Version 1.1, 13 Nov. 2014

Lists of Some Possible UCD Modules for PhD Students in the College of Agriculture, Food Science and Veterinary Medicine

From September 2014, **all** incoming PhD students in the UCD College of Science Graduate School – which includes all PhD students in the College of Agriculture, Food Science and Veterinary Medicine – must take **30 credits of taught modules** over the course of their programme. This INCLUDES students based off-site, for instance at Teagasc research centres. The aim of these taught modules is to facilitate your research as well as to provide you with important transferable skills enhancing your career development. Unless your PhD programme stipulates specific modules, you may choose from the full range of modules available throughout UCD in consultation with your Principal Supervisor. (Students undertaking Thematic PhD Programmes should consult with their Programme Co-ordinator/administrator for specific modules that may be mandatory.)

PhD students who began their programme **before** September 2014, and all incoming Research Masters students, can also undertake taught modules which will be beneficial to their research and/or transferable skills. However this is NOT mandatory.

To register for modules, you must complete a **module registration form** which is available from your School, after securing agreement from the module co-ordinator and from your supervisor. This form should be returned as soon as possible to your School office, who will register you to your chosen modules. Being fully registered to a module means that you must attend classes, complete assignments and assessments, and you will earn credits for this which will be shown on your final transcript.

Please note that once registered for a module, if for any reason you do not complete it and have not officially withdrawn from this module within 6 weeks, a NG grade will be entered onto your university record and will appear on your transcript. To withdraw from a module, please contact your School office within 6 weeks of the commencement of the module. NO RETROSPECTIVE CHANGES CAN BE MADE.

This document provides some suggestions for PhD students seeking taught modules. What follows is NOT a catalogue of UCD modules for research students, nor should it be taken as a recommendation for any module listed (or as a recommendation against any module not listed). It is merely a listing of some possible modules which students might consider as a starting point, in consultation with their Principal Supervisor.

Three lists of possible modules are provided below:

(a) Two new online modules provided via the UCD College of Science Graduate School;
(b) Potential modules for research students provided by schools in the UCD College of Science Graduate School and the Innovation Academy;
(c) Modules actually taken by PhD students registered to the College of Science Graduate School in 2013/14.

Please note that not every module will necessarily be offered in every academic year, and not all students will be eligible for all modules.

For full details of all current UCD modules, please click the 2014/15 Modules tab on the UCD Course Search page: http://www.ucd.ie/students/course_search.htm

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You may also wish to visit the Transferable Skills Training Portal for Post Graduate Students web page, for a full list of the 2014/15 Transferable Skills courses:
http://www.ucd.ie/graduatestudies/collegesandschools/transferable-skills-training/

(a) Two new online modules provided via the UCD College of Science Graduate School

Module Code	Module Name	Credits	Summary Description
SCI50010	Online Research Skills	5	This module covers a range of early-stage research skills tailored towards the needs of graduate students in the Sciences. The module employs a combination of e-learning using materials delivered via the Blackboard VLE and face-to-face workshops with discussion of specific case studies. The e-learning elements of the module are determined for individual students based on their skills needs assessment and cover the following specified learning activities:- working with your supervisor/collaborators, - project management, - intellectual property in the research context, - research ethics, - career planning, - getting published, attending conferences, presenting and networking. The workshops introduce, augment and complement the activity-based e-learning elements by providing a forum for reflective practice and team-based discussion of issues and case studies. On completion of this module students should be able to:- develop reasonable and agreed answers to the questions "What do I need and expect from my supervisor?" and "What does my supervisor need and expect from me?" - create criteria for monitoring and reporting progress, identify and manage project risks, - explain the elements of Intellectual Property in an academic/research setting and recognize the responsibilities of individual researchers - identify and address ethical problems- conduct an annual appraisal of career opportunities and goals - recognize the value of constructive criticism and review, understand the skills, materials and confidence required to plan and deliver at an academic conference- recognize the requirements, skill sets, attitudes and aptitudes which will support their development towards autonomy as a researcher.
SCI50020	Research Integrity Online	5	This module is designed to help researchers in the sciences to: know, understand and explain the key responsibilities they have as researchers; identify the challenges they could face in meeting those responsibilities; be aware of strategies for dealing with pressures and difficult situations. Online activity will be accompanied by workshops. This course covers all stages of the research process. Information, practical advice and reflective activities in key areas: 1: Introduction: principles and professional responsibilities, dealing with misconduct, mentoring 2: Planning: research with human participants, conflicts of interest, workplace safety 3: Conducting: data collection, sharing and interpretation 4: Reporting: plagiarism, authorship, peer review 5: Responsibility to the public and society.

For full details of these and other current UCD modules (including those offered as part of taught Masters programmes), please click the 2014/15 Modules tab on the UCD Course Search page:
http://www.ucd.ie/students/course_search.htm

(b) Potential modules for research students provided by schools in the UCD College of Science Graduate School and the Innovation Academy

COLLEGE OF AGRICULTURE, FOOD SCIENCE & VETERINARY MEDICINE

Module Code	Module Name	Credits	Summary Description
ANSC50010	On-line Research Skills for Graduate Students	5	This module covers a range of early-stage research skills tailored towards the needs of graduate students in the Life Sciences. The module employs a combination of e-learning using materials delivered via the Blackboard VLE and face-to-face workshops with discussion of specific case studies. The e-learning elements of the module are determined for individual students based on the skills needs assessment of the Research and Professional Development Plan and cover the following specified learning activities:- working with your supervisor/collaborators, - project management, - intellectual property in the research context, - research ethics, - career planning, - getting published, attending conferences, presenting and networking. The workshops introduce, augment and complement the activity-based e-learning elements by providing a forum for reflective practice and team-based discussion of issues and case studies.
ANSC50020**	Mixed Model Methodology**	5	The objective of this module is to provide students with an advanced working knowledge of statistical theory and application for life sciences research. Students will gain knowledge in REML, data diagnostics, analysis of incomplete block designs, repeated measures, linear and nonlinear regression and logistical regression.
*** Will not be offered in academic year 2014/15. May be offered in academic year 2015/16.*			
FDSC40490	AFS Seminar Series	2.5	The objective of this module is to provide students with an overview of the latest research developments across the major research themes underpinning the School of Agriculture and Food Science. In addition, students will advance their ability to assess critically scientific research, results and interpretations, and enhance their ability to summarize latest research findings. Each student is required to attend a minimum of 70 % of seminars presented by international and internal expert speakers and maintain a record of those seminars attended. They must attend and contribute to the post-seminar forum where possible. In this session, a critical discussion of the seminar will be presented and the students will prepare a brief written synopsis of the seminar content. On completion of this module students should have an understanding of current research developments in agriculture and food science, be able to critically assess the current research and the appropriateness of the experimental design. They should have developed critical thinking skills and the ability to summarize latest research findings.
FDSC40140**	Food Regulatory Affairs**	5	This module will explore and discuss the issues involved in the process of regulation of the food industry. It will begin by giving a history of food law and the agencies responsible for the regulation of the food industry. It will examine the risk based approach to regulation from a consumer, industry and regulators viewpoints. Public Health Aspects of food regulation will also be discussed including food fortification, nutrition and labelling, ingredients and food claims. Examples of food scandals, contaminations and scares will be given by the students in case study format.
***Only FIRM funded post grad and post docs will be able to attend this module. If there are places available, non FIRM post grad researchers will be able to attend. Further details on www.foodpostgrad.ie*			
FDSC40150**	Introduction to the National and Global Food Sector**	5	This module will introduce food scientists to the principle business aspects of the food industry on the national and global scale. This is done through a series of lectures, working groups and interactive discussions. To use case studies and speakers working in relevant industrial settings to demonstrate the relevancy of theoretical elements.

