

# Dublin Institute of Technology

Module Code	Module Title		
BIOL 9223	<b>Research Methods and Biostatistics</b>		
ISCED CODE	Pre-Requisite Modules code(s)	Co-Requisite Modules code(s)	ECTS Credits
			10

## Module I (Core)

**Module Coordinator:** Dr. S. Meaney

**Module Author(s):** Dr. J. Curtin, Dr. D. Drudy, Dr. J. Kearney, Dr. S. Meaney

### Module Aim:

The aim of this module is twofold:

- to provide the student with the skills necessary to design, perform, evaluate and disseminate modern hypothesis driven scientific research;
- to provide the student with both theoretical understanding and practical competency in contemporary biostatistical methods.

### Module Description:

This module is designed to support the scientific development of the learner by equipping them with the key skills required to carry out independent scientific enquiry and by providing them with a framework for lifelong scientific development. This module will guide the learner through a series of teaching and learning activities which represent core activities of the contemporary life science researcher including design and management of research projects, funding, ethics, data analysis, biostatistics and dissemination of research results. Moreover, the module has been designed such that these tasks will support the research project (Module BIOL 9235).

### Learning Outcomes:

On successful completion of this module, the student will be able to:

- Formulate a testable hypothesis based on existing available scientific data and devise an experimental approach to test this hypothesis;
- Manage the progression of a significant laboratory-based scientific project;
- Collate and analyse generated data, using appropriate statistical methods and software packages;
- Present research findings in the appropriate scholarly manner to specialist and non-specialist audiences.

### Learning and Teaching Methods:

This module will be delivered using a blended approach, whereby 90% of the content will be delivered in an online/distance format, using WebCourses as the core E-learning package. The remaining contact will be in the form of induction sessions, video presentation, round-table tutorials and workshops. Online teaching and learning activities will include: completion of simulated applications for research ethics committee approval and research funding, review of peer applications, online instruction in the use of statistical software, data analysis, live videocast tutorials and online lectures. Students will also be required to engage in peer-to-peer learning and ongoing discussions using WebCourses.

### Module Content:

- Design and management of scientific research projects including hypothesis formulation, project management, sample collection and storage, record keeping and data storage, research funding and ethical applications, evaluation of grant and ethical applications;
- Theoretical basis of biostatistics: Probability, independence, statistical testing, correlation and regression analysis, univariate versus multivariate analyses;
- Epidemiological methodology: descriptive, observational and interventional studies (clinical trials);
- Practical statistical analysis: Data analysis using Excel and SPSS;
- Dissemination of data: uses-and-abuses of presentation software; the importance of clarity in visual

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representations of data; practical presentation skills (including analysis of video presentation); scientific writing; the anatomy of a scientific manuscript; approaches to literature and reference management.

### Module Assessment:

This module will be assessed entirely by continuous assessment. These assessments are draft and evaluate an online joint grant and ethics application and formally evaluate that of a peer (30% of available marks); practical data analysis and interpretation (30% of available marks); theory assessment (MCQ and short notes) on statistical and epidemiological theory (10% of available marks); submission of their research project proposal (30% of available marks). These assessment components have been designed to replicate activities which would be required in connection with planning and carrying out a research project.

To pass the module students must (a) attain 50% of the maximum marks available for the module and (b) achieve a mark of at least 50% in the continuous assessment components. The module cannot be passed if any assessment component returns a final mark of less than 45%.

### Reading List:

Beauchamp, T.L. and Childress, J.F. 2008 Principles of Biomedical Ethics. Oxford University Press.  
 Belcher W.A., 2009, Writing Your Journal Article in Twelve Weeks: A Guide to Academic Publishing Success, Sage Publications.  
 Campbell, M.J., 2009, Statistics at Square One, Wiley-Blackwell.  
 Campbell, M.J., 2006, Statistics at Square Two: Understanding Modern Statistical Applications in Medicine, Wiley-Blackwell.  
 Day RA and Gastel, B., 2006 How to write and publish a scientific paper, Cambridge University Press.  
 Ellison, S.L.R, Barwick, V.J. And Duquid-Farrant, T.J., 2009, Practical Statistics for the Analytical Scientist: A Bench Guide, Royal Society of Chemistry.  
 Fricker, L., 2004, How to Write a REALLY Bad Grant Application (and Other Helpful Advice For Scientists), Authorhouse.  
 Katz, M.J., 2009, From Research to Manuscript: A Guide to Scientific Writing, Springer.  
 Lang, T.A., 2009, How to Write, Publish, and Present in the Health Sciences: A Guide for Physicians and Laboratory Researchers, American College of Physicians.  
 Lang, T.A. and Secic, M., 2006, How to report statistics in medicine. American College of Physicians  
 Norman, G., 2008, Biostatistics: The Bare Essentials 3/e (with SPSS), BC Decker Inc.  
 Rothmann, K.J., 2008, Modern Epidemiology, Lippincott Williams & Wilkins .  
 Petrie, A. And Sabin, C., 2009 , Medical Statistics at a Glance, Wiley-Blackwell.  
 Vaughn, L., 2009, Bioethics: Principles, Issues, and Cases, Oxford University Press.  
 Veney, J.E., Kros, J.F. And Rosenthal, D.A., 2009 , Statistics for Health Care Professionals: Working With Excel, Jossey-Bass.

