineering is an accredited degree programme of the Institution of Engineers of Ireland.

MECHANICAL ENGINEERING

Engineers are the people who apply science for the benefit of mankind. Virtually everything you buy or use has had an engineer involved in its design and production. Mechanical Engineers design and develop everything you think of as a device or machine, from something as simple as a can opener to a modern jet aircraft. They are concerned with all types of machines and devices such as those used in home appliances (refrigerator, central heating, dishwasher), engines and other components used in transportation (cars, buses, trains, boats and aircraft), power conversion equipment such as steam and wind turbines used in modern electric power plants and processing equipment used in oil and gas rigs. Mechanical Engineers also design the tools and processes necessary to make all man-made products, from tractors for agriculture, robots to assemble cars, material handling systems (e.g. automatic guided vehicles), to methods to melt and shape metals and plastics, and tools to assemble circuit boards.

The engineer must be knowledgeable in basic science and engineering topics which include; design, materials, fluid mechanics, thermodynamics, manufacturing processes. Modern day Mechanical Engineers make intensive use of computers. Typical examples are CAD (Computer Aided Design), analysis and visualisation of complex heat-transfer problems (e.g. radiation in solar heating) or fluid mechanics problems (e.g. what will be the flow around a new propeller) and simulation (e.g. being able to simulate how a proposed new vehicle will behave in a crash).

The challenge facing the Mechanical Engineer is the constant demand for newer, better, faster, more reliable, more versatile, longer lasting and more environmentally friendly products and processes. Their technical competence must be complimented by managerial and personal skills required to interact with teams. The basic training in Mechanical Engineering is a sound foundation for a

career in design, research and development, consultancy, technical sales and management.

THE MECHANICAL ENGINEERING PROGRAMME AT NUI Galway

FIRST YEAR

Your first year as a Mechanical Engineering student will give you a grounding in the basic sciences (Chemistry, Physics and Maths Physics) and expand your knowledge of Mathematics. You will also be introduced to important areas in Mechanical Engineering such as heat and energy, engineering materials, technical drawing. Computer software and computer programming necessary for modern Mechanical Engineering will also be introduced.

SECOND AND SUBSEQUENT YEARS

Successfully completing First Year you will spend the next 3 years exploring the areas of fluids, heat, energy, materials, electronics, automation, machine and product design and computer-aided engineering. You will also learn how to apply your ever-increasing knowledge to real situations. You will be involved in projects as an individual and as part of a team, in which you will have opportunities to use your skills and knowledge to solve real problems. These projects are designed to encourage you to act on your own initiative, come up with and apply your own ideas, co-operate with the other members of your team and be able to make maximum use of the skills of each team member.

Mechanical Engineering students are also trained in the non-technical areas of communications, management, finance and languages. Writing reports and making presentations will be an integral part of your job as a Mechanical Engineer and you will be taught how to do both in an effective and professional manner. You will be given an introduction to personnel management and finances to prepare you for your career and you will have the option of studying a European language. After your Third Year, you will spend 5 months on a Professional Experience Programme.



The PEP gives you a taste of what the real world of Mechanical Engineering is all about. You will be employed by a company and given a chance to apply the skills and knowledge you have learned at NUI Galway in a practical business or industry setting.

In Final Year you will undertake a specific project. This project is very often based on actual engineering problems students encounter during their PEP.

CAREER OPPORTUNITIES

Career opportunities exist for Mechanical Engineers in research, design, project management, environmental protection, energy production, technical sales, computer-aided engineering, process control, manufacturing, aeronautics, materials and product development.

ELECTRONIC AND COMPUTER ENGINEERING

Electronics and computers are playing an ever increasing role in our lives, with everything from consumer goods to satellites using both electronic hardware and computer software. Successful companies who design such systems, particularly in the telecommunications, computer and information technology industries, increasingly require engineers who are equipped with software skills to complement traditional electronic hardware skills. The Electronic and Computer Engineering programme at NUI Galway was introduced in 1997 to meet unprecedented demand for engineers with combined skills in computer software, hardware and computer systems. The programme covers the main core subjects of Electronic Engineering with emphasis on new computer software courses, micro-chip design, computer communications and multimedia applications.