***Only FIRM funded post grad and post docs will be able to attend this module. If there are places available, non FIRM post grad researchers will be able to attend. Further details on www.foodpostgrad.ie*			
FDSC40370*	Entrepreneurship in Agri Food*	5	Researchers in the Food and Nutrition area are increasingly being employed in large corporations where they will expected to have skills in the area of innovation and entrepreneurship. This module has been designed to give an insight into what entrepreneurship is and its role in business in the Agri Food sector in Ireland. Topics to be covered include: Innovation and Entrepreneurship – a perspective from a global corporation; Idea generation, mind-mapping, roadmaps for the venture process, exploring the industry perspective; The business planning process; Communications and team building; Intellectual property; Opportunity recognition; Market analysis; Understanding finance and seeking resources; Incubation, finance, state supports, operational considerations; Sales and marketing; The role of food regulation in food and business.
**Priority may be given to students funded by certain research programmes.*			
FDSC40390*	Farm to Fork in Bioeconomy*	5	This module is concerned with the final products of production systems, which in turn become the raw materials for food processing and supply chains. A key focus will concern how the whole supply chain strives to respond to market signals, reduce costs, and increase added value. This module aims to provide an integrated overview of the production and processing elements of the food supply chain. How can production systems and food processing achieve synergistic effects on added value? What is the role of marketing and labeling of the quality and environmental standards of Irish production and processing systems? This module also addresses the wider role of the knowledge-based bio-economy. Other prominent forces within the bio-economy include the internationalisation of the food retail sector, fast-changing aggressive international markets, climate change implications and the demand for sustainable ecosystem management.
**Priority may be given to students funded by certain research programmes.*			
FDSC40400*	Hygiene Management*	5	The objective of this module is to describe the conditions and practices required to produce foods of the highest microbiological quality. • Hygienic production of foods • Building and equipment design • Microbiological quality of water, air • Cleaning and sanitisation of processing plants • Pest control • Management and disposal of waste. • Case study: production of highly sensitive foods such as infant formula • One day workshop on HACCP as applied in different food processing and service settings. • Module will incorporate HACCP certification for participants
**Priority may be given to students funded by certain research programmes.*			
FDSC40430*	Leadership Training*	5	This module will be based on the highly successful European Nutrition Leadership Programme (www.enlp.eu.com)which aims to lead to the development of future leaders in the field of human nutrition in Europe. Emphasis will be placed on understanding the qualities and skills of leadership, team building, communication project management and conflict resolution. This is achieved through a varied and highly interactive programme, which includes role-playing, presentations, discussion groups and talks by leading scientists in the Agri-Food sector in the field of academia and industry.
**Priority may be given to students funded by certain research programmes.*			

FDSC40440*	Management Skills Food Sector*	5	This module is designed to give researchers an insight into the management skills required for the employment in the food industry. Skills auditing, setting objectives, creative decision making, consultancy skills, dealing with controversy and career planning are all areas in which researchers could benefit from having a comprehensive understanding. Module Content: Effective Objective Setting, identifying developmental needs for professional goals; Career planning: skills audits, self assessment, professional goal setting, breath of professional opportunities for postgraduates, strategies for the modern jobs marketplace, identifying employment opportunities; Presentation Skills, the tools and techniques of preparing and delivering effective presentations; clarifying your contribution and creative working/job hunting, social media; consultancy case study: how to make powerful arguments and present them with passion and conviction to a well informed audience who may have diametrically opposed views.
**Priority may be given to students funded by certain research programmes.*			
FDSC40470*	Science Writing for Agri Food*	5	This module gives researchers in the Agri Food Sector an overview of the different areas of writing and communication skills in this specialized area, depending on your audience, medium and aim. It includes practical workshops with feedback. Module Content: The scientific publication process; good scientific writing principles; getting published and making an impact; when to publish and when to patent; writing a research proposal; writing your thesis; ethics and publication; communicating with non-scientific audiences; writing a press release; communicating with Stakeholders.
**Priority may be given to students funded by certain research programmes.*			
FOR50010	GIS and Remote Sensing 2	10	This is an advanced geographic information system (GIS) and and remote sensing (RS) module. The objective is to develop advanced GIS skills for the quantification, analysis and modelling of spatially distributed resources. Topics covered may include: An overview of ArcGIS 10, ArcMap, and ArcCatalog and ArcToolbox. Shapefile and geodatabase spatial data formats. Accessing image databases and raster catalogs on servers. Creating and editing data in ArcGIS 10. Spatial analysis including buffers, spatial adjustment, proximity analysis, geoprocessing. Editing spatial and attribute data in ArcMap. Introduction to model building. Overview of the ArcToolbox functionality including 3D analyst, analysis tool and geoprocessing tools. Introduction to geospatial analysis, geostatistics and geocomputation. Use of ArcGIS 10 and the opportunity to develop and communicate geospatial understanding using the scientific paper format. Introduction to R. Introduction to self-directed learning. This module is designed for researchers and professionals required to undertake research and analysis of GIS and remote sensing data. Postgraduates are encouraged to work on their own geospatial data.
FOR50020	GIS and Spatial Modelling	10	This is an advanced geospatial biological modelling module. The objective of the module is to integrate GIS and geospatial biological modelling. Topics covered may include: A review of the fundamental equation and assumptions of linear and nonlinear regression analysis. Hypothesis testing and biological interpretation of model parameters. The extra sums of squares principle and partial F tests. Model building strategies. Asymptotic precision of the model parameters. Matrix formulation of the analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA). Integral and differential forms of nonlinear models including the simple exponential, monomolecular, Logistic, von Bertallanffy, Chapman-Richards, Richards and Weibull models. Biological interpretation of nonlinear sustained yield parameters. Introduction to spatial forecasting and geographically weighted regression. Parameter estimation of linear

