



» School of Science



The School of Science, which undertakes tuition and research in laboratory and field sciences and in informatics, is made up of two departments:

The Department of Chemical and Life Sciences and the Department of Computing, Mathematics and Physics.

The School of Science in Waterford Institute of Technology is accredited to make its own awards up to PhD level, in recognition of the excellence of its teaching and research. A committed team of lecturers and support staff is available to make the student experience at WIT an enjoyable and rewarding experience. The School has a strong research ethos, with internationally recognised research groups working in such fields as environmental science, separation science, genetics, telecommunications software, human factors in computing, e-Learning and automotive software engineering.

Head of School: Mr. Paul Barry

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School Administrator: Ms. Fiona Power

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» Departments

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Postgraduate Prospectus



» Department of Chemical & Life Sciences

The Department of Chemical and Life Sciences has as its mission the provision of undergraduate programmes and postgraduate research activities in the areas of Chemistry, Pharmaceutical Science, Biology, Biotechnology, Forestry, Agricultural Science, Agriculture, Horticulture and Good Manufacturing Practice and Technology.

It has developed all of these discipline areas to Bachelor of Science level and has Bachelor of Science Honours level programmes in Applied Chemistry and Applied Biology. The department is currently introducing a four year ab-initio Honours Degree in Pharmaceutical Science.

The development and running of these programmes takes place in close conjunction with its external partners, which, include TEAGASC, COILLTE, and the Pharmaceutical and Biotechnological sectors of industry both regionally and nationally.

It has developed specific research activities and specialisations which are grouped as follows: Estuarine, Macular Pigment, Metals, Molecular Biology, Polymer Modified Sensing, Separation Science, Surface and Interfacial Chemistry, Forest Vegetation Alternative Systems management.

It has currently 367 undergraduate students and 25 postgraduate students, a fulltime academic staff complement of 25 lecturers and 6 technicians. Taught Graduate Diplomas/Masters programmes in Quality Management and Analytical Science are to be introduced in 2007.

It has 9 recently refurbished teaching laboratories and 6 dedicated research laboratories.

Head of Department: Mr. John Griffith

Tel: +353 51 302029

Email: jgriffith@wit.ie



» Research Opportunities in the Department of Chemical & Life Sciences



» Research Groups/Centres

1 Macular Pigment Research Group

www.wit.ie/MPRG/

Age-related macular degeneration (AMD) is the most common cause of blindness in the Western World and there is a growing consensus that cumulative blue light damage and/or oxidative stress play a role.

The macula represents the central retina, and is responsible for detailed, central vision. A pigment, composed of two hydroxycarotenoids, lutein (L) and zeaxanthin (Z), accumulates at the macula where it is known as macular pigment (MP). MP is entirely dietary of origin, it is a blue light filter and a powerful antioxidant, and is therefore believed to protect against AMD. There are several putative risk factors for AMD including, obesity, iris colour and female gender. The focus of this research group is to investigate whether macular pigment does protect against AMD, and to what extent dietary modification/supplementation might delay or prevent the commonest cause of blindness in the Western World.

The Macular Pigment Research Group (MPRG) was established in 2002 with the support of WIT and substantial funding from the National charity 'Fighting Blindness'.

The leadership is a collaboration between Mr Stephen Beatty (Consultant Ophthalmic Surgeon, WRH) and Dr Orla O' Donovan (Biochemistry lecturer, WIT). Since its inception, three postgraduates and one postdoctoral researcher have been recruited to the MPRG and we are actively pursuing further funding in order to attain critical mass.

Multidisciplinary links have been developed between the MPRG and other research groups within WIT, such as the Center for Health Behavior Research and the Molecular Biology Group, and externally both with industry and academic institutions across the EU and the USA. National media have created an awareness of our research,

which has resulted in unprecedented enthusiasm and participation of the public in our volunteer studies. This research group is in a dynamic stage of development. The research by the MPRG is recognized nationally and internationally, reflected in prizes, financial support, peer-reviewed publications and the awarding of a Fulbright Scholarship Dr. John Nolan.

External Funding

Project	Funding
'Macular Pigment levels and serum concentrations of lutein and zeaxanthin, in a middle-aged Caucasian population'	Fighting Blindness
'Body Fat and its Relationship with Macular Pigment Optical Density and Serum Levels of Lutein and Zeaxanthin'	Health Research Board (HRB)
'The putative beneficial effects of supplemental lutein (L) and zeaxanthin (Z) with co-antioxidants in patients with age-related maculopathy (ARM)'	Dr Mann Pharma, Berlin (Bausch and Lomb)
'Macular Pigment and its relationship to axial length and ocular dimensions'	Kemin Foods USA
'Apo Σ 4 allele status, and its relationship with macular pigment optical density and lipoprotein profile, in subjects with and without a family history of age-related macular degeneration'	Technology Sector Research: Strand 1
'Retinal Visual Acuity in Patients with Age-Related Maculopathy'	Health Research Board (HRB)



» Research Groups / Centres contd...

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Number of WIT Staff in Group: 3
 Number of Postgraduates/Postdoctoral Students at present: 3

Contact:
 Dr Orla O' Donovan Email: oodonovan@wit.ie

The Research Group accepts graduates with the following qualifications for Masters/PhD Research: Honours degree in Biology/Biochemistry/Molecular Biology/Biomedical Science. Medical Degrees.

2 Estuarine Research Group (ERG)

www.wit.ie/ERG/

Overview of the ERG:

The ERG is a multi-disciplinary team of researchers at WIT with a broad range of interests in the biological and chemical disciplines. Members of the group are experienced in estuarine fieldwork, e.g. identification of seaweed spp. (Phaeophyceae, Rhodophyceae, Chlorophyceae) and saltmarsh plant spp. (Monocotyledonae, Dicotyledonae) as well as sampling and analysis techniques. Team members have a range of scientific expertise from molecular biology and bioremediation to inorganic chemistry and biological separations.

Establishment of this research team was facilitated through funding under the Technological Sector Research Strand III (Core research strengths enhancement 2000-2006) initiative.

Current research focuses on an investigation into the chemical and biological mechanisms associated with metal-binding within a range of seaweed species with a view to establishing the potential of this natural resource for bioremediation of metals from wastewater streams.