By having a full understanding of both hardware and software applications, the Electronic and Computer Engineering graduate can design and develop systems that maximise the potential of both areas. Electronic and Computer Engineers design individual computer chips to perform specific functions; complete electronic systems that may use many such chips; and the software to enable the various elements to work together to achieve a given result.

Telecommunications and computer networks, as well as consumer appliances such as mobile phones, PCs, electronic personal organisers and home or personal audio and video entertainment systems, are also designed by electronic and computer engineers.

BIOMEDICAL ENGINEERING

The Biomedical Engineer extends an engineer's natural curiosity about how things work to include the human body. Biomedical Engineers design and create machines, devices, instruments and materials to enable the Medical Profession to diagnose disease and repair or replace damaged living tissue. Using traditional and modern engineering principles, modern technology and biology, the Biomedical Engineer assists clinicians to sustain or improve life. The introduction of the Biomedical Engineering programme at NUI Galway is a result of the need within the Biomedical Industry for highly skilled personnel. Local biomedical companies - with interests ranging from minimally invasive surgical devices to tissue and materials engineering - were closely involved in the planning and design of the programme.

Biomedical Engineers are challenged to make certain that the advances in technology keep pace with the advances in medicine and that the diagnostic, life-support or life-enhancing tools they create remain compatible with the human body.

The Biomedical Engineering programme addresses the foundation of biological disciplines by exposing the students to the concepts of anatomy, pathology, cell biology and surgery. Biomedical Engineering is offered within the Mechanical and Biomedical Engineering Department and is run in collaboration with the Medical and Health Science College.

Students take many courses in common with Mechanical Engineering students, especially in the first two years.

THE BIOMEDICAL ENGINEERING PROGRAMME AT NUI Galway

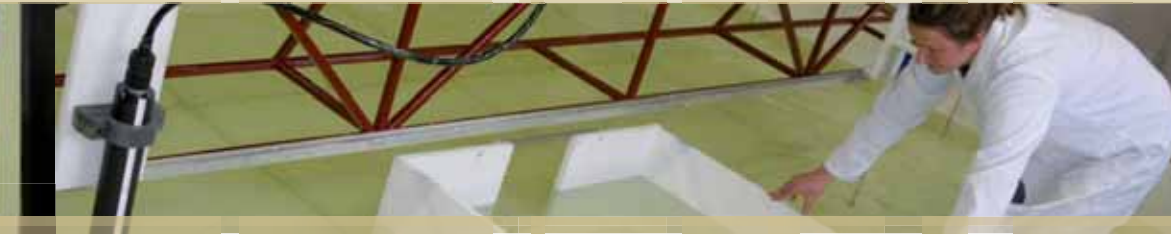
FIRST YEAR

Your first year as a Biomedical Engineering student will give you a grounding in the basic sciences (Chemistry, Physics, Biology and Cellular Processes) and expand your knowledge of Mathematics. You will also be introduced to important areas in Mechanical Engineering such as heat and energy, engineering materials, technical drawing, computer software and computer programming.

SECOND AND SUBSEQUENT YEARS

After successfully completing the 1st year of the course, you will spend the next three years building your foundation of engineering by exploring the areas of transfer theories (fluid, heat, energy) materials, electronics, automation, machine and product design and computer-aided engineering. You will also be given tools to make the linkages between these engineering principles and the biological applications by exploring the fields of biomaterials, biomechanics, tissue engineering and design of medical devices.

As a Biomedical Engineering student you will also learn biology, human body structure and function, biomechanics, biomaterials and the design and production of medical devices. You will also learn how to apply your ever-increasing knowledge to real situations. You will be involved in projects - as an individual and as part of a team - in which you will have opportunities to use your skills and knowledge to solve real problems. These projects are designed to encourage you to act on your own initiative, come up with and apply your own ideas, co-operate with the other members of your team and be able to make maximum use of the skills of each team member. The projects for Biomedical Engineering students are based on topics related to the biomedical industry and medical profession. Writing reports and making presentations will be an integral part of your job as a Biomedical Engineer and you will be taught how to do both in an effective and professional manner. You will be given an introduction to personnel management and finances to prepare you for your career and you will have the



option of studying a European language.