			and nonlinear models using SAS, PASW, R and possibly Mathematica. Transparent and independent analysis, interpretation and reporting of geospatial biological models. Literature review of geospatial biological models. Application of geospatial biological modelling to Coillte-COFORD permanent sample plot data from long-term forestry experiments. This module is designed for researchers and professionals required to undertake research and analysis of GIS and biological modelling data. Postgraduates are encouraged to work on their own geospatial and biological data.
FOR50030	GIS and MANOVA I	10	This is an advanced applied GIS and multivariate analysis of variance (MANOVA) module. The objective of this module is to develop applied quantitative skills for the design, geospatial layout, independent transparent analysis and interpretation of data from elementary multivariate experimental designs. Topics covered may include: A review of elementary matrix algebra. The determinant and inverse of symmetric pxp matrices. Computation of the mean vector, sums of squares and cross products, variance-covariance and correlation matrices using matrix algebra. Eigenvalue-eigenvector decomposition of covariance matrices. Fundamental equations of analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA) and the underlying assumptions. Analysis and interpretation of multivariate generalizations of the Student t-test i.e. Hotelling's T2 test, one-way, two-way, factorial treatment combinations and repeatedly measured experimental designs. Outline of the union-intersection principle. Hypothesis testing of main and interaction effects using Wilks' lambda, Roy's greatest-root and other multivariate test statistics. Introduction to multivariate simultaneous inference using Bonferroni and Roy-Bose simultaneous confidence intervals. Independent verification of MANOVA analyses using Microsoft Excel, SAS 9.2, Mathematica 8, PASW and possibly R. Transparent and independent analysis, interpretation and reporting of data from elementary multivariate experimental designs. Introduction to multivariate analysis of Coillte-COFORD permanent sample plot data from long-term forestry experiments. This module is designed for researchers and professionals required to undertake GIS and multivariate analysis of data from elementary experimental designs.
FOR50040	GIS and MANOVA II	10	This is an advanced applied GIS and multivariate analysis of variance (MANOVA) module. The objective of this module is to understand the logic behind geospatial multivariate analysis of balanced p-dimensional data from repeatedly measured experiments. A secondary objective is to provide PhD students with the opportunity to learn advanced multivariate techniques within a geospatial context. Topics covered may include: Computation of the mean vector, sums of squares and cross products, variance-covariance and correlation matrices using matrix algebra. Eigenvalue-eigenvector decomposition of covariance matrices. Testing the significance of non-zero eigenvalues. The fundamental equation of multivariate analysis of variance (MANOVA). The multivariate normal and Wishart distribution. Reduction of dimensionality using principle component analysis and factor analysis. Minimum and Mahalnobis distances. Independent verification of MANOVA analyses using Microsoft Excel, Mathematica 8, SAS 9.2, PASW, ArcGIS 10 and possibly R. Application of GIS and MANOVA techniques to balanced data from repeatedly measured experimental designs. Issues relating to multivariate analysis of Coillte-COFORD permanent sample plot data from long-term forestry experiments will be alluded to. This module is designed for researchers and professionals required to undertake GIS and multivariate analysis of p-dimensional data.

RDEV40560	Agricultural Extension & Innov.	10	This module is a Level 4 module for the Masters in Agricultural Innovation Support (MAIS). It will be available as an elective module to other postgraduate programmes. This module focuses on processes of learning and behaviour change as they relate to farm level decision making, technology adoption and creation of innovation. It examines the link between agricultural research, farm advisory services and agricultural education as part of the 'Knowledge transfer' triangle and how extension and education can be seen as a science, a process/activity and as a policy instrument. The module explores the social and psychological factors that influence farmer learning, innovation and behaviour change. This is critically important in farm productivity, profitability and viability. This module examines the evolution of approaches to agricultural extension from technology transfer to capacity building and enabling change. It examines the role of extension and education as instruments of agricultural and rural development policy and the role of the agricultural knowledge and information system (AKIS). It explores the social, cultural and psychological factors that act as barriers or catalysts for innovation and technology adoption and equips the student with a sound understanding of adult learning and behaviour change. The module gives students an opportunity to learn practical skills in group facilitation.
VET50010	On-line Research Skills Grad.	5	This module covers a range of early-stage research skills tailored towards the needs of graduate students in the School of Agriculture, Food Science & Veterinary Medicine. The module employs a combination of e-learning using materials delivered via the Blackboard VLE and face-to-face workshops with discussion of specific case studies. The e-learning elements of the module are determined for individual students based on the skills needs assessment of the Research and Professional Development Plan and cover the following specified learning activities:- working with your supervisor/collaborators, - project management, - intellectual property in the research context, - research ethics, - career planning, - getting published, attending conferences, presenting and networking. The workshops introduce, augment and complement the activity-based e-learning elements by providing a forum for reflective practice and team-based discussion of issues and case studies.
VET40080	Advances in Infection Biology	5	The aim of this module is to provide students with an overview of current research developments in the infection biology area, and how these are translating into novel therapeutic modalities. Students will learn key concepts in Infection Biology from the bottom up, starting with the molecular basis of host-pathogen interaction, moving to animal models of disease, then to population level studies in epidemiology, and finally to therapeutics. Students will also receive guidance on how to write a grant, and how to present their grant ideas by an "elevator pitch" type presentation, as this will be the mode of assessment for this module. We will include sessions outlining the process involved in writing an innovative research proposal. The module comprises 7 seminar sessions (3 hours each). Prior to each session students will be given a review or original research paper on the topic to be discussed.
VET40090	Current Concepts in Infection Biology A	5	This module is designed to provide research students in the first year of their PhD with an overview of the latest advances in infection biology, both through research seminars and critical evaluation of the scientific literature. Students will learn how research is presented in the scientific literature, and also how to critically assess scientific methodologies and hence develop their critical thinking skills. Students will also have to present their own research work and defend their work before their peers. The module will therefore develop critical thinking and communication skills. Each student must present at least 1 journal club and 1 research seminar of their own

			work per year.
VET40100	Current Concepts in Infection Biology B	5	This module is for second year Infection Biology PhD students and builds on skills learnt in Current Concepts in Infection Biology A. Students will further develop their critical analysis skills and be challenged to critique research papers they are presenting. They will become proficient at communicating research concepts, and become adept at defending their own research work to their peers and PIs. Students will also develop skills in organizing and chairing research seminars. Each student must present at least 1 journal club, 1 seminar, and chair 1 session per year.
VET40250	MolCellBiol Current Concepts	2.5	This module is designed to provide research students in the first year of their PhD with an overview of the latest advances in inflammation research in the thematic areas of Infection Biology, Neuroscience, Vascular Biology, and Protein Science. Students in the MolCellBiol programme are aligned to both the over-arching theme of the programme (i.e. Inflammation) as well as individual thematic areas (Infection, Vascular Biology, Neuroscience, or Protein Science). The goal of this MolCellBiol Current Concepts' module is to ensure that students are kept up to date in research developments across these themes. Students will present (1) a journal article and (2) an overview of their own research project. Students will learn through research seminars and critical evaluation of the scientific literature. They will develop understanding in how research is presented in the scientific literature, and also how to critically assess scientific methodologies and hence develop their critical thinking skills. Students will also have to present their own research work and defend their work before their peers. The module will therefore develop critical thinking and communication skills. There will be 1 joint session 'MolCellBiol Current Concepts' per month, with 10 sessions per year. Each student will present a research paper related to their area.
VET40350	MolCellBiol Current Concepts B	2.5	This module is designed for students in the second year of their PhD. It will further develop critical thinking and communication skills that the students began in 'Current Concepts A'. As in the 'A' module, the core goal is to ensure that students are kept up to date in the umbrella MolCellBiol programme theme of 'inflammation'. Students will learn through research seminars and critical evaluation of the scientific literature. They will develop understanding in how research is presented in the scientific literature, and also how to critically assess scientific methodologies and hence develop their critical thinking skills. Students will also have to present their own research work and defend their work before their peers. The module will therefore develop critical thinking and communication skills. There will be 1 joint session 'MolCellBiol Current Concepts' per month. Each student will present a research paper related to their area.

SCHOOL OF BIOMOLECULAR AND BIOMEDICAL SCIENCE

Module Code	Module Name	Credits	Summary Description
BMOL40080	Teaching in Higher Education	5	In this module, the participants, who are in the role of graduate teaching assistant, will engage in a scholarly critique of their teaching performance in supporting student learning in their disciplinary context. Participants will apply some of the basic generic and discipline specific skills in their teaching.

