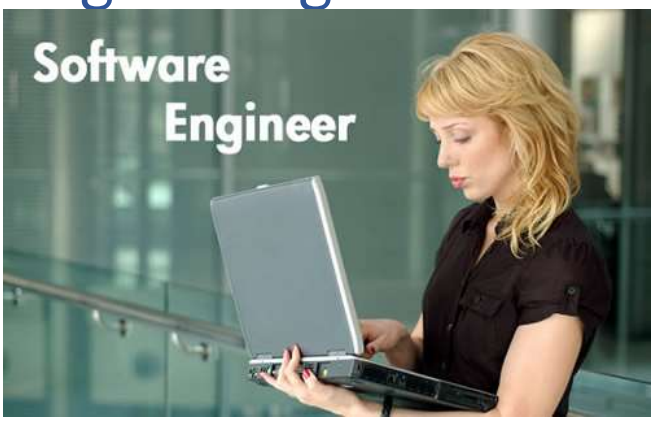
Engineering tomorrow... Filling the Skills Gap



MSc. in Applied Software Technology

This highly successful programme addresses the needs of the ICT sector in Ireland to equip participants with the skills required for a successful career in software engineering. It delivers work ready graduates, covering all aspects of the technical roles required for a career as a software engineer and reflects the changing circumstances of industry and the market place.

Origination

There continues to be a shortage of suitably qualified and "work ready" Irish graduates to fill available posts in Irish based companies who have a requirement for software developers, data systems and network systems personnel. Ireland is now the world's second largest exporter of software products. The ICT sector in Ireland is a thriving but continues to face the challenge of filling available vacancies.

This programme was designed in 2011 to meet the needs of technology companies in Ireland. Ericsson Ireland has been partnered with the programme to fill software engineering vacancies at its Product Development Unit in Athlone. Ericsson has employed 220 programme graduates to date from the programme and continues to support it and accept graduates on Internship. The programme is now expanding to encompass a wider range of industry partners.

The programme provides high-level intensive educational and work experience and real jobs for those graduating in the current year (or in recent years) in computer and non-computer degrees (but with disciplines that contain significant levels of mathematics and science) and who have a desire to live and work in Ireland and are motivated to pursue a career in the ICT sector.

Aims of the Programme

Software developers require a unique combination of technical abilities in order to effectively design, develop, test and maintain their firm's software. These abilities are more critical than ever before, especially in today's climate of rapid technological change where new products are: increasingly complex; have shorter life-cycle; often involve many technologies; are required to integrate with software developed by other business units and companies; and have more demanding criteria for performance, quality, cost and delivery.

The programme offers an integrated approach to delivering end to end software development skills. From computing fundamentals and software design to implementation and testing, the entire lifecycle of software development is covered.

It focuses on the practical problem-solving skills required for computer programmers. Programme participants will also gain an integrated and critical knowledge of the skills and particular technologies widely used in industry today.

Programme learning outcomes

Knowledge: On successful completion of the programme the learner will:

- Demonstrate an advanced knowledge of the theory and practice of software development, both in the context of the functional area and in regard to the integration of information technology.
- Acquire the specialist knowledge to design, develop, deploy and maintain to appropriate levels information technology solutions in an organisation environment.

Know-How and Skill: On successful completion of the programme the learner will:

- Have a specific knowledge of current theory related to software development, information technology networks and information technology security as they impact on the organisation's environment.
- Acquire sufficient knowledge to critically analyse current tools and techniques for IT services and to work as part of a team in the context of software development.
- Be equipped to perform in an Agile software development environment.

Competence: On successful completion of the programme the learner will:

- Be able to propose and defend technology solutions based on best practice nationally and internationally
- Be competent at the appropriate level to design, deliver and implement supports for information technology solutions.
- Be an effective communicator in a range of written, oral and visual media.
- Have developed the capacity for self-directed learning such as will facilitate further academic and professional development in a lifelong learning context.
- Be able to demonstrate understanding of the complexities of information technology solutions in the field and to contribute to the enhancement of standards of professional practice at the appropriate level.

Programme delivery

The underlying philosophy is to provide a diverse and challenging range of learning experiences in which programme participants explore an appropriate body of knowledge. Delivery methods include lectures (including guest lectures based on Irish company case studies, outline and specialist knowledge lectures), laboratory classes (to provide practical experience of programming, database administration, networking etc), tutorials (including student presentations, discussion and problem solving), practical assignments (including programming, networking practicals and database assignments), and self-study (including technology-aided learning, practical individual and group projects and problem-based learning).

Action learning is a particularly important feature of the programme learning strategy. Students will learn by doing in carrying out module assignments and particularly when they carry out the in-company project work. Action learning has been endorsed in the literature reviewed during the preparation of the programme as well as in feedback obtained from industry.