After your 3rd year you will spend 5 months taking part in a Professional Experience Programme (PEP). You will be employed by a company, in Ireland or overseas, and given an opportunity to apply the skills and knowledge you have learned at NUI Galway in a practical business or industry setting. The PEP gives you a taste of what the real world of Biomedical Engineering is all about and allows you to see Biomedical Engineers at work, designing solutions to real problems.

In Final Year you will undertake a specific project. This project is very often based on actual engineering problems students encounter during their PEP.

CAREER OPPORTUNITIES

There has been major expansion in the Biomedical Industry in recent years, locally, nationally and internationally. The demand for suitably qualified personnel still far exceeds the supply. Biomedical engineers are employed in industry, universities, hospitals, research facilities, educational and medical institutes, teaching and government regulatory agencies. In industry, they may create designs where an in-depth understanding of technology and living systems is essential. They could be involved in performance testing of new or proposed products as well as establishing safety standards for devices. In a hospital, the Biomedical Engineer may provide advice on the selection and use of medical equipment as well as supervising performance testing and maintenance. They may also build customised devices for special health care or research needs. In research institutions, Biomedical Engineers supervise laboratories and equipment and conduct or direct research activities. Some Biomedical Engineers are technical advisors for marketing departments and some are in management positions.



BACHELOR OF SCIENCE IN PROJECT AND CONSTRUCTION MANAGEMENT

Project Management may be defined as the overall control and coordination of a project from inception to completion aimed at meeting a promoter's requirements on time, within costs and to required quality standards. A project is a combination of human and non-human resources brought together in a temporary organisation to achieve a specific purpose. As a discipline in its own right, Project Management has gained significantly in stature in the last decade or so because it effectively deals with the management of change. Project Management has its origin in Civil Engineering, particularly in the area of Construction Management. Now it has spread into almost every sector of industry and commerce. Project Management differs from ordinary management in that it takes change and risk specifically into account, as opposed to "non-projects" which to some degree represent "work as usual".

The future of Ireland's competitiveness will be dependant to a large extent on how quickly Project Management methods and systems can be adopted and applied in a high cost economy. Fortune magazine rates Project Management as the No. 1 career choice through the beginning of the 21st century.

The Irish Engineers Journal November 2000 states: "In order to fulfil its potential for cranking up organisational competitiveness and strategic success, those responsible for Project Management in organisations recognise two requirements:

- i) The need for individuals to have the required skills to manage the projects assigned to them and
- ii) The need for organisations to manage the bulging portfolio of projects that is engulfing it."

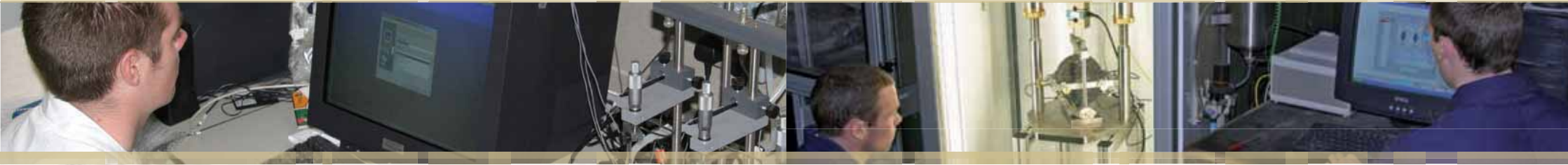
CONSTRUCTION MANAGEMENT

The construction industry in Ireland is currently enjoying an unprecedented period of activity. This is placing an enormous burden on all sectors of this industry and the demand for professionals in this area is extremely high. In addition, the industry has seen many rapid changes with the advent of new technologies, the extensive use of computer based techniques. Added to this are the exciting developments in new materials with enhanced performance. There is also the interdisciplinary challenge with a blurring of boundaries between traditional roles. This has resulted in the demand for highly trained, and sought after graduates with the capacity to apply problem solving skills across a growing and diverse number construction specialisations.