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SCHOOL OF CHEMISTRY AND CHEMICAL BIOLOGY

Module Code	Module Name	Credits	Summary Description
CHEM 40360	Advanced Organic Synthesis	5.0	The student following this course will develop an understanding and appreciation of the construction of complex molecules using a variety of chemical methods. They will also be exposed to the different structural types and classes of natural products and in addition the link will be made between natural products and pharmaceuticals based on their scaffolds.
CHEM 40370	Advanced NMR & Mass Spectrometry	5.0	The module allows students to develop a theoretical, analytical and practical approach to the use of modern spectroscopic techniques for structure determination, namely Nuclear Magnetic Resonance (NMR) and mass spectrometry (MS). The physical principles underlying the spectroscopic methods will be outlined.
CHEM 40390	Topics in Inorganic Chemistry	5.0	Students will develop a solid foundation in the coordination chemistry and organometallic chemistry of the Lanthanoid and Actinide elements. A large emphasis is placed in understanding the fundamental differences in 4f and 5f chemistry.
CHEM 40340	Teaching in Higher Education as a Graduate Assistant in Chemistry & Chemical Biology	5.0	The module will consist of 3 strands, a practical, a theoretical and a professional. The module will be delivered with a mixture of face-to-face and online environment and participants must be in an active teaching role. The practical component will consist of an initial presentation on the realities of demonstrating and attendance at a presentation to undergraduates on laboratory safety. There will also be preparatory sessions specific to individual experiments. Although these will be for all demonstrators they will constitute contact hours for those taking this module.
CHEM 40160	Chemistry & Chemical Biology Seminar Program 1	2.5	The module aims to provide exposure to recent research developments in Chemistry and Chemical Biology.
CHEM 40280	Chemistry & Chemical Biology Seminar Program 2	2.5	The module aims to provide exposure to recent research developments in Chemistry and Chemical Biology.
CHEM 40520	Chemistry & Chemical Biology Seminar Program 3	2.5	The module aims to provide exposure to recent research developments in Chemistry and Chemical Biology.
CHEM 40210	Comprehensive X-ray Crystallography	2.5	The module aims to give students the opportunity to develop a theoretical, analytical and practical approach to the use of X-ray Crystallography. Students will be aware of the format for reporting data and learn to appreciate the quality of published data.
CHEM 40240	Spectroscopic Techniques	2.5	The module aims to give students the opportunity to develop a theoretical, analytical and practical approach to the use of spectroscopic techniques. It includes content related to: the physical principles underlying the techniques, instrument operational parameters and application to various chemical and biological systems.
CHEM 40250	Structure & Biophysics of Nucleic Acids	2.5	The module aims to give students a comprehensive understanding of nucleic acid structures. The introduction will explore the history of the DNA structure and development of synthetic methods for basic and advanced systems.
CHEM 40350	Chem Lab to Commercialisation	2.5	This module aims to give students an overview of the process of taking an idea/invention in the lifesciences from early stage research at the laboratory bench all the way through to a successful and lucrative Company Exit. Topics covered will include industry overview, strategic and business planning, fundraising and real-life case studies.

SCHOOL OF MATHEMATICAL SCIENCES

Module Code	Module Name	Credits	Summary Description
MATH40270	Analysis for Graduates	15	
MATH40280	Algebra for Graduates	15	

MATH40390	Advanced Matrix Theory	10	
MATH40380	Mathematical Theory of PDEs	10	
MATH40160	Operator Theory	10	
ACM40290	Numerical Algorithms	5	MATLAB programming: data types and structures, arithmetic operations, functions, input and output, interface programming, graphics; implementation of numerical methods Introduction, finite floating point arithmetic, catastrophic cancellation, chopping and rounding errors. Solution of nonlinear equations; bisection method, secant method, Newton's method, fixed point iteration, Muller's method.
ACM40570	Mathematical Methods	5	- Graph Theory and Networks - Dynamical Systems - Chaos, bifurcations and Diffusion - Complexity - Random Networks - Synchronization phenomena - Asymptotic Analysis
ACM40580	Case Studies in Simulation Science	5	Application case studies will be presented to develop integrative methodologies for solving problems in simulation science. The course consists of seminars, assignments and computational labs.
ACM40590	Special Topics in Simulation Science	5	Advanced knowledge in Simulation Science
STAT40680	Stochastic Models	5	This module covers part of the syllabus for the professional examination, Models (CT4), of the Faculty and Institute of Actuaries (UK) and is twinned with the module, Models - Survival Models. The module treats the principles behind, and key characteristics, of stochastic models in actuarial applications.
STAT40320	Mathematical Statistics	7.5	An overview of mathematical statistics based on the likelihood principle will be presented and placed in the context of modern statistical problems. Both single and multiparameter methods will be examined. The introduction will cover maximum likelihood, likelihood ratio and Fisher information.
STAT40230	Survival Analysis	7.5	The basic concepts and methods in the analysis of survival data will be covered. We begin with the topics of censoring, life tables, the Kaplan-Meier estimator and the exponential, Weibull, Gamma and extreme value distributions.
STAT40180	Data Programming	7.5	This module introduces students with no previous programming experience to the open-source statistical programming language R. Topics include: manipulating vectors, matrices, arrays and lists; basic programming constructs and programme flow; graphical methods; dealing with large data sets; parallel processing; web scraping; statistical methods.
STAT50010	Statistics for biologists	2.5	Basic statistical ideas will be introduced including (1)Common probability distributions. (2) Confidence Intervals and Hypothesis Testing. (3) Classical parameter estimation theory. (4) Generlized Linear Models (5)The Bootstrap. (6) Model Comparison and validation. Examples and coding will be performed in R.

SCHOOL OF MEDICINE & MEDICAL SCIENCE

Module Code	Module Name	Credits	Summary Description
MDSA40200	Critical appraisal of current literature and research developments in translational medicine Part A	5	This module is designed to enable research students to integrate the scientific and clinical aspects of their translational research, to increase their ability to critically assess the current literature and develop their critical thinking skills.
MDSA40210	Critical appraisal of current literature and research developments in translational	5	This module is designed to enable translational medicine research students- to further develop their knowledge of the clinical issues and scientific developments relevant to their

	medicine Part B		research, - to further develop their critical analysis skills - to become adept at discussing developments in the area with clinical and scientific peers- to become proficient at communicating and defending their own research - to develop skills in writing a research thesis and in evaluating and adjudicating on research presentations
MDCS41410	Teaching in Higher Education	5	The participants, who are in the role of graduate teaching assistant, will engage in a scholarly critique of their teaching performance in supporting student learning in their disciplinary context. Participants will apply some of the basic generic and discipline specific skills in their teaching.
MDCS41640	Clinical Trials	10	Introduce the different types of clinical trial •Explain the study designs used in clinical trials •Introduce the regulatory environment for clinical trials •Discuss quality systems in clinical trials •Describe what is involved in Clinical Trial sponsorship •Introduce Pharmacovigilance and safety reporting •IMP Management •Clinical trial Roles and Responsibilities• Explain statistical methods used to design and analyse clinical trials •Include ICH-GCP Training• Introduce Clinical trial management

SCHOOL OF NURSING, MIDWIFERY AND HEALTH SYSTEMS

Module Code	Module Name	Credits	Summary Description
NMHS40540	Research Methodologies	15	This module is largely delivered online with four face-to-face workshops taking place throughout the semester. Module includes the theoretical perspectives underpinning research, ontology and epistemology, a range of qualitative and quantitative methodologies used in social research and the criteria for rigour and ethics in the conduct of research in nursing, midwifery and healthcare
NMHS40580	Research Methods	7.5	The aim of this module is to provide students with an understanding of advanced research designs and methods required to address research questions that arise in clinical practice, education or management