A number of parallel research strands involving genetic, biochemical, ecological and chemical studies are currently ongoing in the group. The combined output from these research elements are aimed at gaining a better understanding of the dynamics of metal uptake by seaweed species. Elucidation of metal binding within the seaweed species is examined utilising potentiometric and conductivity titration techniques as well as FPLC, SEM/EDX, GC-MS, NMR and IR spectroscopy.

Although the ERG is actively involved in a specific project the development of a state of the art dedicated estuarine research laboratory at WIT facilitates the participation of this team in a wide range of estuarine/environmental based research projects.

External Funding

Project	Funding
An investigation into the potential uses of seaweed species for the bioremediation of metals	Technology Sector Research – Strand III Programme
An investigation into the take-up and mechanism of binding of heavy metals by select red and green seaweed species	IRCSET

Number of WIT Staff in Group: 5
 Number of postgraduates at present: 3
 Number of Postdoctoral researchers: 1

Contact:
 Dr. Peter McLoughlin Email: pmcloughlin@wit.ie
 Tel: +353 51 302056
 ERG Research Laboratory
 Tel: +353 51 845514

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; Honours degree in Chemistry, biology, environmental science, and marine science.

“ WIT provided a great environment in which I could develop my research and scientific skills. In addition I had the opportunity to gain valuable teaching experience during my time spent as a PhD candidate. ”

Dr. Michael Breen Science PhD, 2005



3 Separation Science Research Group (SSRG)

www.wit.ie/SSRG

The SSRG was established at WIT in 2001. Establishment of this research group was facilitated through funding under the Technological Sector Research Strand III (Core research strengths enhancement 2000-2006) initiative.

Separation science involves the use of techniques to facilitate the isolation, purification and analysis of complex mixtures of chemical and biological compounds.

Current research topics at the SSRG include,

- Development and optimisation of microemulsions for use in MEEKC
- Analysis of substrate range and catalytic activity of novel nitrile metabolising enzymes
- An investigation into the use of sol gel molecular imprinted stationary phases for the analysis of pharmaceutical templates.
- Application of (GC-MS) and Solid Phase Microextraction (SPME), in conjunction with MIPs for selective analysis
- Molecular Imprinting of the Angiotension Converting Enzyme Inhibitor, Lisinopril Dihydrate in an aqueous environment
- The use of modified Polyvinyl Alcohol for use as Molecular Imprinted Polymers

The high profile of this group is indicated by their extensive record of publications and presentation of their work at international conferences.

Number of WIT Staff in Group: 8

Number of postgraduates at present: 8

Number of postdoctoral researchers: 1

Contact:

Dr. Peter McLoughlin Email: pmcloughlin@wit.ie

Tel: +353 51 302056

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; An Honours degree in Chemistry, biology, analytical science, or material science.

External Funding Sources

Project	Funding
An investigation into the use of sol gel MIPs as selective extraction media interfaced to optical sensing methodologies	Council of Directors
The use of modified Polyvinyl Alcohol for use as Molecular Imprinted Polymers	Council of Directors
Development of Novel Stationary Phases, Mobile Phases and Extraction Techniques for Applications in Separation Science	Council of Directors
SFI China/Ireland collaboration project	SFI
Development of novel extraction media for use in the purification/sensing of pharmaceutical industry specific analytes	Enterprise Ireland and industrial funding
SWINGS (Separations, Wales & Ireland – Novel Generation Science) (i) An investigation into the significance of Separation Science techniques in supporting the regional development of pharmaceutical/biotechnology centres (ii) Provision of training in novel separation techniques to support future regional development	EU
Investigation into the potential use of sol gel molecularly imprinted polymers (MIPs) as novel controlled release media for pharmaceutical delivery	IRCSET



» Research Groups / Centres contd...

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4 Molecular Ecology Research Group

www.wit.ie/MERG/

The molecular ecology group uses forensic type genetic techniques to gain information from ecological samples such as hair, faeces and road kill animals on population density and genetic structure of the pine marten (*Martes martes*) in Ireland. The genetic techniques developed facilitate typing samples to species, sex and individual. This is of importance because the pine marten in Ireland is of international significance due to its decline across the rest of Europe. The techniques developed in for species identification of pine marten from hair and faecal samples are currently being developed as a tool for surveying a broader range of small and medium sized animals. This project which is funded by the EPA is in collaboration with The Mammal Society (U.K.)

External Funding Sources

Project	Funding
Genetic diversity in pine marten in Ireland	IRCSET
DNA identification of small mammals	EPA

Number of WIT Staff in Group: 2
 Number of postgraduates at present: 3

Contact:
 Dr. Peter Turner Email: pturner@wit.ie
 Dr. Catherine O'Reilly Email: coreilly@wit.ie

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; At least upper second class honours in a relevant biological area.

5 Bioremediation and Biocatalysis Group

www.wit.ie/Research/

The main focus of the bioremediation/biocatalysis research group at the moment is the biodegradation and biotransformation of nitriles (R-CN), cyanide (H-CN) and metal cyanide complexes.

The group works with a wide range of microorganisms, many isolated from estuarine environments, which are capable of metabolising cyanide and nitriles compounds. The metabolism of cyanide and nitriles in these microorganisms is due to the presence of one or more enzymes. The main enzymes associated with cyanide metabolism are cyanide hydratase and cyanide dihydratase while nitrile metabolism is due to either a nitrile hydratase/amidase system or nitrilase.

The enzymes cyanide hydratase, cyanide dihydratase and nitrilase are part of the same family of enzymes with many interesting characteristics. The nitrile hydratase/ amidase system is of particular interest due to the enantioselectivity of the amidase. This has great potential for the production of pharmaceutically active compounds.

Recently an enantioselective amidase has been cloned and expressed at a very high level in *E. coli*. The work at WIT is aimed at studying the basic biochemistry/molecular genetics of nitrile/cyanide metabolism in the isolated microorganisms and in the potential application of these enzymes in the bioremediation and biotransformation of cyanide and nitriles.