**Further Details:** This linear module will be run using a blended learning approach, whereby 90% of the content will be delivered in a distance format, including both synchronous and asynchronous contact, using the WebCourses package. This module will begin and end with a face-to-face sessions.

**Date of Academic Council Approval:**

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Module Code	Module Title		
BIOL 9227	<b>Cell Biology and Immunology</b>		
ISCED CODE	Pre-Requisite Modules code(s)	Co-Requisite Modules code(s)	ECTS Credits
			5

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## Module No 2 (Core)

**Module Coordinator:** Dr. G. Byrne, Dr. S. Lynch

**Module Author:** Dr. G. Byrne, Dr. J. Guerin, Dr. O. Howe, Dr. S. Lynch

## Module Aim:

The aim of this module is to develop and update knowledge in key areas of contemporary cell biology and immunology.

## Module Description:

This module is designed to review the cutting-edge of cell biology and immunology. The module will explore contemporary issues in these areas and, through the use of appropriate examples, integrate these findings into biomedical science. The module will provide the students with a competency and know-how in using the literature to learn about cell cycle pathways and control, receptor structure and function and the downstream consequences in receptor signalling. The module will provide the students with a competency and know-how in using the literature to learn about expand their basic knowledge in cell biology and immunology.

## Learning Outcomes:

On successful completion of this module, the student will be able to:

- Outline the mechanistic basis of essential cell functions including regulation of gene expression, the progression of the cell cycle, processing of RNA and cell signalling;
- Discuss the structure, function and genetics of immunologically essential proteins (e.g. immunoglobulin, T-cell receptor, Toll Like Receptor) and outline their downstream signalling cascades;
- Critically appraise selected topics from the literature and communicate this content to their peers.

## Learning and Teaching Methods:

Lectures, round table workshops, case studies, tutorials

## Module Content:

- Cell cycle control system: role of cyclin-dependent protein kinases (CDKs) and CDK inhibitory proteins;
- Control of cell division and growth: effect of mitogens on CDK activity, effects of DNA damage, abnormal proliferation signals
- Apoptosis: role of caspases, cell surface death receptors, Bcl2, Inhibitors of apoptosis (IAPs), dysregulation of apoptosis and its contribution to disease (cancer);
- Ion-channel coupled, G-protein coupled and Enzyme-linked cell surface receptors, intracellular signalling proteins: case study (pattern recognition receptors): Toll-like receptors (MAP kinase and NFkappaB activation);
- Gene expression and RNA processing, splicing pathway, role of spliceosome, alternative and aberrant forms of splicing, splice variants as cancer biomarkers;
- Pattern recognition receptors of the innate immune system including toll-like receptors and natural killer receptors;
- MHC class I and II structure, function and antigen processing and presentation;
- Antigen recognition structures of the specific immune response including TCR and immunoglobulin molecules, structure, function and genetics;
- MHC class I and II structure, function and antigen processing and presentation;

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- Downstream signalling events following receptor engagement within the immune response; failures in these systems and resulting pathology

### Module Assessment:

Critical review of a journal article (50%);

Peer-seminars (50%)

To pass the module students must attain 50% of the maximum marks available for the module.

### Reading List:

Osborne, B., Kindt, T.J., Goldsby, R., 2006, Kuby Immunology, W. H. Freeman & Co.

Travers, P., Walport, M., Shlomchik, M.J., 2007, Janeways Immunobiology, Garland.

Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., Walter, P., 2007, Molecular Biology of the Cell, Garland Publishing.

Links to online journal references will be available on the programme website.

**Further Details:** Total of 30 contact hours, distributed as follows: Lectures: 12 hours; Tutorials, Workshops and Presentations: 18 hours. This 5 ECTS module will be delivered in a day release format.

**Date of Academic Council Approval:**

# Dublin Institute of Technology

Module Code	Module Title		
BIOL 9228	<b>Metabolic and Endocrine Disorders</b>		
ISCED CODE	Pre-Requisite Modules code(s)	Co-Requisite Modules code(s)	ECTS Credits
			5

## Module 7 (Modular Option)

**Module Coordinator:** Mr. F. Clarke

**Module Author:** Mr. F. Clarke, Dr. S. Meaney

### Module Aim:

To provide the student with a state-of-the-art knowledge of the biochemical investigation of selected metabolic and endocrine disorders, and to provide the learner with the advanced knowledge and skills required to investigate these disorders.