SCHOOL OF PHYSICS

Module Code	Module Name	Credits	Summary Description
PHYC40570	Physics Demonstrating / Tutoring	5	This module will introduce the graduate student to the theory & practice of small class tutoring and demonstrating in physics.
PHYC50010	Advanced Topics in Atomic Physics	5	
PHYC50100	Modelling and Simulation	5	The module will provide a broad discussion to theoretical models currently applied in physics of materials, and of the computational techniques used to investigate their properties.
PHYC50110	EUV Science and Technology	5	The module introduces students to the fields of EUV Science and its applications in the research and high-technology sectors. These include the semiconductor, imaging and microscopy industries. The students will learn largely through small-group interactions, which will involve literature-based research and presentation skills. Three main areas are presented: 1) Atomic Absorption and Emission Processes, 2) Plasma Physics and EUV Sources and 3) EUV optics and Applications.
PHYC50120	Hardware Dev. & Instrumentation	2.5	
PHYC50130	Radiation Therapy Physics	2.5	This module will focus on advanced dosimetric verification of complex patient treatment plans in radiation therapy and the impact of patient anatomical changes over the treatment period. The students will learn through a combination of lectures, literature based research and small group practical application of techniques to real patient data.

PHYC50140	Nanofluidics & Bio-simulation	5	The module covers application of analytical and computational methods of fluid mechanics to the micro- and nanoscale biological fluid systems.
PHYC50150	DGPP Imaging and Data	5	
PHYC50160	Intro Trans Electron Micr	5	
PHYC40400	Nanooptics and Biophotonics	5	In this module we review the basics of optics and move forward in the study of theory and key experiments towards and at the nanoscale. The knowledge acquired brings us to the forefront of nanooptics and biophotonics from the mesoscopic level and down to single molecule detection and imaging.
PHYC40410	Physics of Nanomaterials	5	Contents of the course include: Introduction to nanomaterials; physics of two-dimensional nanomaterials; properties in physics of carbon nanotubes and other one-dimensional nanomaterials; physics and properties of zero-dimensional nanomaterials; molecular nanomaterials; growth and systhesised methods, structural and optical characterisation, and device applications of nanomaterials. The application of nanomaterials to bio and life sciences will be covered.
PHYC40420	Spectroscopy and Lasers for BioNanoScience	5	he course covers Einstein's rate equations, 3/4 laser level systems, pumping, population inversion, optical setup, laser cavities, different laser types, Q-switching, mode locking (ultra fast pulses), frequency doubling (SHG), diffraction limit, frequency comb techniques (ultra high resolution) and applications in spectroscopy, imaging, diagnostics and medical therapeutics.
PHYC40430	Nanomechanics – from single molecules to singe cells	5	The module covers a range of problems related to mechanical properties of biological systems at the nanoscale. The module will include the following topics: statistics of biopolymers; molecular adsorption at interfaces; single molecule mechanics, mechanics of polymer networks and brushes; force spectroscopy; collective phenomena and surface forces; microrheology; dynamics of nanostructured systems.
PHYC40440	Atomic Force Microscopy for BioNanoScience	5	
PHYC40470	Computational Biophysics and Nanoscale Simulations	5	To introduce the students to both basic and advanced concepts involved in a variety of modern methods in biomolecular and nanoscale simulations with a focus on membranes, proteins and nucleic acids.
PHYC40480	Biophysics at the Nanoscale and Nanodevices	5	Advanced understanding of nanoscale phenomena and the physics behind them, the necessary models to compute their interactions and the techniques to measure these.
PHYC40490	Biomimicry – learning from nature	2.5	Biomimicry is a relatively new science that studies nature, its systems, processes and elements and then imitates them to solve human problems. Here, we focus on chemical, mechanical and topographical biomimicry at the nanoscale. Examples of the systems that we will examine include: natural adhesives - blue mussel, gekko, amyloid; antifouling surfaces - shark skin; aqueous lubricant, brushes - artificial joint lubrication; mechanically adaptive materials - abalone, squid beak, sea cucumber. Other systems of interest include those that exhibit anhydrobiosis (desiccation tolerance) and those that thrive in physically or geochemically extreme conditions (extremophiles).
PHYC40520	Biological fluid mechanics at the micro and nanoscale	2.5	The module covers application of analytical and computational methods of fluid mechanics to the micro- and nanoscale biological fluid systems. These systems are characterized by low Reynolds numbers and enormous role of interfaces, so special attention will be paid to modelling fluid flow past complex surfaces and theoretical treatment of boundary conditions.
PHYC40550	Laser Tissue Interactions	5	Laser medicine covers all aspects of medicine, surgery and dentistry. To use lasers efficiently, effectively and safely, reasonably theoretical and practical studies on laser dose parameters and laser-tissue interactions are essential. This course will provide an

			introduction to key concepts and applications.
PHYC40560	AFM for Bionano	5	The atomic force microscope (AFM) is one of the family of scanning probe microscopes, and is widely used for biological applications. This module covers the basic principles of AFM including: cantilever design; approach mechnisms; cantilever deflection detection techniques, modes of operation; quantitative measurements; force-distance curves; force-extension curves; and imaging.
PHYC40630	BioOptics and NanoBio Imaging	5	Optics is the preferred imaging method for biology due to its noninvasive character and the vast number of contrast techniques that can be implemented. Many modern microscopes funcion with lasers as illumination sources due to the high directionality and monochromacity of the light.
PHYC40660	The Space Environment	5	Students are given an overview of the space environment, under the following five sections: the vacuum environment; the neutral environment; the plasma environment; the radiation environment; and the micrometeoroid/orbital debris environment.
PHYC40670	Space Sector Seminars	5	Students are introduced to various players in the space industry, via a series of guest speakers on a diversity of topics. Guest speakers include space agency representatives, space industry professionals and space research academics.
PHYC40700	Satellite Subsystems Laboratory	5	This module give an understanding of small satellites. In this module, a fully functional nano-satellite simulator is used allow students to become familiar with all the major sub-systems on a satellite, including computing and data-handling, attitude determination and control, communications, and power.
PHYC40710	Detector Laboratory	5	Students will gain experience with detectors of various wavelengths from optical to gamma-ray. Practical laboratories will include hands-on experience in characterising charge-coupled device (CCD) cameras and calibrating gamma-ray detectors, such as high-resolution germanium detectors
PHYC40720	Professional Skills	5	This module facilitates professional development, via participation in a series of lectures and workshops on a diversity of topics
PHYC40730	Applications of Space Science	5	This module presents an overview of applications of space science and technology, including: astronomy, cosmology and planetary science; Earth observation and remote sensing; satellite services such as telecommunications and satellite navigation.
PHYC40740	Space Sector Orientation	5	This module gives graduates an orientation within the sector, and includes the following topics: - Space Sector Main Players: An overview of the main players in the space sector globally, from agencies to industries. - Space Policy & Law: Space policy in Ireland, EU and internationally, as well as global trends;

SCHOOL OF PUBLIC HEALTH, PHYSIOTHERAPY AND POPULATION SCIENCES

Module Code	Module Name	Credits	Summary Description
PHPS 40550	Applied Research Methods and Data Management	10	This module prepares students working, or intending to work, in a population health or clinical setting to undertake all elements of a research project from concept through design, implementation and analysis to interpretation and presentation of findings.
PHPS 50010	Graduate Teaching Assistant	5	This module offers doctoral students in Public Health the opportunity to explore theoretical principles of teaching and learning and to gain practical experience in the delivery and assessment of seminars and tutorials to undergraduate medical and physiotherapy students.
PHPS 40620	Graduate Seminar	2.5	This module comprises 10 two-hour seminars over the course of the academic year for PhD and Research Masters students of Public Health. Each seminar is comprised of two or three presentations from graduate students of the SPHPPS or guest external speakers.