External Funding Sources:

Project	Funding
Nitrile and amide biotransformation	SFI China/Ireland Collaborative Grant
Genetic organisation of nitrile metabolising genes in a number of novel microorganisms	IRCSET



Number of WIT Staff in Group: 3
 Number of postgraduates at present: 4

Contact:
 Dr. Catherine O'Reilly Email: coreilly@wit.ie
 Dr. Peter Turner Email: pturner@wit.ie

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; At least an upper second class honours degree in an appropriate biological or chemistry subject.

6 Polymer Mediated Sensing Research Group (PMSRG)

www.wit.ie/PMSRG/

The PMSRG is a multidisciplinary research team investigates the potential of various polymer facilitated sensing methodologies. Use of polymer modified spectroscopy for the detection of residual solvents in the environment is one project area under investigation. Studies identifying key factors affecting the diffusion of target analytes into polymer matrices with a view to optimising sensor response are another key area of research of this team [1-6]. Analyte diffusion studies coupled with mathematical models are utilised to quantify key diffusion parameters. This team has also utilised mathematical projection modelling to reduce sensing time.

"Interaction bands" have been observed during the diffusion of analyte molecules into Teflon AF2400 polymer matrices. The nature/character of observed 'interaction bands' has been investigated. Through monitoring of these bands an increase in detection sensitivity is observed for a number of test species.

Several international and national academic and industrial partners are actively engaged in collaborative projects with this group.

External Funding Sources

Project	Funding Sources
Development of novel extraction media for use in the purification/sensing of pharmaceutical industry specific analytes	Council of Directors
The use of 'smart' materials in conjunction with experimental FTIR sensor designs for the determination of polar solvent residues	Enterprise Ireland
An investigation into polymer mediated mid-ir spectroscopy as a mechanism for the sensing of solvent residues	Enterprise Ireland and industrial funding
Selective ionophore-based optical sensors for metal ion measurement in aqueous environments	Enterprise Ireland and industrial funding

Number of WIT Staff in Group: 3
 Number of postgraduates at present: 2

Contact:
 Dr. Peter McLoughlin Email: pmcloughlin@wit.ie
 Tel: +353 51 302056

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; An Honours degree in Chemistry, Environmental Science, material science or physics.



» Research Groups / Centres contd...

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Postgraduate Prospectus

7 Metals Research Group

www.wit.ie/MRG/

The focus of the work involves the development of novel inorganic materials for use as alternative chemotherapeutic complexes in conjunction with two different research groups at Dublin City University. The basis of the work is that certain inorganic materials which are non-toxic to the body, can be used to transport oxygen to cancer cells. These cells will die in the presence of too much oxygen. Current therapeutic methods are quite toxic to good cells also, such as cis-platin. We aim to develop more site specific materials with less side-effects for the effective treatment of cancers. Students are currently writing up their PhD's in this area and are publishing their results in peer reviewed publications such as Dalton Transactions. The results of this work has also been presented at both national and international conferences.

Co-operating University: DCU

Project	Funding
Base-selective Oxidation and Cleavage of DNA by Photochemically or Thermally Activated Oxo-Diperoxo Complexes of Vanadium	Strategic Research Grant
The study of novel organo-germanium complexes as alternative chemotherapeutic agents	Strand 1

Number of Postgraduates at Present: 2

Contact:

Dr. Helen Hughes Email: hhughes@wit.ie

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; Honours degree in chemistry or equivalent

8 Surface and Interfacial Chemistry

www.wit.ie/Research/

The Surface and Interfacial group at Waterford IT is involved in research investigating the use of associated surfactant structures. It is led by Dr. Sheila Donegan in Waterford IT and has strong links with the Materials and Surface Science Institute at the University of Limerick and with University College Dublin with whom collaborative research projects have been carried out.

Projects have ranged from the production of nano particles in surfactant systems to the use of microemulsions used in conjunction with traditional methods of chromatography such as HPLC, LC and CE for pharmaceutical analysis. Much of our work is done in conjunction with major multinational pharmaceutical companies.

At well defined concentrations of surfactants, associated structures of various types are formed. Due to the unique properties of surfactants themselves, both polar and non polar species can be solubilised. This property has been exploited in the production of nano particles where the size of the particle is constrained by the size of the structured compartment formed by the surfactant.

It has also been exploited in the separation of pharmaceutical products from creams and ointments, where the use of a microemulsion eliminates the need for preextraction stages required in conventional chromatographic techniques.

This research group was the first in the world to successfully use a water in oil microemulsion to separate a range of pharmaceuticals using electrokinetic chromatography.

Much of the work of the group focuses on correlating the fundamental properties of surfactant systems to their applications, using instrumentation including:



- Scanning Electron Microscope
- Digital Contact Angle Meter
- Digital Surface Tension meter
- Contact Angle Measurement system
- Particle Size Analysis system

External Funding

Project	Funding
Analysis of Adhesion of Polymer Coatings.	Forbairt
Analytical Developments of Cast Iron Enamelling	EU CRAFT Programme
Use of Associated Surfactant Structures as Reaction Media	HEA in association with the University of Limerick
The use of Microemulsions in Electrokinetic Chromatography	HEA
The Use of Microemulsions as Reaction Media	IRCSET – EMBARK
The Use of Microemulsion in Electrokinetic Chromatography	Strand 1

Number of WIT Staff in Group: 3
 Number of postgraduates at present: 2

Contact Persons:
 Dr. Sheila Donegan Email: sdonegan@wit.ie
 Dr. Michael Breen Email: mbreen@wit.ie

This Research Group accepts graduates with the following qualifications for Masters/PhD Research:
 An honours degree in Chemistry

9 FORVAMS (Forest Vegetation Alternative Management Systems)

www.forvams.org

Objectives:

For a forestry plantation to succeed, it is essential to reserve for the seedlings, the water and nutrient resources of the soil. Weeds in the immediate vicinity of the plants can mean if not death, then restriction of their growth. Herbicides have always been the main means of controlling weed vegetation in Irish forests due to their efficiency and relatively low cost. However, increased environmental awareness and the certification process coupled with tighter control legislation, have greatly reduced the herbicide arsenal and force the industry to consider other methods of weed control.

The objective of this project is to investigate the use of mulches in controlling weed vegetation in the forest, in order to reduce Ireland's dependence on herbicide. Mulching is a means of passively controlling weed vegetation and reduces the need for mechanical and chemical intervention.

