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Foreword

Welcome to Dublin, to Trinity and to a busy year which we hope will be exciting, challenging and rewarding for all of you. With the help of our colleagues and friends from across the campus and from other institutes, in Ireland and abroad, we have been working hard to put together a comprehensive Immunology programme, which we have designed to stimulate, entertain and inform. We hope that you will all graduate from this course with a deep understanding and love for immunology and immunological research, which will open doors on to exciting new career options. This M.Sc. in Immunology is already internationally renowned and our graduates are undertaking PhDs in the UK, Germany and Russia as well as Ireland, are doing medicine or are employed as science communicators, medical laboratory scientists or in pharmaceutical companies. Upon graduation you will be our ambassadors in leading universities, hospitals and pharmaceutical companies across the globe. Enjoy yourselves, work hard and make great discoveries.

Cliona O'Farrelly, Ph.D. 
Professor of Comparative Immunology, Co-Director, M.Sc. Immunology Course

Nigel Stevenson, Ph.D. 
Assistant Professor Co-Director, M.Sc. Immunology Course
Module Co-Ordinators and Academic Staff

Cliona O'Farrelly (Co-Director) is Professor of Comparative Immunology in the School of Biochemistry and Immunology and the School of Medicine at TCD. She graduated with a BA Moderatorship in Microbiology from TCD in 1977 and a PhD in Immunology, also from TCD in 1982. Cliona and her Comparative Immunology research group use combinations of in silico, molecular and cellular technologies to discover and examine new genes, proteins and cells of innate and adaptive immune systems from different species and in different organs, particularly the liver and uterus. The influence of these immune components on the hosts’ susceptibility to pathogens, especially Hepatitis C virus, is a major focus. Cliona has extensive experience in graduate training, having graduated 32 Ph.D., 7 M.D. and 5 M.Ch. students and developed this MSc in Immunology, together with her colleagues, Nigel Stevenson and Andrew Lloyd. A recipient of the Irish Research Scientists’ Association Gold Medal, the Graves Medal, the Conway Medal and the Isla Hasliday Award, Cliona was President of the Irish Society of Immunology from 2000-2007 and was awarded the Nature Mentoring Award in 2014. Email: cliona.ofarrelly@TCD.ie

Nigel Stevenson (Co-Director) is Assistant Professor in the School of Biochemistry and Immunology at TCD. In 2000 Dr. Stevenson graduated from Queen’s University of Belfast (QUB) with an Honours Degree in Biomedical Science, before joining Randox Laboratory’s research and development team in 2001. Under the supervision of Prof. Jim Johnston at QUB, Nigel carried out Ph.D. studies investigating the novel regulation of immune cell migration by intracellular SOCS proteins. After post-doctoral research in the Centre of Infection and Immunity, QUB, in 2007 Dr. Stevenson joined the Liver Research Programme at St. Vincent’s University Hospital, Dublin. In 2008 the Irish Health Research Board awarded Nigel with a Fellowship to investigate the mechanisms by which Hepatitis C Virus blocks innate anti-viral immunity. Dr. Stevenson’s Intracellular Immunology group at TCD investigate the effects of viruses upon innate immune signalling pathways and translate these novel discoveries towards the development of novel therapeutics. Email: N.Stevenson@TCD.ie

Andrew Bowie is currently Head of Immunology in the School of Biochemistry and Immunology, TCD. He obtained his Ph.D. in Biochemistry from TCD in 1997, and was appointed to his current post in 2001. He was elected a Fellow of TCD in 2008. His research interests focus on how viruses are detected by the innate immune system, leading to the activation of transcription factors such as NF-kappaB and IRF3, and to the induction of cytokines and interferons. In particular, he is interested in DNA sensing by the innate immune system. He also has a strong interest in how viruses evade detection, and has published some seminal reviews and opinion articles on this emerging area, as well as speaking at numerous international conferences, workshops and seminars on the topic. Recently, he has published research papers and reviews as senior author in leading international journals including Nature
Rachel McLoughlin completed her Ph.D. at the Institute of Nephrology at Cardiff University, UK. Following post-doctoral positions at Cardiff University and Brigham and Women’s Hospital, Boston Rachel obtained an Assistant Professor position at Brigham and Women’s Hospital/Harvard Medical School where she began to establish my independent research group. In 2010 Rachel was awarded a Wellcome Trust Career Development Fellowship, which facilitated her move to the School for Biochemistry and Immunology at TCD, where she established the Host Pathogen Interaction research group. Since 2011 Dr. McLoughlin has held the position of Usher Lecturer in Immunology. Rachel’s research centres on understanding the interaction of bacteria and the molecules they express, with the host's immune system and is primarily focused on understanding the immune response elicited by the gram-positive bacterium Staphylococcus aureus, in the context of infection, and through exposure to this organism as a commensal. Email: mclougrm@tcd.ie