PHPS 40010	Research Methods in Epidemiology	5	This module will introduce the student to the research process concentrating on 'population' based studies. The basic descriptive statistics for a simple variable (e.g. means, medians, standard deviations, percentages) and for quantifying an association between two variables (e.g. mean differences, relative risks, odds ratios) will be considered.
PHPS 40190	Quantitative and Qualitative Analysis	5	The quantitative component will cover statistical methods with an emphasis on the techniques used in population-based research and the development of applicable skills.
PHPS 40460	Statistical Modelling & Survival Analysis	5	This module will build on the module PHPS40190 'Quantitative and Qualitative Analysis', concentrating on more advanced techniques employed in the analysis of epidemiological and medical research.
PHTY 40270	Research Methods for Healthcare Professionals	5	This is a course in health economics specifically tailored to non-economists. This course will provide an introduction to main concepts in health economics (opportunity cost, equity, efficiency, scarcity) and an overview of economic principals with particular application to health care.

CONWAY INSTITUTE

Module Code	Module Name	Credits	Summary Description
CNWY40010	Conway Lecture & Seminar Series	2.5	This module is designed to provide research students with an overview of the latest research developments across the breadth of the biological sciences, to advance their ability to critically assess scientific methodologies and data, and to demonstrate how best to deliver succinct, clear and logical scientific presentations.
CNWY40090	Introduction to 'Omic' and Advanced Imaging Technologies	5	This course is designed to familiarise students with the principles, practice and application of the rapidly developing 'omic' and imaging technologies.
CNWY40110	Molecular Neuroimmunology	5	This course focuses on the interaction between the immune and nervous systems at molecular, cellular and systems levels. It provides an overview of current and developing concepts in neuroimmunology from both neuroscience and immunology perspectives.
CNWY40120	Advanced Biological Imaging	5	This module is designed for students who wish to understand and become critically aware of the principles, practice and applications of rapidly developing imaging technologies. Particular focus is given to transmission and fluorescent light-based imaging approaches
CNWY40130	Flow Cytometry: Principles and Practice	2.5	This module is designed for research students who wish to understand and become critically aware of principles, practice and applications of flow cytometry and become competent, independent users of this technology.
CNWY40160	Applied Proteomics	5	This module is designed for students who wish to understand and become critically aware of principles, practice and applications of the rapidly developing proteomic technologies.
CNWY40170	Fundamental Biological Imaging	2.5	This module is designed for students who wish to understand and become critically aware of the basic principles, practice and applications of rapidly developing imaging technologies. Particular focus is given to white and fluorescent light-based imaging approaches.
CNWY40180	Introduction to Core Research	2.5	This module is designed to introduce NEW graduate students embarking on a laboratory-based biomedical research programme to essential skills required for success. It will cover aspects of core research skills that can be applied directly to laboratory based graduate programmes of study in the Colleges of Health Sciences; Science and Agriculture, Food Science & Veterinary Medicine be transferred to further graduate research and training or to employment.
CNWY401130	Data Analysis: Biological Sc	2.5	This module is designed to provide postgraduate students involved in laboratory-based research in the biological sciences with the analytical and statistical skills to generate meaningful results from

			experimental data in practical computer-based sessions.
CNWY50010	Introductory Biology for Postgraduate Computational Biologists	5	Module description:This course is intended as a "boot-camp" for those lacking biology background who will carry out a PhD in computational biology. It will happen at the outset of semester 1. It will cover basics of (a) structure of proteins, DNA, RNA, lipids, sugars, carbohydrates (13 lectures)(b) the genetic code, transcription, translation (3 lectures)(c) genomes (2 lectures) (d) evolution, selection and heritability (1 lecture)(e) modern experimental approaches: proteomics, metabolomics, polymorphism detecting chips and expression detecting chips. (1 lecture)

INNOVATION ACADEMY

Module Code	Module Name	Credits	Summary Description
IA40180	Innovation Academy Speaker Series	2.5	This module is designed to expose students to a diverse range of Innovation Academy related topics through a series of invited speakers. Selected entrepreneurial thought leaders will provide motivation and insight by sharing their unique experiences in an environment designed to promote audience enquiry. Formal and informal debate are an intrinsic part of this speaker series.
IA40110	Creative Thinking & Innovation	10	The aim of this module is to help postgraduate students and professionals access their innate ability for independent creative thinking and innovation, in its broadest sense, and to aid them in discovering the potential for the development of their new ideas in a multi-disciplinary team environment.
IA40260	Entrepreneurial Thinking and Innovation	15	The aim of this module is to foster an entrepreneurial mindset amongst postgraduate and professional participants and to develop skills that will help them to identify the potential value of their ideas and convert those into sustainable economic, social, environmental and cultural activities and impacts. Learning takes place in a dynamic, multidisciplinary team environment, which replicates the reality of new ventures.
IA40120	Opportunity Generation and Recognition	5	To take independent ideas from the point of ignition, to the creation of value, not only requires the appropriate recognition for the potential of the original idea, but also requires a combination of skill sets to develop and communicate the idea in such a way as to secure the necessary support and resources. The aim of this module is to help participants to start to develop their thinking around this process
IA40130	Capturing Novel Ideas	5	Participants are encouraged to explore IP from a number of perspectives including strategic, commercial and legal. Specifically the module addresses: different types of IP such as patents, trademarks and logos, registered designs and copyright and the related ownership and registration issues; how to derive value from the 'unprotectable'; how to deal with emerging IP challenges such as copyright, the Internet and Social Media; how to conduct effective IP and patent searches; IP protection processes and associated costs; competitive IP challenges and infringements; working in collaborative or open innovation project groups; valuing and commercially exploiting IP; identifying and managing IP stakeholders; understanding the role of IP in career path options.

IA40140	Planning Your New Venture	5	Theme I: Understanding Business Models: This component introduces students to five key elements which define a business model, to their use and to their limitations: the revenue model; the gross margin model; the operating model; the working capital model; and the investment model. Theme II: Feasibility Analysis enables building and managing a portfolio and pipeline of development projects that fit strategically with venture objectives, balance risks and generate cash flows. Managing at the "fuzzy front end" involves project evaluation and selection methods. This analysis integrates business and technology plans by setting budgets and targets for the venture.
IA40170	Inspiring Creative and Divergent Thinking	5	This module explores ways of triggering creative thinking within an educational institution. Generic foundations of teaching and learning, including motivation, evaluation and review will be explored. Students will then design and deliver their own half-day of igniting creative thinking with full access to Innovation Academy facilities of A/V equipment, iPad learning lab, LEGO education lab etc.
IA40240	Digital Marketing and Social Media	5	This module looks at the most up to date methods of internet marketing and has been co-designed with industry specialist Google.

SCHOOL OF BUSINESS

Module Code	Module Name	Credits	Summary Description
BMGT42130	Innovation and Knowledge Transfer I	2.5	The Innovation and Knowledge Transfer modules will provide an introduction to the area of Innovation and Entrepreneurship in the context of the Knowledge Economy.
BMGT42140	Innovation and Knowledge Transfer II: Transferring Technology from Research to the Knowledge Economy	2.5	The Innovation and Knowledge Transfer modules will provide an introduction to the area of Innovation and Entrepreneurship in the context of the Knowledge Economy.