External Funding Sources

Project	Funding
FORVAMS Mulch trial	ICOFORD

Contact:
 Dr. Nick Mc Carthy Email: nmccarthy@wit.ie

This Research Group invites applications from graduates with the following qualifications for Masters/PhD Research;
 BSc Honours in Forestry , Botany.



» Student / Graduate Profiles

» Research Groups / Centres contd...

10 Biofuels Research Group

Wood biofuel forms a major part of the evolving strategy to generate increasing amounts of renewable energy in Ireland. This may take the form of heat only, power only or combined power or heat. Regardless of the technology used, any combustion will lead to air emissions and some level of wood ash.

The air emissions and ash content depends on the chemical composition of the wood used. Evidence suggests that the geographic source of the wood, as well as species, plays a role in determining the chemical make-up of the wood. In particular the degree of exposure to sea spray determines the chlorine content of the wood and ultimately influences the emissions and the wood ash composition as well as corrosion potential in wood burners.

In this research, different species from various geographical locations and in different wood forms will be analysed to determine the emission and ash compositions. It is also intended to compare the emission and ash compositions of the samples after combustion at different temperatures in various wood burners.

External Funding Sources

Project

The Chemical and Physical Analysis of Pine, Spruce and arch for use as a solid biofuel

Number of WIT Staff in Group: 2

Number of postgraduates at present: 1

Contact:

Dr. Eleanor Owens Email: eowens@wit.ie

Mr. Tom Kent Email: tkent@wit.ie

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; An Honours Degree in Chemistry, Materials or Forestry.

“ I graduated in 1999 with a first class honours degree in chemistry from UCD. During my time at UCD I decided that I would like to continue my studies as a postgraduate. After graduation the opportunity arose in WIT to become a PhD candidate.



The project, which was in conjunction with the Materials and Surface Science Institute in the University of Limerick, involved research in the area of surface chemistry. This area of research interested me and in addition I thought WIT offered a great environment in which I could further my research and scientific skills. Thus I had no hesitation in undertaking the position.

I successfully completed my PhD in 2004 and I am currently a lecturer in the Department of Chemical and Life Sciences here in WIT. Looking back at my time as a postgraduate I have to say that WIT lived up to my expectations. Not only did it provide the facilities and support through which I could complete my research and obtain my PhD but it also gave me the opportunity to develop my teaching skills. This strengthened my desire to become involved in education as well as research: a path I hope to follow for many years to come. ”

Dr. Michael Breen, - Science PhD, 2005



Most people will have heard the stories of thalidomide – a pharmaceutical product that in the 1960's was administered as an anti-depressant. The drug is composed of two forms called enantiomers. Each of these enantiomers has very different physiological effects. One is successful in the treatment of depression whereas the other is implicated in the development of foetal abnormalities.



Aisling Olwill's PhD research focussed on the pharmaceutical compound, Lisinopril Dihydrate that is used in the treatment of hypertension. This important drug material is synthesised by Merck Sharpe and Dohme Ltd in Clonmel. The assistance received from the company throughout this research particularly from Ms. Eileen Counihan, Director of Quality was greatly appreciated.

By using the inherent chemical properties of the drug compound it was possible to prepare an extraction system (solid phase extraction) which could selectively retain this compound when in the presence of related substances. The molecularly imprinted medium has the ability to remove the drug of interest while allowing the related substances to remain behind in solution. By carefully choosing the solvent (liquid) in which the drug compound is dissolved it is possible to enhance the efficiency of this extraction process. The techniques developed during this research could potentially be used to complement and enhance the specificity of traditional analytical processes used by pharmaceutical companies. The concept of molecularly imprinting is a burgeoning area of research that has numerous long-term benefits to the pharmaceutical industry if exploited to its full potential. Aisling's research findings were presented at both national and international conferences and a poster presentation documenting results won first prize at a national research colloquium. Result data was also published in the peer-reviewed scientific journal, 'Biosensors and Bioelectronics'. Aisling is now working with Genzyme in Waterford

Dr Aisling Olwill - Science PhD, 2005

John Nolan a recent PhD graduate of WIT is the only student from the Institute to ever secure a Fullbright Scholarship. He is currently based in Augusta, Georgia having been given the opportunity to work at the Institute of Georgia's Vision Science Laboratory. Here he is building on his thesis work on age-related macular degeneration, the most common cause of blindness in the Western World . Funded by Fighting Blindness Ireland John's PhD project (a study on age-related macular degeneration (AMD) and macular pigment) was the first large-scale population-based study of its kind in the world and was supervised by Dr. Stephen Beatty, Consultant Ophthalmic Surgeon in Waterford Regional Hospital and Dr Orla O'Donovan of WIT.



AMD involves degeneration of the central retina in people over 55 years of age. People with age-related macular degeneration lose central vision and have difficulty with everyday activities such as reading, writing, watching television and recognising familiar faces. What is truly fascinating is that macular pigment which is entirely of dietary origin is believed to protect against age-related macular degeneration. One of the most interesting findings to emanate from John's PhD was the discovery that healthy middle-aged offspring of patients with AMD had a relative lack of macular pigment. In other words this finding suggests that the observed lack of pigment may predispose the sons and daughters of AMD sufferers to this disease and that appropriate dietary modification may prevent or even delay the onset of the disease.

Dr. John Nolan - Science PhD, 2005



» Department of Computing, Maths & Physics

The Department of Physical and Quantitative Sciences is accredited to Level 10 NQAI. It undertakes research and provides undergraduate and postgraduate courses in computing, physics and mathematics. It has 66 lecturing staff and 2 technical assistants.