Derek Nolan is a Lecturer in biochemistry and cell biology and head of the confocal facility in the School of Biochemistry and Immunology. Derek is also Director of Postgraduate Teaching and Learning and Director of the Centre for Microscopy and Analysis. Dr. Nolan’s research interests in African trypanosomes began as a postgraduate student in Paul Voorheis’ laboratory at the Dept. Biochemistry, TCD and continued at postdoctoral level when, following the award of a long term fellowship from EMBO. Derek moved to Etienne Pays’ group at the Universite Libre De Bruxelles (ULB) to investigate surface proteins in trypanosomes (1992). Subsequently, through Marie Curie and PIA Belgium fellowship awards he continued to work on the cell biology and biochemistry of trypanosomes at the ULB in Brussels. Following the award of a Wellcome Trust Senior Fellowship in basic biomedical sciences, Derek returned to Trinity to establish an independent research group focused on providing a better understanding of how these parasites survive in their mammalian hosts in order to develop new, improved therapies against African trypanosomes. Email: DENOLAN@tcd.ie

Derek Doherty completed his Ph.D. studies at King’s College, School of Medicine and Dentistry, London and postdoctoral research in the University of Washington, Seattle and University College Dublin before holding lecturing positions at the National University of Ireland, Maynooth and subsequently TCD. Derek is interested in the mechanisms by which cells of the innate immune system control adaptive immune responses and how they can be exploited for the design of improved vaccines and therapies. His group is currently investigating how human natural killer cells, natural killer T cells and γδ T cells influence the functions of dendritic cells, B cells and conventional T cells and how they contribute to immunity against hepatitis B, C and HIV and the pathogenesis of autoimmune disease, obesity and cancer. Email: dohertde@tcd.ie
Eleanor Wallace is Chief Medical Scientist in the Department Immunology in St. Vincent’s University Hospital, and Lecturer in Immunology in the Department of Clinical Immunology in St James’s Hospital & Trinity College Dublin. She graduated from Dublin University, Trinity College in 1988 with a B.A. Mod (Biochemistry). In 1994 she was awarded a Ph.D in Immunology (TCD) for her research in C1-Inhibitor proteinase interactions and implications for inflammatory processes. Eleanor has held senior scientist posts in the Departments of Immunology in Beaumont Hospital and St. James’s Hospital, Dublin and has significant experience in the clinical laboratory accreditation process. Together with Dr.s Mary Keogan and Paula O’Leary, Eleanor has published the course textbook on clinical immunology, *Concise Clinical Immunology for Healthcare Professionals* (2007). Mary Therese Keogan, Eleanor M. Wallace, Paula O'Leary. Routledge, London. Dr. Wallace’s research interests include investigation of the molecular mechanisms causing common variable immunodeficiency (CVID); collection and analysis of data on primary immunodeficiency states for the European Society of Immunodeficiency (ESID) Online Registry project; Lymphocyte changes in HIV+ pregnant women and Mannan Binding Lectin (MBL) deficiency.

Email: E.Wallace3@st-vincents.ie

Joanne Lysaght graduated with a Science degree from N.U.I Maynooth in 2001. She then went on to complete a Ph.D. in 2005, in the Department of Biochemistry and Immunology in TCD under the supervision of Prof. Kingston Mills studying the modulation of innate and adaptive anti-tumour immune responses. Joanne then took up a role as a clinical scientist in the Cancer Molecular Diagnostic Laboratory in St. James’s Hospital, Dublin and post-doctoral positions in the Department of Haematology/Oncology and the Department of Surgery at St. James's Hospital. In 2009, Dr. Lysaght was awarded a HRB Post-Doctoral Fellowship for her work in the area of obesity and tumour immunity. In 2011, she was appointed Ussher Lecturer in Molecular Oncology and Assistant Professor in the School of Medicine in 2015. She is currently the course co-ordinator for the M.Sc. in Translational Oncology. Dr. Lysaght’s research focuses on the impact of obesity on anti-tumour lymphocyte responses in gastrointestinal cancer patients, combination immunotherapy with chemoradiation, T cell trafficking, cellular immunotherapy and inflammatory driven co-morbidities of cancer.