Such learning experiences develop abilities to think critically and rationally, to apply knowledge in solving problems, to skilfully work in and lead groups and to acquire the capacity to act responsibly and ethically. They also allow for the participant to undertake assignments during the programme that will be of value to their organisation.

Dedicated Laboratory

For the purpose of the delivery of this programme, the Department of Management Information Systems in DIT has set up a dedicated lab for exclusive use by MSc Applied Software Technology students. This approach ensures that the cohort have unlimited access to the hardware and software required for such a technically intensive course.

Supporting this delivery strategy is dedicated course website. All staff, students and organisation based staff including project manager, co-supervisors and guest lecturers join as members of the site at the beginning of the academic year which allows interaction between staff, in both DIT and participating companies and students,

dissemination of course notes, links to web-based resources, on-line discussion forum, and communication of key events, timetabling information and project information.

Programme structure

The structure of the programme is dictated by the hours required for a level 9 programme, along with the requirement of work based placement and project work. Formal lectures are supplemented by practical laboratory classes. Individual and group-based exercises and assignments make up part of the continuous assessment that accompanies the majority of modules. These interactive exercises will serve to re-enforce some the learning of the module. During academic holidays students will work on specific projects within participating companies.

Semester 1 (September-January)
Computing Technology (advanced)
Computer Networking (advanced)
Software Design & Testing (advanced)
Data Architectures and Database Systems
Object Oriented Software Development

Semester 2 (February-May)
Web Technologies
Distributed Systems & Security
Computational Mathematics
Self-Management & Teamwork
Systems Administration & Virtualization
Agile Group Project

Internship (June-August)
Supervised Application Development Project (in companies)

Assessment

Each student must complete and pass the assessment for that module. Each module assessment will require the student to demonstrate the leaning from that module and the ability to apply this learning to a practical example.

Module Outlines

The programme is structured over ten modules, induction, work placement and a work based project. While they are designed as stand-alone modules they are also intended to provide an integrated learning experience. This will be aided by assessments that may go across modules.

If companies have specific subject requirements that they wish to have covered these will be considered depending on the number of students that may be involved and subject to available resources.

Module A : ***Computing Technology***
This module aims to provide the participant with an understanding of the relevant fundamentals of computing. These underpin all higher level computing principles and technology. It will give the student an insight into the basic principles of data representation and compression, computer architecture and computer systems. Topics include algorithms, data structures, operating systems and system architecture.

Module B : ***Computer Networking***
Networks underlie distributed systems and knowledge of networks is key to the participants understanding of distributed programming. To introduce students to network fundamentals including TCP/IP & OSI, routing, network topologies, telecoms networks, IP based networks, wireless networks, and Cisco CCNA basics.

Module C : ***Software Design and Testing***
The module aims to deliver a comprehensive view of software development from design to release. Software development life cycle areas including design, testinvg and maintenance will be covered within this module.

There will be a particular focus on Agile development, in particular the SCRUM methodology and XP and TDD principles. Open source communities will also be explored. Tools including UML, JUnit, JIRA and other related tools will be used in the practical application of module content.

Module D : ***Data Architecture and Database Systems***
Data storage is fundamental in information systems. This module will cover the entire spectrum of database areas including database design and database application development using relational databases, SQL and object relational mapping technologies.

Module E : ***Object Oriented Software Development***
As students may have limited previous experience of programming, the application programming module provides practical knowledge of Object-Oriented concepts using Java as a practical learning tool. Students will progress to Java concepts and features including data structures, event driven programming, threading. Elements of Design Patterns and refactoring will also be included. As requested, memory usage, multithreading and dependency injection will be covered in this module.

Module F : ***Web Technologies***
This module aims to enable participants to develop internet based systems. The module will cover the basics of client/server models and the HTTP protocol. Web applications will be developed using a selection of frameworks and technologies based on the requirements of the organisation. Topics include JavaScript, JQuery, DOM, XML JSON.

Module G : ***Distributed Systems & Security***
This module will introduce students to the principles on which modern distributed systems are based, their architecture, algorithms and design. The module will begin with a study of the goals and characteristics of distributed systems and the challenges that must be addressed in their design. This will be followed by an in-depth examination of the communication mechanisms deployed in distributed systems as well as distributed technologies and middleware. In this module the concepts will be taught from a practical perspective. The predominant programming platform will be the Java EE platform. The technologies that are taught are contemporary and widely used in today's business and academic environments and include EJB, REST, JMS, Web Services, Web Frameworks. Security in distributed systems will also be delivered including encryption, digital signatures and certificates etc.

Module H : ***Systems Administration and Virtualisation***
Systems Administration is required to control computer components including operating systems, software and hardware. A grasp of the commands necessary to operate effectively and the ability to create appropriate scripts are key to software development. This module will Linus Systems Administration, configuration management and scripting languages such as Perl and Python. It also covers Virutalisation techniques (hardware, hypervisors).