The department is committed to

- Promoting excellence in higher education through the provision of programmes leading to internationally recognised awards
- Promoting research and enterprise related activities that assist the sustainable development of the region
- Ensuring that its students and staff are afforded the opportunity to develop their full potential in a professional and supportive environment
- Participating openly with units within the institute as well as with regional and international partners in promoting excellence in teaching, research and innovation
- Promoting the educational, cultural, social and economic development of the wider community

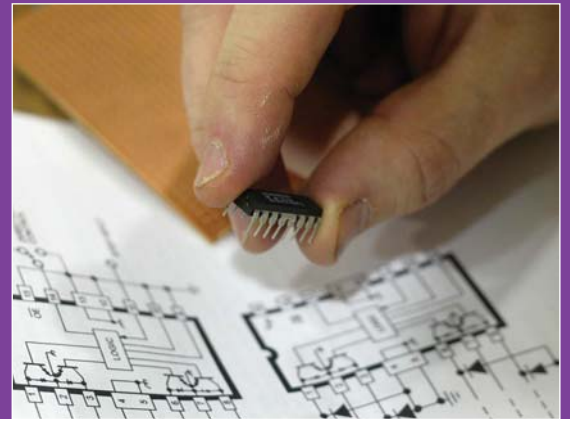
The range of programmes on offer affords students the opportunity to develop their full potential. The taught programmes and the research activities of the department have been developed to promote enterprise and research related activities that assist the sustainable development of Ireland and the South East region in particular.

Head of Department: Dr. Micheál Ó hÉigearthaigh

Tel: +353 51 302029

Email: moheigearthaigh@wit.ie

» Taught Courses



MSc in Computing (in Communications Software) – WD_KTESO_R

Course Leaders: Mr. Jimmy McGibney / Mr. Richard Frisby
E: jmcgibney@wit.ie / rfrisby@wit.ie

Minimum Entry Requirements:
2nd class honours grade II

This one-year full-time Masters degree programme aims to produce graduates with knowledge, skills and expertise in Communications Software Development. The course will also confer on the graduates a set of personal and professional attributes that will allow them greater flexibility in the development of their own career options. Specifically, the course aims to produce graduates who can:

1. Reason and problem-solve to a high level in the context of communications software technology and its role in business, industry and research.
2. Participate constructively in the strategic deployment of new communications technologies.
3. Participate in the development of high-quality communications software products.
4. Undertake research-based projects for industry, providing effective advice and leadership where required.
5. Manage technology-based projects that require the handling of innovation and change in dynamic environments.

The Information and Communications Technology (ICT) sector plays a very significant role in Ireland. This sector is comprised of more than a thousand organisations ranging from multinationals to start-ups, with employment approaching 100,000 people – up from 47,000 in 1993. Globally, the explosive impact of computers and information technology on our everyday lives has generated a need to design and develop new computer software systems and to incorporate new technologies in a rapidly growing range of applications. There are many opportunities for software developers and in particular for communications software developers in the Telecommunications software industry. A graduate of this course will also be well equipped to pursue a research-oriented career in both Academia and Industry.





According to Dr. Sergeyev, success in research is similar to sporting success,

“ The main feature of success is to have a good team. Every player has to be professional in sense of technique, and have the ability to communicate with others players quickly and effectively. For me the Optics Research Group is such a team. ”

Dr. Sergey Sergeyev – Researcher, Optics Group.

MSc in Computing (in Information Systems Processes) – WD_KISYP_R

Course Leader: Mr. Liam Doyle
E: ldoyle@wit.ie

Minimum Entry Requirements:
2nd class honours grade II

This one-year full-time Masters degree programme aims to produce graduates with knowledge, skills and expertise in Information Systems. The course will also confer on the graduates a set of personal and professional attributes that will allow them greater flexibility in the development of their own career options. Specifically, the course aims to produce graduates who can:

1. Reason and problem-solve to a high level in the context of information systems and its role in business, industry and research.
2. Participate constructively in the deployment of information systems.
3. Participate in the development of high-quality information systems products.
4. Undertake research-based projects for industry, providing effective advice and leadership where required.
5. Manage information systems based projects that require the handling of innovation and change in dynamic environments.

Organisations worldwide are increasingly relying on information systems to assist in their work at an operational, tactical, and strategic level. There is a growing awareness that these systems are not simply technical in nature but are in fact socio-technical systems. “Socio-technical” here refers to the need for an appreciation of both technical and human factors in the design, development and deployment of advanced computer-based systems. There is an increasing recognition that the success of an investment in information systems requires that these human factors be addressed. As information systems become more pervasive their impact at a human level becomes more pronounced. This course equips students with the understanding of the issues that will prepare them for a career in information systems.

A graduate of this course will also be well equipped to pursue a research-oriented career in both Academia and Industry.

The course is aimed both at new graduates and experienced professionals wish to obtain a deeper understanding and appreciation for the human factors associated with information systems in modern organisations.

Entry Requirements: An honours degree in Computing, Information Systems, Information Technology or equivalent. Alternatively an honours degree in Business Studies or Engineering where there is a strong computing component will also be acceptable



MSc in Computing Multimedia and eLearning

Course Leader: Ms. Annetta Stack
E: astack@wit.ie

Minimum Entry Requirements:
2nd class honours grade II

This is a one-year full-time Masters degree programme which aims to produce graduates with knowledge, skills and expertise in Multimedia and eLearning. This course will also confer on the graduates a set of personal and professional attributes that will allow them greater flexibility in the development of their own career options.

Specifically, the course aims to produce graduates who can:

- Reason and problem-solve to a high level in the context of multimedia development tools and eLearning platforms and their role within business, industry and research
- Participate in the development of high-quality multimedia and eLearning educational products
- Undertake research-based projects for industry, providing effective advice and leadership where required
- Manage technology-based projects that require the handling of innovation and change in dynamic environments.

There are many opportunities for multimedia developers and in particular for multimedia developers in the eLearning industry. A graduate from this course will also be equipped to pursue a research-oriented career in both Academia and Industry. This course is aimed both at new graduates and experienced professionals who wish to obtain a deeper understanding and appreciation of multimedia technologies and elearning architecture.





Higher Diploma in Applied Computing

Course Leader: Ms. Ciara Murphy
E: cmmurphy@wit.ie

This is a one-year fulltime programme designed to help graduates gain employment within the modern computing industry. It will be of interest to international students who subsequently wish to undertake postgraduate studies in computing and to students from a non-technical background who wish to acquire advanced skills in ICT.

The technical modules are complemented with ones designed to promote personal and professional development.

This programme will be delivered in two semesters. Students must undertake 4 mandatory and 2 elective modules in each semester.