Construction Management is the study of how projects are conceived, designed and built; the types of materials and methods used; techniques for estimating the cost of construction; design and contract law; accounting and financial management; oral and written communications; safety requirements and specifications and project planning. Graduates must now have an appropriate mix of technical, business, managerial and interpersonal skills to succeed in this industry.

Construction management skill sets include the ability to:

- read and interpret construction contract documents
- determine appropriate methods for project construction and the sequence for each associated construction task
- estimate project costs and time requirements
- determine construction site safety hazards and to ensure that the potential for accidents is minimised
- understand the legal framework associated with all aspects of the construction project
- manage the myriad of activities associated with a construction project.



The programme goals and objectives of the B.Sc. degree in Project and Construction Management at NUI, Galway are as follows:

- Provide a high-quality educational experience that prepares graduates to be capable of assuming technical, management, academic and research/development level positions in the construction industry.
- Provide a stimulating learning environment where students acquire the high quality skills and knowledge necessary for identifying and resolving problems in the management of engineering related projects and activities.

On completion of the degree programme, graduates will:

- have extensive training through an interdisciplinary curriculum that contains a mixture of technical, managerial, and business modules.
- have acquired significant transferable skills. In addition to management related skills, they will have developed extensive communication skills, innovation, entrepreneurial and leadership skills, problem solving and decision making skills, mediation, negotiation and advocacy skills.
- be highly marketable for the vibrant construction industry.
- have the skills necessary to also engage with project management issues across a range of other industries.
- have developed an ability to progress to postgraduate education (research and taught).
- have achieved the education standards required for membership of the CIOB.

Course Outline:

The basis for Project and Construction Management will be covered in first year with courses in Mathematics, Physics, Surveying, Graphics, Computer Systems, Health and Safety, Accounting, Introduction to Management and Fundamentals of Project & Construction Management.

This will be expanded on in second year with further courses in Computer Applications and Statistics, Management, Operations, Law, Health and Safety, Engineering courses on Materials and Project Management Applications.

In the third and fourth years students will take more professional courses in Project & Construction Management, Operations Research, Organisational Management, Business Law, Management of Human Resources, Innovation and Quality Management.

Throughout the four years, lecture courses are supplemented by computer laboratory and project work, culminating in a major project in final year on a subject of your own choosing. There is an emphasis throughout on the development of communication and presentation skills. From first year onwards your Information Technology skills are developed, through applications in report writing, data presentation, engineering analysis, CAD and engineering programming.

CAREER OPPORTUNITIES

There is no doubt that the construction industry in Ireland is doing extremely well at present. It is clearly evident that graduates of relevant programmes such as in Project and Construction Management, Civil Engineering and Health & Safety Systems are in tremendous demand and have little difficulty in securing direct employment. In addition to the strong focus towards the construction industry, the structure of the curriculum is such that the project management skills will be marketable across a wide range of other industries. In particular, the growth in Ireland of high value added industries such as biopharma will result in heavy demand for project management skills. The demand will be repeated across other high-technology engineering and science industries creating additional markets for graduates of the programme.

POSTGRADUATE PROGRAMMES IN ENGINEERING

Graduates with good Honours Degrees in Engineering and in the B.Sc. Degree in Project and Construction Management from this and other recognised Universities may be admitted to postgraduate study in the College as Ph.D., Master or Diploma students.

Students who enter postgraduate study directly from their undergraduate programmes are normally admitted to the M.Eng. Sc. programme or in some cases to the Ph.D. programme. The M.Eng.Sc. Degree may be obtained by course work with a minor thesis or by research work with a major thesis. Course work M.Eng. Sc. Degrees are available in such areas as Design and Analysis, Industrial Engineering and Information Systems, Applied Operations Research, Computer Integrated Manufacturing, Human Factors Engineering, Quality and Reliability and Mechanical Engineering Design and Analysis. Ph.D. and M.Eng.Sc. Degrees by research are available in the Engineering disciplines of the College.