Module I : ***Self Management and Team Working***
This module provides for development of both personal management skills as well as skills for working in project environments. The module will have a particular focus on the group dynamics of project and team work, including cross-department / discipline / functional group project work, which is considered a key way of working for the management of cross-cutting issues. This module will enable participants to assist groups in achieving their goals and will help people to go beyond basic approaches to facilitation.

Module J : ***Agile Group Project***
This module incorporates and solidifies module learning in a capstone group project. Participants undertake a significant development project and are responsible for configuration, deployment, development, automated testing of the build. We adhere to Agile processes, namely Scrum, TDD and XP.

Programme Schedule

The programme is a fulltime course, with 10 modules plus work placement and project, and break periods to enable the course to be a level 9 MSc validated course.
The start date is 12th September 2016 and the programme formally ends on 31st August 2017.

Company Participation

Companies who commit to the programme will be given exclusive access to participants towards the end of the course (in May 2017) when very detailed reports will be available on their results, aptitude tests, assignments, ability and performance on the programme. This will allow companies to make effective choices around offering an Internship or job opportunity to one or more participants.

Companies are asked to make a contribution towards the cost of the programme on the basis of 3,000 euro for each participant that they plan to offer an Internship/job opportunity. This covers about 35% of programme costs and is payable at the start of the programme in September. The rest of the costs are paid by Skillnets.

Each company may appoint one representative to the Review Panel which meets at the end of each year to assess the outcome of the course and make proposals for changes to content and structure for the following year.

Internship

The research project will be delivered as part of a 3 month internship in participating companies where students will work, as far as possible, on real-time problems and projects. During the Internship individual students are assigned an academic supervisor and a company based supervisor. They will monitor the student's progress and support the student in all aspects of their learning and development. The results of the internship/research project forms a major part of the MSc award.

Companies are requested to provide some form of weekly allowance/bursary to the student to cover out of pocket expenses, travel expenses, etc. during the internship. While the tuition, recruitment, selection and management costs are part funded by Skillnets the Department of Social Protection does not support participants on full-time Level 9 courses so they will need to rely on their own resources or family support. The amount of this is entirely a matter for each company but an indicative figure is €175 per week.

At no stage is there any undertaking, indication or liability on the company to employ a student doing an internship. The student intern is not in any sense considered to be an employee of the company. However, some companies may opt may opt to offer employment to the participant rather than take them on an Internship and use the 3 month period as part of the employment probationary period. In any event the participant must be allowed to complete a project during this period in order to qualify for the Masters award.

Selecting the Interns

Each company will be given a full report on all the participants in May 2017. This will include their -

- Full CV
- Attendance record on the course
- Result of semester exams and continuous assessments
- Report from DIT on their engagement in project work and in class activities

Companies will inform the College of the candidates they wish to interview/conduct aptitude tests or other appropriate selection procedures. After interviews companies will inform the College of their preferences in an order of priority list. Where more than one company makes an offer for a candidate the candidate may decide which company they wish to attend for the Internship.

Handling Issues

Where issues arise with the Intern during the Internship the company/intern will refer the matter to the College Supervisor in the first instance and to ICT Ireland Skillnet if necessary. In accordance with the agreement with the student (see attached Annex 1) ICT Ireland Skillnet has the power to remove a participant from the programme where it deems this to be necessary.

Participant Selection

Participants will be recruited by ICT Ireland Skillnet through a wide range of State and private channels which it has developed in recent years, and will undergo a rigorous selection process which will include screening, vetting, aptitude test and interview. Each participant will enter into a formal contract with ICT Ireland Skillnet who will be responsible for managing all interactions with participants during the programme. ICT Ireland Skillnet

will closely monitor each participant's attendance, timekeeping, participation, assessments, results and regularly seek feedback from participants during the programme. A participant may be removed from the programme by ICT Ireland Skillnet under certain conditions.

Applications for places can be made by sending CV to susan.kelly@ictirelandskillnet.org

This programme is funded by the ICT Ireland Skillnet under the Jobseekers Support Programme of Skillnets Ltd and by member companies. Skillnets is funded from the National Training Fund through the Department of Education and Skills.

Programme Partners

Skillnets is a state funded, enterprise-led support body dedicated to the promotion and facilitation of training and upskilling as key elements in sustaining Ireland's national competitiveness.

The Department of Management Information Systems at the College of Business in DIT, Aungier St, is an industry leader in third level education with a particular focus on industry relevant, practical programmes.

The ICT Ireland Skillnet is a group of companies within the sector operating a broad based training programme under the aegis of the ICT Ireland Federation with support from the companies and Skillnets.