Semester I (Sep – Jan)

Mandatory Modules:

Systems Analysis and Design
Programming I
Web Design Fundamentals
Project Management

Elective Modules:

Cognitive Science & HCI
Consolidation of Advanced Language Skills I
Database Systems

Semester II (Feb – May)

Mandatory Modules:

Operating Systems and Networks
Programming II
Dynamic Web Development
Project

Elective Modules:

Management Psychology
Consolidation of Advanced Language Skills II
Intercultural Communications
Practical Game Design

Career Opportunities

Graduates from the programme will be equipped with the requisite skills for employment as systems/ business analysts and as software developers. They will have taken a significant software project through the full development cycle and learnt how to communicate effectively with clients.

They will also have developed a range on Internet based skills that should enable them gain employment in the distributed computing area.

The elective modules will add to the range of application areas to which they are suited.



» Research Opportunities in the Department of Computing, Maths & Physics



» Research Groups/Centres

1 Telecommunication Software & Systems Group (TSSG)

<http://www.tssg.org>

The Telecommunications Software & Systems Group (TSSG) was founded in 1996. Since then, it has grown from 3 to around 75 members of staff and students comprising WIT faculty, full-time principal and senior investigators, centre managers, researchers - including programmers and engineers - research students and support staff. All the funding for the TSSG has been won in competitive tenders for national and international research funding.

The TSSG's main area of research is communications software services encompassing emerging architectures for management of complex telecommunications and Internet systems as well as next generation service development and deployment. The TSSG has strong expertise in the areas of distributed systems and service oriented architectures, particularly when applied to the communications and telecommunications domain.

The TSSG has two primary divisions - the Research Division and the Commercial Division. Each of the divisions is composed of centres, each with its own thematic focus. Together the TSSG encompasses a balanced portfolio of active research projects reflecting a synergistic mix of basic research (strategically oriented), applied research, pre-product development, and commercial spin-off activities. Thus the TSSG sees itself as an exemplar of a new vision of research in Ireland that is both trans-disciplinary (combining mainly engineering, computing and business) and pursues a combination of academic and commercial excellence. With over 30 current active funded research projects (primarily Irish and European funding), and a history of over 50 funded projects (of which the TSSG has been the lead partner in over 65%) the TSSG is the largest group in Ireland engaged in such a critical mass of activity relating to communications software services, and indeed is one of the most successful integrated research clusters in any academic domain in Ireland.

The TSSG is located in the new Research and Innovation Centre on the Carriganore Campus of WIT.

Project		Funding
M-Zones (WIT)	R-CIM	IE HEA PRTLI
SFI PI Awards	R-CIM	IE SFI
10 Projects		Enterprise Ireland
6 Projects		EU FP6
2 Projects		EU eTEN
4 Projects		EU Interreg

Number of WIT staff in group: 73

6 Faculty

5 PI/SI postdoctoral research fellows

51 Staff (Researchers, Developers and Support Staff)

Contact :

Mr. Mícheál Ó Foghlú Email: mofoghlu@tssg.org

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; An Honours degree in Computing or Electronics or equivalent.





“ W.I.T has provided me with many opportunities, initially with the qualification to work as a software engineer and now the support to study for the award of PhD. I have also gained experience in lecturing at W.I.T confirming my career choice. Research is a long and lonely process, however in W.I.T there is an excellent postgraduate community providing guidance and support throughout. ”

Brenda Mullally – ISOL Group.

2 ISOL Research Group

www.wit.ie/ISOL/

The group deals with research in the confluence of information systems, organizational studies and learning. ISOL research therefore is primarily concerned with

1. making information systems useful and appropriate for human systems including modern organizations and individual human beings and
2. enabling these human systems to adapt to technology-driven change.

Information Systems Development (ISD) Methodologies & Usability

A problem that the group identified early on was the promotion of ISD Methodologies which were inappropriate and inadequate for the complexities of modern information systems. In order to address this the group are focused in a number of research areas including

- Effective management of domain knowledge
- Privacy and intrusion
- User requirements analysis for complex systems
- Post-implementation support processes
- The relationship between ISD and organizational learning
- Technology-mediated human interaction
- Usability of complex systems

In addressing issues associated with ISD and systems failure, it became apparent that teaching and training practices in Europe and North America, especially in higher education, were directed at developing incomplete and inappropriate sets of skills and competences. Consequently, the group also has conducted a number of studies in the following research area of education of information systems professionals

Supply Chain Systems Logistics for Small Firms

Early in the development of the group it was clear that the take up of advanced information echnologies was surprisingly poor amongst small Irish firms, and even where it was taken up, it was generally being used very ineffectively. This was

recognized as a major bottleneck in the Irish knowledge economy as well as a poorly understood problem in systems engineering. Furthermore, particular difficulties were evident in relation to the role of small Irish firms in the supply-chain. For example, recent shifts in the development of EDI systems has created significant pressures upon small firms to adopt these technologies, in some cases with serious negative consequences. The group has conducted a number fo studies both nationally and internationally to understand the nature of these issues, and to find ways by which they can be addressed. In conducting research in this field the group deal particularly with:

- Barriers to the effective take-up of information systems in small firms
- Systems security issues for small firms
- Evaluation of information technology initiatives in small firms

External Funding Sources:

Project	Funding
Technologically-mediated learning support processes for Kosovo	EU TEMPUS Programme
Information Technology take-up amongst SMEs	EU-Interreg
SRSTI project to establish knowledge management systems	SRSTI EU-India
E-Business Systems Take-up	Ireland-Newfoundland partnership
TIARE-to evaluate the take up of ICT amongst organisations charged with environmental conservation	Grundtvig Socrates

“ I would describe my experience of research in WIT as challenging and stimulating giving me a very rewarding experience. ”

Ruth Barry - MSc Computing 2005, ISOL Group.



Project	Funding
Innovation Relay Centres	IRC-TTT Programme
Requirements Engineering and Sensemaking Supports	BEHEST
AISLE- Intelligent manufacturing business systems	Enterprise Ireland

Number of WIT Staff in Group: 10
 Number of postgraduates at present: 12

Contact:
 Dr. Larry Stapleton Email: lstapleton@wit.ie
 Mr. Liam Doyle Email: ldoyle@wit.ie

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; An Honours degree in Computing or equivalent.