Email: JLYSAGHT@tcd.ie

Kieran Meade is Senior Research Officer in Animal Health at Teagasc, Ireland’s Agricultural Research Institute. He did his undergraduate degree in Animal Science and a Ph.D. in Molecular Genetics in UCD. In the International Livestock Research Institute (ILRI), Kenya (2004), Kieran took part in cutting edge bovine trypanosomiasis research. Kieran then took up a post-doctoral research position with the Comparative Immunology Group first based at St. Vincent’s University Hospital, and subsequently to the School of Biochemistry and Immunology, TCD. Kieran’s research programme encompasses functional genomics and immunogenetics toward building a strong national research platform in bovine Immunology. Kieran has a passion
for basic research in animal bioscience, and is also intent on the translation of this research into applied benefits for Irish agriculture, animal and human health. Email: Kieran.Meade@teagasc.ie

Luke O'Neill was appointed to the Chair of Biochemistry at TCD in 2008, where he also leads the Inflammation Research Group. He was Academic Director of the Trinity Biomedical Sciences Institute from 2011-2014. He has a Ph.D. in Pharmacology from the University of London and carried out Post-Doctoral research at the Strangeways Laboratory in Cambridge. He has won numerous awards for his research, notably the Royal Irish Academy Medal for Biochemistry, The Irish Society for Immunology medal, the Royal Dublin Society/ Irish Times Boyle medal for Scientific Excellence, the Science Foundation Ireland Researcher of the Year Award 2009 and the 2014 EFIS Medal. He was elected a member of EMBO in 2005. He is a co-founder and director of Opsona Therapeutics. In 2008 he was appointed Chair of the Immunity and Infection panel of the European Research Council. His research is in the area of the molecular basis to inflammatory diseases, with a particular interest in pro-inflammatory cytokines and Toll-like receptors. He has published over 200 papers and reviews on his research, in journals such as Nature, Science, Cell, Nature Immunology, Nature Medicine, Nature Genetics and PNAS. He is on the editorial boards of 6 journals, including the Journal of Biological Chemistry and Trends in Immunology. He is also on the Board of Reviewing Editors for Science, covering Innate Immunity. Email: LAONEILL@tcd.ie

Kingston Mills is Professor of Experimental Immunology, School of Biochemistry and Immunology, TCD. He is also Director of the Immunology Research Centre in The Trinity Biomedical Sciences Institute. He is a graduate of Trinity College and trained at as a Postdoctoral Fellow at University College London and the National Institute for Medical Research, Mill Hill, London, before joining the Scientific Staff of the National Institute for Biological Standards and Control in Herts, UK. He returned to Ireland in 1993 to take up an academic position at National University of Ireland, Maynooth. He was appointed to a Personal Chair at TCD in 2001 and was Head of the School of Biochemistry and Immunology form 2008-2011. He heads an active research team of around 20 scientists focusing on immunity to infection, autoimmunity and cancer. He is co-founder of Opsona Therapeutics and TriMod Therapeutics, drug development companies focusing on the development of immunotherapeutics for inflammatory diseases and cancer. Email: mills@tcd.ie
Course Objectives

On successful completion of the M.Sc. in Immunology students should be able to:

1. Demonstrate in-depth knowledge of the cellular and molecular basis of innate and adaptive immunity
2. Describe the key cells, organs and molecules of the innate and adaptive immune systems and how they function
3. Describe the biological basis of major immunologically mediated diseases
4. Discuss evolutionary and genetic influences on the immune system
5. Discuss innate and adaptive immunological involvement in viral, bacterial and parasitic infections
6. Discuss the role of the tumour microenvironment and the immune system in the development of cancer and in cancer therapeutics.
7. Demonstrate practical laboratory skills and expertise in selected methodologies used to study the immune system
8. Identify the scientific and clinical challenges pertinent to treatment and management of immunological diseases
9. Discuss the principles of immunotherapy discovery from target identification, to validation and commercialisation
10. Critically appraise research protocols and manuscripts, statistically evaluate data and write research reports
11. Demonstrate knowledge of key techniques used to answer research questions in Immunology
12. Describe how immunological research approaches might direct a research project or research-related career
13. Assess research hypothesis, design experimental studies and conduct quality scientific research in an ethical manner and communicate research findings in an appropriate scholarly manner to specialist and non-specialist audiences
14. Interpret experimental findings and evaluate in relation to study hypothesis and existing research
15. Critically analyse research findings in terms of experimental design and outcomes
16. Analyse and present data
17. Write clear and accurate scientific essays and reports
## Course Structure