(c) UCD Modules actually taken by PhD students in the UCD College of Science Graduate School during academic year 2013/14

Online modules (where known) are highlighted in bold.

School Responsible for Delivery	Module Code	Module Title
Agriculture & Food Science	AERD 40050**	Food and Agricultural Policy**
	***Replaced by AERD 30210 Food and Agricultural Policy*	
Agriculture & Food Science	AESC 40020	Epidemiology and Zoonoses
Agriculture & Food Science	AESC 40130	Soil Ecology
Agriculture & Food Science	AESC 40180	Data Analysis for Biologists
Agriculture & Food Science	ANSC 30050	Exp Design and Data Analysis
Agriculture & Food Science	ANSC 40030	Advanced Beef Production

Agriculture & Food Science	ANSC 40040	Advanced Dairy Production
Agriculture & Food Science	ANSC 40160	Equine Industries Case Studies
Agriculture & Food Science	ANSC 40170	Applied Equine Genetics & Br
Agriculture & Food Science	**ANSC 50010**	**On-line Research Skills Grad. (Online)**
Agriculture & Food Science	ANSC 50020**	Mixed Model Methodology**
*** Will not be offered in academic year 2014/15. May be offered in academic year 2015/16.*		
Agriculture & Food Science	FDSC 30030	Food Analysis II
Agriculture & Food Science	FDSC 40060	Fresh&Processed Meat Products
Agriculture & Food Science	FDSC 40250	Hot topics
Agriculture & Food Science	FDSC 40470	Science writing for Agri Food
Agriculture & Food Science	FDSC 40490	AFS Seminar Series
Agriculture & Food Science	**FDSC 40550**	**Meat Products (Online)**
Agriculture & Food Science	FOR 30060	Forest Establishment
Agriculture & Food Science	FOR 30330	Silviculture of Forest Stands
Agriculture & Food Science	HNUT 40020	Nutritional Metabolism
Agriculture & Food Science	HNUT 40200	Molecular Nutrition
Agriculture & Food Science	HNUT 40230	Public Health Nutrition
Agriculture & Food Science	HNUT 40240	Food Regulation
Applied Language Centre	LANG 10040	Eng Acad Purp 5
Applied Language Centre	LANG 10070	Italian Gen Purp 2
Applied Language Centre	LANG 10170	French Gen Purp 1
Applied Language Centre	LANG 10180	French Gen Purp 2
Applied Language Centre	LANG 10230	Spanish Gen Purp 1
Applied Language Centre	LANG 10510	English Acad Purp 4
Applied Language Centre	LANG 10530	English Acad Writing 5
Applied Language Centre	LANG 20330	French General Purposes 3a
Applied Language Centre	LANG 20340	French General Purposes 3b
Applied Language Centre	LANG 20370	Japanese Language & Culture 3a
Biology & Environmental Sci	BIOL 40100	Teaching in Higher Education
Biology & Environmental Sci	BIOL 40110	Global Challenges&GreenIssues
Biology & Environmental Sci	BIOL 40140	Science and Society
Biology & Environmental Sci	BIOL 40270	ENS Work Placement I
Biology & Environmental Sci	BIOL 40280	ENS Work Placement II-A
Biology & Environmental Sci	BIOL 40300	Data Mgt and Interpretation
Biology & Environmental Sci	BIOL 40310	Sci Writing and Commun Skills
Biology & Environmental Sci	ENVB 10010	Biol. Recording & Data Mgt.
Biology & Environmental Sci	ENVB 10020	Bio. Iden: Field & Lab Methods
Biology & Environmental Sci	ENVB 20040	Project (Biol. Rec. & Iden.)
Biology & Environmental Sci	ENVB 40290	Ecological Modelling
Biology & Environmental Sci	ENVB 40370	Data Anal. & Interpretation
Biomolecular & Biomed Science	BIOC 40060	Advanced Neurochemistry

Biomolecular & Biomed Science	BMOL 40080	Teaching in Higher Education
Biomolecular & Biomed Science	GENE 30040	Programming for Biologists
Biomolecular & Biomed Science	MICR 40070	Enzyme Technology&Protein Eng
Biosystems Engineering	BSEN 40410	Food Chain Integrity
Biosystems Engineering	BSEN 40450	Contaminants in the Food Chain
Business	MIS 30040	Analytics Modelling
Business	MKT 30040	Consumer & Buyer Behaviour
College of Human Sciences	GSHS 50070	Research Design Social Science
Chem & Bioprocess Engineering	CHEN 40060	Bioreactor Modelling &Control
Chem & Bioprocess Engineering	CHEN 40440	Chem Proc Sust & Ren Energy
Chemistry & Chemical Biology	CHEM 40060	Methods in Organic Synthesis
Chemistry & Chemical Biology	CHEM 40160	Chem&Chem Biol Seminar Prog I
Chemistry & Chemical Biology	CHEM 40210	Comp X-ray Crystallography
Chemistry & Chemical Biology	CHEM 40280	Chem & Chem Bio Sem Prog II
Chemistry & Chemical Biology	CHEM 40310	Catalytic Asymmetric Synthesis
Chemistry & Chemical Biology	CHEM 40340	SCCB Grad Assistant
Chemistry & Chemical Biology	CHEM 40350	Chem Lab to Commercialisation
Chemistry & Chemical Biology	CHEM 40360	Advanced Organic Synthesis
Chemistry & Chemical Biology	CHEM 40370	Advanced NMR & MS
Chemistry & Chemical Biology	CHEM 40390	Topics in Inorganic Chemistry
Chemistry & Chemical Biology	CHEM 40520	Chem & Chem Bio Sem Prog III
Chemistry & Chemical Biology	CHEM 40850	TransmissionElectronMicroscopy
Chemistry & Chemical Biology	CHEM 40860	Chemistry Outreach
Chemistry & Chemical Biology	CHEM 40920	Translational Research in Aids
Chemistry & Chemical Biology	CHEM 50030	Chem 3rd Yr PhD Presentation
Civil Struct & Env Engineering	CVEN 40250	Specialist Studies IB
Computer Science & Informatics	COMP 20070	Databases and Info. Systems I
Computer Science & Informatics	COMP 30230	Connectionist Computing
Computer Science & Informatics	COMP 30250	Parallel and Cluster Computing
Computer Science & Informatics	COMP 40180	Parallel Algorithms Design and
Computer Science & Informatics	COMP 40260	Connectionism
Computer Science & Informatics	COMP 40400	Bioinformatics
Computer Science & Informatics	COMP 40600	Multimed Security&Data Hiding
Computer Science & Informatics	COMP 40640	Topics in Cognitive Science II
Computer Science & Informatics	COMP 40760	Investigative Techniques
Computer Science & Informatics	COMP 40790	Application Forensics
Computer Science & Informatics	COMP 41380	Communications and Outreach