3 Centre for eLearning Technologies Research, WeLearnT

www.wit.ie/Research/

WeLearnT, the WIT eLearning Technologies research group, undertakes multidisciplinary research into the use of new and emerging elearning technologies in a variety of contexts. Active since 1996, this group has researched such areas as computer-based learning and primary education, the development of computer-based tools to support adults with learning difficulties in mathematics, the applicability of computers to literacy best practice, the use of information communication technologies to support the promotion of social inclusion. Much work has been of a transnational nature, with partner institutes in Europe including the University of Yyvaskyla,

Finland, the Icedand University of Education, Reykjavik, Riga Technical University, Latvia and the University of Dundee, Scotland.

Details of projects and funding sources
 Recent research funding to the group included a SOCRATES-MINERVA ICT/ODL project, while a current post-graduate student has been awarded an IRCSET grant.

External Funding Sources:

Project	Funding
Postgraduate Student Scholarship 2005	Irish Research Council for Science, Engineering & Technology (IRCSET)
IE-Learning in early childhood education	European Commission – Socrates Minerva Funding

Number of WIT staff in group: 13

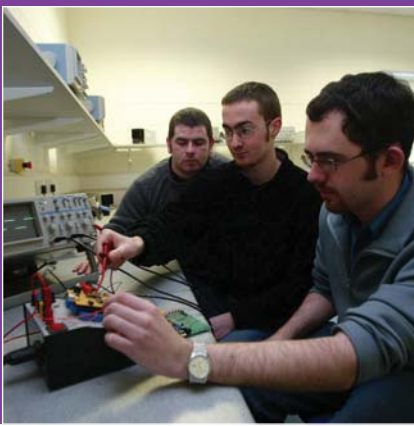
Group Leader:
 Ms. Mary Barry
 Email: mbarry@wit.ie

Number of Postgraduates: 3

Contact persons:
 Ms. Mary Barry Email: mbarry@wit.ie
 Ms. Mary Power Email: mpower@wit.ie
 Ms. Catherine Fitzpatrick Email: cfitzpatrick@wit.ie

Research opportunities by subject area/ potential supervisor/email addresses

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; An Honours degree in Computing or equivalent.



» Research Groups / Centres contd...

4 Optics Research Group

www.wit.ie/ORG/

The Optics Research Group (ORG) was formed at WIT in 1994 by Donal Flavin (RIP). It is active in a range of areas of optical interferometry relevant to optoelectronics/ photonic applications in telecommunications and advanced optical/photonic sensing. The work of the Optics Research Group is concentrated in the areas of low-coherence optical fibre interferometry, stationary Fourier Transform Spectrometry, and Fibre Bragg gratings. Recent research activity includes:

- Interferometry for characterisation of group delay and dispersion in single-mode optical fibres using Dispersive Fourier Transform Spectroscopy
- Simultaneous interferometric optical fibre sensing of temperature and strain via the modulation of group velocity and group velocity dispersion
- Optical fibre polarimetric sensing and multiplexing on high-birefringence optical fibre, using dispersive Fourier transform spectroscopy
- 'Hilbert transform technique' for measurement of the resonant Bragg wavelengths in Fibre Bragg Gratings; applications to sensor multiplexing
- Dispersive properties Fibre Bragg Gratings
- Characterisation of geometric and optical propagation properties of materials by low-coherence interferometry
- Spatially-scanned Fourier transform spectrometry

Major Application Areas

- Sensing in smart structures using embedded single-mode low-coherence optical fibre interferometry
- Sensing in smart structures using optical fibre Bragg gratings
- Optical telecommunications applications of in-fibre Bragg gratings
- Characterisation of propagation properties of optical and laser materials

- Environmental and biomedical sensing

International Collaboration

A significant part of its work is carried out in collaboration with international partners. It has a long-standing partnership with the Fibre Optic Research Group at Heriot-Watt University, Edinburgh. This group has active programs of research covering several areas of fibre optics relating to the sensing of physical variables and wave propagation properties in single and multimode optical fibre waveguides.

More recently it has worked in collaboration with the Photonics Research Group, Aston University, Birmingham on multiplexing of fibre Bragg grating sensors.

It has fruitful working communications with other international groups particularly the Optoelectronics Division of the National Institute of Standards and Technology, Boulder, Colorado.

External Funding Sources:

Project	Funding
Infrared Spectroscopic Demodulation for Bragg Grating Sensor Arrays	Enterprise Ireland – Technology Development Phase 2005
High-Speed Bragg Grating Sensor Array Demodulator for Structural Health Monitoring	Enterprise Ireland Commercialisation Fund – Proof of Concept Phase 2004
Spectroscopic Measurement System for Bragg Grating Sensor Networks	Technology Sector Research – Strand 1 2005
High concentration erbium doped fibre/waveguide optical amplifier with a smart gain control system for telecom and distributed sensor networks	Enterprise Ireland Commercialisation Fund – Proof of Concept Phase 2006

“ The support and advice I received from WIT staff during the process of deciding the most suitable course was remarkable. After commencing my studies I realised I'd made a great choice to study in WIT. ”

Venet Osmani – Postgraduate Research TSSG.



Number of WIT Staff in Group: 5
 Number of postgraduates at present: 3
 Number of postdoctoral students at present: 1

Contact:
 Dr. P.J. Cregg Email: pjcregg@wit.ie
 Dr. Sergeyev Email: ssergeyev@wit.ie

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; an Honours degree in Physics or Electronics.

5 Automotive Control Group

www.wit.ie/automotive/

The Automotive Control Group carries out research at post-graduate level, with the current emphasis on the following topics:

- Distributed automotive control systems
- Diagnostics
- Telematics

This research is geared towards results with direct industrial application (applied research). Our primary aim is to provide our researchers with the real world skills that will enable them to secure employment as research and development engineers in the automotive industry. The main method for achieving this aim is to research relevant topics for current and future automotive applications. Many research ideas originate from our partners in the automotive industry and each student is linked up with an industry collaborator who acts as an external mentor for the research. Current industrial collaborators include TRW, ETAS and Ford. A number of undergraduate projects are also sponsored each year with the aim of supporting our primary research and discovering new areas of investigation.