The Higher Diploma in Engineering, which can provide a modular path, to the Master of Engineering Design (M.E.D.) Degree is designed with the continuing professional education of practising engineers in mind and the Master of Applied Science (M.Appl. Sc.) is available to University graduates from a broad range of disciplines. The Diploma in Quality Assurance, which is of one year's duration, is available to graduates and in some cases to non-graduates.

College of Engineering

National University of Ireland, Galway.

Telephone: 091 524411

Facsimile: College of Engineering:

091 750558

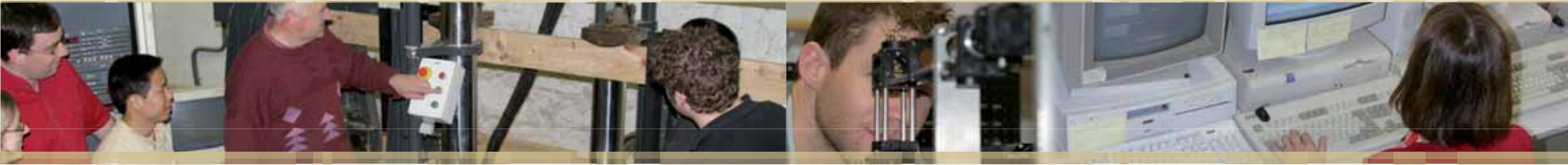
Admissions Office:

091 750436

University Website: www.nuigalway.ie

Engineering College website:

<http://www.nuigalway.ie/engineering/>



QUESTIONS AND ANSWERS

WHAT DO ENGINEERS AND PROJECT MANAGERS DO?

Engineers and Project Managers create tomorrow's technology and environment. They apply scientific principles and common sense to make the world a more interesting, comfortable and safe place to live and work. Engineers and Project Managers integrate a knowledge of Mathematics, natural sciences and modern technology with creativity, communication skills and practical thinking. These challenging and dynamic professions are about finding new and inventive ways, and using tried and tested standard procedures, to anticipate, prevent and solve the problems of the physical world. Engineers and Project Managers are always looking ahead, questioning how things can be improved then analysing, planning and designing a way to make that happen.

IS MATHEMATICS IMPORTANT IF I WANT TO BE AN ENGINEER?

Engineers solve problems by quantifying and, for this reason, Mathematics is the keystone of the profession. You must be fairly comfortable working with Mathematics. The entry requirement for B.E. programmes of the College of Engineering at NUI Galway is a Grade C3 or higher on the Leaving Certificate Honours Maths paper.

However, if you are studying for Pass Maths in the Leaving Certificate, you can still gain entry to B.E. programmes in the College of Engineering by passing the NUI Galway Special Engineering Entrance Examination. The standard of this examination is between the Higher and Lower level Leaving Certificate Mathematics. The Special Engineering Entrance Examination is held during the summer months and you can get the exact date, the syllabus and sample papers from the Admissions Office.

IS MATHEMATICS IMPORTANT IF I WANT TO BE A PROJECT MANAGER?

Mathematics is an important subject for Project Managers. At least Grade D3 in the Higher level paper of the Leaving Certificate, (or its equivalent), or at least Grade B3 in the Ordinary level paper of the Leaving Certificate (or its equivalent), in Mathematics is required for entry to the B.Sc. in Project and Construction Management.

WHAT ABOUT PHYSICS, TECHNICAL DRAWING?

You need one Laboratory Science Subject. This could be Physics, Chemistry, Biology, Physics with Chemistry (joint) or Agricultural Science. You need not have studied Technical Drawing or Computing to start Engineering or Project and Construction Management at NUI Galway.

But won't I be at a disadvantage without those subjects? At NUI Galway the aim of first year is to bring everyone to an acceptable level in Science, Computing and Technical Drawing. Physics, Chemistry, (Engineering only) Technical Drawing and Computing are all taught from first principles assuming little or no prior knowledge. Clearly having covered these topics before is a help but is by no means essential. First year may be easier for those who have covered these subjects at secondary school but by the end of first year, everyone will be on an equal footing.

ARE THERE JOBS FOR ENGINEERS AND PROJECT MANAGERS OUT THERE?