### Module Description:

This module will provide students with advanced knowledge of the theory and practice of clinical biochemistry and the application of clinical biochemistry to the investigation of selected endocrine and metabolic disorders.

### Learning Outcomes:

On successful completion of this module, the student will be able to:

- Describe in detail the approaches by which inborn errors of metabolism and endocrine disorders, respectively, are currently investigated in the laboratory;
- Critically appraise the methodologies used to perform these investigations;
- Evaluate the role of the clinical laboratory in the assessment of metabolic disease;

### Learning and Teaching Methods:

Lectures, tutorials, student presentations, case studies, In all cases, an overview of the topic will be provided and the essential features highlighted by case presentations.

### Module Content:

- Setting the context: endocrinology & metabolism
- Laboratory investigation of endocrine disorders;
- Inherited and acquired metabolic disorders;
- The biochemical basis of inherited errors of metabolism;
- The role of newborn screening;
- Biochemical assessment of cardiovascular risk.

### Module Assessment:

This module will be assessed by a combination of continuous and summative assessment. Continuous assessment will be by case presentation (30% of available marks). Summative assessment consists of an unseen written paper (70% of available marks).

To pass the module students must (a) attain 50% of the maximum marks available for the module and (b) achieve a mark of at least 50% in each of the continuous and/or summative assessment components. The module cannot be passed if any assessment component returns a final mark of less than 45%.

### Reading List:

Lavin, N., 2009, Manual of Endocrinology and Metabolism, Lippincott Williams & Wilkins.  
Gardner, D. and Schoback, D., 2007, Greenspan's Basic & Clinical Endocrinology, McGraw-Hill Medical.  
Salway, J., 2004, Metabolism at a Glance, Wiley-Blackwell.  
Davies, T.F., 2008, A Case-Based Guide to Clinical Endocrinology, Humana Press.

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BIOL 9228	<b>Metabolic and Endocrine Disorders</b>		
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Online references will be available on the programme website.

**Further Details:** Total of 25 contact hours, distributed as follows: Lectures: 16 hours; Tutorials, Workshops and Presentations: 9 hours

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# Dublin Institute of Technology

Module Code	Module Title		
BIOL 9233	<b>Transfusion science</b>		
ISCED CODE	Pre-Requisite Modules code(s)	Co-Requisite Modules code(s)	ECTS Credits
			5

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## Module 9 (Modular Option)

**Module Coordinator:** Mr. F. McGrath

**Module Author:** Mr. F. McGrath

### Module Aim:

The aim of this module is to update students on current best practice in blood transfusion science in Ireland. The student will be provided with the skills to apply this to the clinical and the laboratory activities of transfusion scientists.

### Module Description:

This module will provide a state-of-the-art overview of current theoretical and applied transfusion science, with emphasis on emerging clinical concerns and new technical approaches.

**Learning Outcomes:** On successful completion of this module, the student will be able to:

- Define in detail the legal and regulatory framework of transfusion practice in Ireland;
- Outline the management of risk and biohazards in the practise of transfusion science.
- Critically evaluate the role and impact of accreditation as applied to transfusion science;
- Describe in detail the current technologies used in the production of currently available blood products and their limitations;
- Devise a detailed strategy for the transfusion of patient cohorts with complex requirements.

**Learning and Teaching Methods:** Lectures, tutorials, student presentations and case study analysis

### Module Content:

- The EU Directive legislation as applied to blood banks and other establishments;
- Haemovigilance, its impact on the laboratory. The role of the National Haemovigilance office;
- Accreditation: its impact and benefits in relation to the blood transfusion laboratory and the patient;
- Blood and blood component preparation. The appropriate use of blood and blood products, including conservation strategies to reduce exposure to risk;
- Current and emerging risks associated with transfusion, both serological and non-serological.
- Transfusion transmitted infection and attempts to control it;
- Specialised cases: transfusion of neonates; transfusion in emergency and trauma situations; massive transfusions;
- The immune response to transfusion.

### Module Assessment:

This module will be assessed by a combination of continuous and summative assessment. Continuous assessment will be by oral presentation based on workplace data (30% of available marks). Summative assessment will consist of an unseen written paper (70% of available marks). To pass the module students must (a) attain 50% of the maximum marks available for the module and (b) achieve a mark of at least 50% in each of the continuous and/or summative assessment components. The module cannot be passed if any assessment component returns a final mark of less than 45%.

### Reading List:

Klein H.G. and Anstee D.J., 2006, Mollison's Blood Transfusion in Clinical Medicine, Wiley-Blackwell.

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Murphy M.F. and Pamphilon D.H., 2009, Practical Transfusion Medicine, Wiley-Blackwell.  
Roback J. *et al*, 2008, AABB Technical Manual, American Association of Blood Banks.

Online references will be available on the programme website.

**Further Details:** : Total of 25 contact hours, distributed as follows: Lectures: 16 hours; Tutorials, Workshops and Presentations: 9 hours