Some major achievements of the group in recent times have been;

- the completion of six M.Sc. research theses
- strong collaborative links with a number of major automotive companies
- a full employment record for our post-graduates in the automotive industry

- publication of seven conference papers at the SAE 2005 Centenary conference in Detroit, including one paper selected for the prestigious SAE Transactions Journal.
- five papers accepted for publication at SAE 2006 in Detroit

External Funding Sources:

Project	Funding
Safety verification of fault-tolerant architectures	IRCSET

Contact:
 Mr. Brendan Jackman Email: bjackman@wit.ie
 Mr. David Power Email: dpower@wit.ie
 Dr. Mícheál Ó hÉigearthaigh
 Email: moheigearthaigh@wit.ie

This Research Group accepts graduates with the following qualifications for Masters/PhD Research; an Honours degree in Physics or Electronics.



» Student / Graduate Profiles

“ I completed research for my Masters and PhD degrees in the area of nonlinear spectroscopy and laser physics at the Belarusian State University, Minsk, Belarus, during the period 1985 to 1991. In the nineties, I worked in various positions from Research Assistant to Senior Researcher at the Department of Physics Belarusian State University. I published extensively in the field of stochastic processes and polarization phenomena in lasers and spectroscopy and was invited to join several program committees and editorial boards of both leading conferences and journals in these areas of expertise.



In search of new challenges, I moved to Sweden at the end of the nineties where I worked as a Guest Researcher, Project Manager and Senior Scientist at the Royal Institute of Technology, KTH, Sweden, Acreo AB and Ericsson AB, Stockholm, Sweden. I actively engaged in the research areas of optical telecoms including; operation and maintenance of optical networks, polarization phenomena in fibre optics, optical amplifiers; design, assembly and testing.

I joined WIT in June 2005 as a Senior Research Scientist at Optics Research Group, WIT, where I lead activity in fibre optics optical telecom and fibre sensor technology. ”

Dr. Sergey Sergeev - Researcher, Optics Group
Email: ssergeev@wit.ie

“ As a graduate of WIT, with a BSc (Hons) in Commercial Software Development I secured a position within the software division of Honeywell, where I worked with colleagues based in the US, Europe, and Asia. Three years as a software engineer provided me with excellent experience and knowledge of information systems development.



With the goal of lecturing in mind, I returned to WIT to conduct full time PhD research within the ISOL research group. My area of research, Virtual Information Systems Development teams, directly stems from working on projects with colleagues that I never had the opportunity to meet in person. My research addresses the unique problems that a virtual information systems development team faces. The presentation of my work at the international conference for information systems development afforded me a positive response and encouragement to complete the study as soon as possible.

WIT has provided me with many opportunities, initially with the qualification to work as a software engineer and now the support to study for the award of PhD. I have also gained experience in lecturing at WIT confirming my career choice. Research is a long and lonely process, however in WIT there is an excellent postgraduate community providing guidance and support throughout. ”

Brenda Mullally – Computing Postgraduate Research, ISOL Group



“ I came to Ireland back in 1999, after my secondary school studies in Prishtina, Kosovo. As with any newcomer I was a bit uncertain as to what course to pursue. I only knew that college study was something I had aspired to. The differences between the educational systems of both countries didn't help either. However, the support and advice I received from the WIT staff in the process of deciding the most suitable course was remarkable. After commencing my studies, I realised I'd made a great choice to study in WIT. The BSc in Applied Computing overall incited exactly where my interests lay, an excellent amalgamation of the software side of computing with a healthy choice of hardware topics. The work placement accomplished during the third year of the course was an invaluable experience in that it strengthened my confidence in the knowledge gained and it assisted in shaping of my future plans.



The four years of hard but very interesting work paid off when I graduated with a first class honours degree. Now I'm pursuing a doctorate degree with the Telecommunications Software and Systems Group, which is a research group within WIT. I have decided to study the potential behaviour of intelligent computing systems, specifically capturing and processing the context of users, devices and services.

I don't know what the future holds, however my intent is to stay actively in the research domain while at the same time sharing and delivering the knowledge that I've acquired, to the generations of forthcoming students. ”

For more information contact:

Venet Osmani – *Computing Postgraduate Research, TSSG.*

“ A desire to improve my career prospects in academia and improve my knowledge in my relevant area of interest motivated me to undertake a masters by research at WIT.



I would describe my experience of research as challenging and stimulating. Some departments offer experience of lecturing hours. Lecturing gave me the opportunity to interact with students without interfering with my research, giving me an overall rewarding experience. ”

Ruth Barry - *MSc Computing by Research, 2005*



» Student Graduate Profiles contd...

[96]

“ I began college at WIT in 1998 where I completed the 2 year National Certificate in Industrial Computing. Following that I joined 2nd year of the BSc. in Applied Computing, choosing the Industrial option (I found embedded systems a lot more interesting than the commercial side of things!).



During 4th year of my B.Sc. I began to think about what I was going to do the following year, whether to further my studies or head straight into Industry. After hearing about the Automotive Control Group (ACG), talking to some postgrad students and then to Brendan Jackman (Lead Researcher), I decided that a career in the Automotive Industry was what I wanted. (Just a quick note to point out that you don't need to have an industrial background to apply for a position in the ACG, most students have been from the commercial side of computing!).

Two years later, with an MSc. by Research , a presentation at the Society For Automotive Engineer's Conference in Detroit, and a little more knowledge under my belt, I was lucky enough to get an interview with Pi Technology in Cambridge and subsequently was offered and took up the position of Automotive Software Engineer with Pi Technology.

I began working as an Automotive Software Engineer at Pi Technology in May 2005. Pi Technology are an Automotive Engineering Company and along with Pi Research form the Pi group of companies. Pi Research, mainly develop solutions for the motor sport industry (including technology used in Formula 1) while Pi Technology develop solutions for the commercial automotive industry, everything from development tools to engine management systems for fuel Cell Vehicles. I am currently working on the Diagnostics Interface feature for a diesel engine management system to be used by Ford and PSA/Fiat. ”

Donal Morrissey - *MSc by Research 2005, Automotive Control Group.*