Job prospects are excellent for Engineering and Project Management graduates from NUI Galway. The world is a fast-changing place and will always need Engineers and Project Managers to create new technology and to anticipate, prevent or solve problems. There is a constant demand for NUI Galway Engineering graduates because a Degree in Engineering from NUI Galway is recognised and respected - locally, nationally and internationally.

WHAT ABOUT THE DIFFERENT KINDS OF ENGINEERS?

The Civil Engineer is a problem solver who applies the fundamental laws of science to obtain solutions for a broad range of issues associated with the infrastructure that surrounds us, such as the provision of buildings, transportation systems and water supply.

The role of the Environmental Engineer has expanded dramatically in recent years in response to an ever increasing awareness of our surroundings. The Environmental Engineer develops and applies various techniques to ensure a safe water supply, the prevention of pollution and the disposal of waste.

The Mechanical Engineer applies his/her knowledge of Science and Mathematics in the design of devices and machines. Applications of Mechanical Engineering are all around us. The cars we drive, the airplanes in which we fly, the turbines driving the generators producing our electricity, machinery used on farms and in manufacturing and processing industry, appliances in the home such as central heating and so on.

The Biomedical Engineer extends an engineer's natural curiosity about how things work to include the human body. Biomedical Engineers design and create machines, devices, instruments and materials to enable the Medical Profession to diagnose disease and repair or replace damaged living tissue.

Industrial Engineering is a pathway to a career of unlimited potential. From designing medical and aeronautical equipment, to protecting the environment, to areas as diverse as human relations and management consulting, industrial engineering graduates have been at the forefront of Ireland's economic success over the past decade. To see what graduates do, go to <http://indeng.nuigalway.ie> and click on 'Career Profiles' on the left side of the home page.

Electronic Engineers use sophisticated computers and programmes to design the electronic and electrical products and systems of the future.

Electronic and Computer Engineers focus on computer hardware, software and systems to meet the demand for combined hardware and software design. By having a full understanding of both hardware and software applications the Electronic and Computer Engineer is well placed to design and develop systems that maximise the potential of both areas.

For more details on the various branches of engineering, see the programme description for NUI Galway programmes in this Prospectus.

WHAT IF I DON'T KNOW WHICH PROGRAMME IN ENGINEERING I WANT TO TAKE?

NUI Galway was the first University in Ireland to offer a one year "Undenominated" Engineering programme, in addition to the individual programmes, especially for people who would like more of an insight into all the disciplines within engineering before deciding which career path to follow. Students entering the Engineering College via this route have until the end of their first year to decide which of the denominated B.E. programmes they wish to join. While most students can expect to be assigned to the programme of their choice, this cannot be guaranteed. Allocation of places may be based on overall performance at the First University Examination in Engineering and/or CAO points at entry.

INFORMATION TECHNOLOGY

WHAT IS INFORMATION TECHNOLOGY?

Information Technology (I.T.) refers to applied computer systems, both hardware, and software, as well as networking and telecommunications. It involves the use of electronic devices (such as computers and mobile phones) and computer software to store, process, transmit, retrieve and manipulate information.

I.T. is constantly changing the world around us. Some examples are:

- The home environment is being transformed through the use of computing devices. In addition to PCs, multimedia players, alarm systems and kitchen devices have embedded software and some are controllable via the Internet. More and more people use the Internet for downloading music, shopping, booking holidays, paying car tax, getting involved in online communities, and furthering their education online.
- I.T. has changed how we communicate with each other. We use our telephones to send text messages, take pictures, play games, download music, manage appointments, as well as make phone calls.

- The business world has been transformed using information management tools. Work can be done more quickly, and the ease of access to information means that decisions can be more effective.
- Telemedicine involves the use of I.T. for diagnosis, consultation, treatment, transfer of medical data, and medical education.
- Smart cards, which contain their own microprocessor, are used for storing personal information, hold digital cash, or prove identity.

Graduates in the area of I.T. will have a vital role to play in this continuing revolution. A B.Sc. in Information Technology will equip you with essential skills to become part of the software industry, both in the development of software and the application of computer systems.