Computer Science & Informatics	COMP 41450	Machine Learning and Network D
Computer Science & Informatics	COMP 47140	Performance of Enterprise Comp
Computer Science & Informatics	COMP 50010	Computer Sci and Informatics
Computer Science & Informatics	COMP 50030	Bioinformatics Applications &
Computer Science & Informatics	**COMP 50040**	**Online Research Skills SCSI (Online)**
Computer Science & Informatics	COMP 50050	Python for biologists
Conway Institute	CNWY 40010	Conway Lecture & Seminar Series
Conway Institute	CNWY 40070	Bioinformatics Research Sem
Conway Institute	CNWY 40090	Intro to Omic
Conway Institute	CNWY 40120	Advanced Biological Imaging
Conway Institute	CNWY 40130	Flow Cytometry
Conway Institute	CNWY 40160	Applied Proteomics
Conway Institute	CNWY 40170	Fundamental Biological Imaging
Conway Institute	CNWY 40180	Introduction to Core Research
Conway Institute	CNWY 41130	Data Analysis: Biological Sc
Conway Institute	**CNWY 50030**	**Online Research Skills CompBio (Online)**
Economics	ECON 20030	Intermediate Quantitative Econ
Economics	ECON 30130	Applied Econometrics I
Economics	ECON 41760	Health Economics
Economics	ECON 41850	Advanced Econometrics
Economics	ECON 42000	Econometrics
Economics	ECON 42030	Quantitative Techniques
Economics	ECON 42110	Topics in Econometrics
English, Drama & Film	ENG 41180	Hands, Quills, Pens
Innovation Academy	IA 40110	Creation
Innovation Academy	IA 40120	Recognition
Innovation Academy	IA 40130	Protection
Innovation Academy	IA 40140	Preparation
Innovation Academy	IA 40150	Activation
Innovation Academy	IA 40280	Protecting Your Idea
Law	LAW 20330	EU Constitutional Law
Mathematical Sciences	ACM 30020	Advanced Mathematical Methods
Mathematical Sciences	ACM 30200	Foundations of Fluid Mechanics
Mathematical Sciences	ACM 30220	Partial Differential Equations
Mathematical Sciences	ACM 40070	Environmental Fluids
Mathematical Sciences	ACM 40290	Numerical Algorithms
Mathematical Sciences	ACM 40570	Mathematical Methods
Mathematical Sciences	ACM 40580	Case Studies in Simulation Sci

Mathematical Sciences	ACM 40690	Survey of Appl and Comp Math
Mathematical Sciences	MATH 40120	Commutative Algebra
Mathematical Sciences	MATH 40250	Problems in Hilbert Space
Mathematical Sciences	MATH 40320	Wavelet Analysis
Mathematical Sciences	MATH 40400	Modules and Rings
Mathematical Sciences	MATH 40420	Quadratic Forms & Wireless Com
Mathematical Sciences	MATH 40440	Graduate Analysis
Mathematical Sciences	STAT 20070	Biostatistics
Mathematical Sciences	STAT 30010	Time Series Analysis
Mathematical Sciences	STAT 30080	Models - Survival
Mathematical Sciences	STAT 30090	Models - Stochastic Models
Mathematical Sciences	STAT 30270	Statistical Data Mining
Mathematical Sciences	STAT 40080	Nonparametric Statistics
Mathematical Sciences	STAT 40120	Categorical Data Analysis
Mathematical Sciences	STAT 40150	Multivariate Analysis
Mathematical Sciences	STAT 40180	Data Programming
Mathematical Sciences	STAT 40320	Mathematical Statistics
Mathematical Sciences	STAT 40330	Nonparametric Statistics
Mathematical Sciences	STAT 40340	Multivariate Analysis
Mathematical Sciences	STAT 40380	Bayesian Analysis
Mathematical Sciences	STAT 40390	Bayesian Analysis
Mathematical Sciences	STAT 40400	Monte Carlo Inference
Mathematical Sciences	STAT 40430	Advanced Biostatistics
Mathematical Sciences	STAT 40470	Intro. to Quant. Research I
Mathematical Sciences	STAT 40590	Statistical Data Mining
Mathematical Sciences	STAT 40670	Regression Methods
Mathematical Sciences	STAT 40680	Stochastic Models
Mathematical Sciences	**STAT 40720**	**Intro Data Analytics (Online)**
Mathematical Sciences	**STAT 40730**	**Data Prog with R (Online)**
Mathematical Sciences	**STAT 40740**	**Multivariate Analysis (Online)**
Mathematical Sciences	**STAT 40750**	**Data Mining (Online)**
Mathematical Sciences	STAT 50010	Statistics for biologists.
Mech & Materials Engineering	MEEN 40180	Nanomaterials
Mech & Materials Engineering	MEEN 40670	Technical Communication
Medicine & Medical Science	MDCS 41410	Teaching in Higher Education
Medicine & Medical Science	MDSA 40200	Appraisal Translational Med A
Medicine & Medical Science	MDSA 40210	Appraisal Translational Med B
Medicine & Medical Science	PATH 10020	Basic Principles of Cell Biolo
Medicine & Medical Science	PHYS 30220	Integrated Neuromuscular Phys
Medicine & Medical Science	RDGY 41010	Research Methods & Statistics
Nursing,Midwifery & Health Sys	NMHS 40540	Research Methodologies

Nursing,Midwifery & Health Sys	NMHS 42070	Research theory,method & procc
Philosophy	PHIL 40420	The Good Society
Philosophy	PHIL 41100	Philos & Science of Free Will
Physics	PHYC 40210	Applied Optics
Physics	PHYC 40250	Condensed Matter Physics
Physics	PHYC 40410	Physics of nanomaterials
Physics	PHYC 40470	Computational biophysics
Physics	PHYC 40480	Biophysics at the nanoscale
Physics	PHYC 40560	AFM for Bionano
Physics	PHYC 40570	Physics Demonstrating\Tutoring
Physics	PHYC 40720	Professional Skills
Psychology	PSY 40020	Neuropsychology
Psychology	PSY 40220	Advanced Qualitative Design an
Public Hlth, Physio & Pop Sc	PERS 10010	Fundamentals of Strength & Con
Public Hlth, Physio & Pop Sc	PERS 20230	Neuromuscular & Biomechanical
Public Hlth, Physio & Pop Sc	PERS 30230	Intro to Statistics
Public Hlth, Physio & Pop Sc	PHPS 40010	Research Methods:Epidemiology
Public Hlth, Physio & Pop Sc	PHPS 40190	Quan&Qualitative Analysis
Public Hlth, Physio & Pop Sc	PHPS 40230	Veterinary Epi & Food Safety
Public Hlth, Physio & Pop Sc	PHPS 40450	Risk Perception, Communication
Public Hlth, Physio & Pop Sc	PHPS 40460	Stat modelling&survival analys
Public Hlth, Physio & Pop Sc	PHPS 40470	Health Economics
Public Hlth, Physio & Pop Sc	PHPS 40550	App Research Mthds & Data Mgt
Public Hlth, Physio & Pop Sc	PHPS 40610	Food Safety
Public Hlth, Physio & Pop Sc	PHPS 40620	Graduate Seminar
Public Hlth, Physio & Pop Sc	PHTY 20020	Applied Physics and Biomech
Public Hlth, Physio & Pop Sc	PHTY 40270	Research Methods for Health
Sociology	SOC 40640	Social Simulation: Methods and
Sociology	SOC 40650	Social Economic & Political...
Veterinary Medicine	VET 40080	Advances in Infection Biology
Veterinary Medicine	VET 40090	Concepts Infection Biology A
Veterinary Medicine	VET 40100	Concepts Infection Biology B
Veterinary Medicine	VET 40250	MolCellBiol Current Concepts
Veterinary Medicine	VET 40350	MolCellBiol Current Concepts B