I.T. DEGREE PROGRAMME ENTRY REQUIREMENTS

Students beginning an undergraduate degree programme must satisfy the minimum entry requirements and also any additional requirements for particular programmes. For the purpose of allocation of places, eligible applicants are ranked in order of performance at school leaving examinations according to the scoring scheme.

CAO CODE	PROGRAMME	MINIMUM ENTRY REQUIREMENTS	ADDITIONAL REQUIREMENTS
GY350	Information Technology	Minimum Grade HC3 in two subjects and passes in four other subjects at H or O level in the Leaving Certificate including: Irish, English, another language*, Mathematics, a laboratory science subject (i.e. Chemistry, Physics, Biology, Physics with Chemistry (joint) or Agricultural Science) and any other subject recognised for entry purposes.	OA2 or HC3 in Mathematics or, alternatively, a pass in a Special Mathematics Entrance Examination approved by the Faculty of Engineering will be acceptable**

* Students who are certified to the University by an appropriate professional authority as having a serious hearing impairment are exempt from the 'third language' requirement, and are permitted to matriculate as follows: Irish or English and any five other subjects recognised for Matriculation registration purposes provided College requirements are otherwise satisfied.

** The University holds Special Entrance Examinations in Mathematics in the summer months each year for entry to this programme and for entry to the Engineering programmes, respectively. Candidates who reach the appropriate standards thereat are deemed to have satisfied the Mathematics requirement. Application forms and details are available from the Admissions Office.



THE INFORMATION TECHNOLOGY PROGRAMME AT NUI GALWAY

This is a four-year honours degree programme that covers a diverse range of I.T.-related topics, built upon a solid scientific foundation and delivered with a practical, applied focus. Learning is based on lectures, laboratory sessions, tutorials and personal study, from September to May. Examinations are held in December and May/June. In third year, students spend 5 months on a Professional Experience Programme, working in a company or on a business/technical project. In final year, students choose from a number of optional subjects and undertake a major IT project.

PROGRAMME OBJECTIVES

- To provide you with an excellent technical basis on which to build an exciting career with varied possibilities
- To provide you with the knowledge to create the next generation of computer programs and devices
- To develop your technical skills and problem-solving abilities
- To enrich your learning experience with studies in Next Generation Technologies, Business or a European Language

PROGRAMME STRUCTURE

- 1) Scientific Foundation
- 2) Core IT subjects
 - Programming & Software Engineering
 - Computer Science
 - Hardware and Networks
 - Information Management
 - Advanced Topics
- 3) Range of Options

Options

Students may choose from a diverse and exciting range of optional subject streams:

Next Generation Technologies, including

Medical Informatics
Scientific Computing
Artificial Intelligence
Semantic Web

Language:

French, German or Spanish

Business:

Subjects such as Accounting, Business Organisation and Management

You decide early in First Year whether to study Next Generation Technologies, a Language or Business. Students on the Next Generation Technologies Stream study all four topics in First and Second Year, and specialise in one in Third Year. They typically select their Final Year Project in their chosen speciality.

B. SC. HONOURS DEGREE IN INFORMATION TECHNOLOGY

CORE COURSES							OPTIONS
YEAR ONE	Computing Systems	Programming	Algorithms & Info. Sys	Maths	Principles of Physics	Fundamentals of Elec. Eng	Options
YEAR TWO	Comp. Systems & Org.	Software Eng. 1	Programming II	Logical Foundations	Database Systems I		Options
	Professional Skills 1	Maths	Statistics	Maths Physics			
YEAR THREE	Networks & Communications	Programming III	Software Eng. & Project Mgmt	Human Computer Interaction	Database Systems II		Options
	Programming Paradigms	Formal Methods					
PROFFESIONAL EXPERIENCE PROGRAMME							
YEAR FOUR	Final Year Project	Distributed Systems	Graphics & Image Proc.	Modern Info. Mgmt.	Software Eng. III	Applied Maths	Options
	Real Time Systems	Advanced Professional Skills	Systems Theory	Advanced Studies in IT	Artificial Intelligence	Advanced Comms	