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<tr>
<th>Module Title</th>
<th>Module Coordinator</th>
<th>ECTS Weight</th>
<th>Term</th>
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<tbody>
<tr>
<td>Basic Immunology</td>
<td>Prof. Cliona O'Farrelly &amp; Dr. Nigel Stevenson</td>
<td>10</td>
<td>Michaelmas</td>
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<tr>
<td>Immunological Technologies</td>
<td>Dr. Nigel Stevenson</td>
<td>10</td>
<td>Michaelmas</td>
</tr>
<tr>
<td>Communicating Science &amp; Critical Analysis</td>
<td>Dr. Nigel Stevenson</td>
<td>5</td>
<td>Michaelmas &amp; Hilary</td>
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<td>Tumour Immunology</td>
<td>Dr. Joanne Lysaght</td>
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<tr>
<td>Immunogenetics</td>
<td>Dr. Kieran Meade &amp; Dr. Nigel Stevenson</td>
<td>5</td>
<td>Michaelmas</td>
</tr>
<tr>
<td>Microbe Detection &amp; Evasion</td>
<td>Dr. Andrew Bowie &amp; Dr. Nigel Stevenson</td>
<td>5</td>
<td>Hilary</td>
</tr>
<tr>
<td>Clinical Immunology</td>
<td>Dr. Eleanor Wallace &amp; Dr. Nigel Stevenson</td>
<td>5</td>
<td>Hilary</td>
</tr>
<tr>
<td>Global Infectious Diseases</td>
<td>Dr. Derek Doherty &amp; Dr. Derek Nolan</td>
<td>10</td>
<td>Hilary</td>
</tr>
<tr>
<td>Immunotherapeutics &amp; Product Development</td>
<td>Dr. Nigel Stevenson</td>
<td>5</td>
<td>Hilary</td>
</tr>
<tr>
<td>Research Project</td>
<td>Dr. Nigel Stevenson &amp; Prof. Cliona O'Farrelly</td>
<td>30</td>
<td>Hilary</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>90</strong></td>
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Module Overview:
This module aims to give a general and comprehensive introduction of immunology to students who have had little formal prior exposure to immunology. Basic terms and concepts of innate and adaptive immunity will be presented in a logical and accessible fashion. Students will be familiarised with immunological terms and introduced to the functions of the principle organs, cells, molecules and genes involved in initiating and mediating successful immune responses. By the end of the module, students should be able to explain fundamental immunological concepts and discuss the roles of functional components of the immune system including haematopoietic cells, acute phase proteins, pathogen recognition receptors, complement, TCRs, immunoglobulins and cytokines. They should also understand some basic concepts of immunological dysregulation seen in inflammatory and autoimmune diseases, allergy, malignancy and immunopathogenesis. Lectures will be supplemented with tutorials, where lecture topics will be discussed and each student will help present and explain research articles chosen from scientific review articles thereby further relating the module topics with course material.

Learning Outcomes
On the successful completion of this module students should be able to:

- Describe fundamental concepts in immunology
- Describe the role of immunological dysfunction in the pathogenesis of certain diseases
- Describe how manipulating the immune system can be used to treat disease
- Analyse recent developments in immunology
- List the application of key immunological techniques in research
- Read, interpret and critically analyse primary immunological literature
- Discuss immunological topics in group situations

Lectures:
1. Introductory Overview                              Cliona O’Farrelly
   INNATE
2. Cells and Organs of the Immune System             Cliona O’Farrelly
3. Introduction to Immunological Techniques         Cliona O’Farrelly
4. Pathogen Detection, Inflammation and TLR signalling Louise Glover
5. Cytokines
Nigel Stevenson

6. Natural Killer Cells: phenotype, function detection of non-self and roles in anti-viral and anti-tumour immunity
Clair Gardiner

7. Tissue Resident and Circulating Myeloid Cells of the Immune System
Cliona O’Farrelly

ADAPTIVE:

8. Cellular and Molecular Components of Adaptive Immunity I
CD3+ T cells TCR Structure and Function
Cliona O’Farrelly

9. Antigen Processing and Presentation’
Derek Doherty

10. Cellular and Molecular Components of Adaptive Immunity II
Kingston Mills

11. Antibody Structure and Function I
Jerrard Hayes

12. Antibody Structure and Function II
Jerrard Hayes

13. Complement
Michael Carty

14. Lymphocyte Development, gene rearrangement and thymic interaction
Cliona O’Farrelly

15. Lymphocyte Development II
Cliona O’Farrelly

16. Immunology Mechanisms in Action
Derek Doherty

17. Immunometabolism I
David Finlay

18. Immunometabolism II
Luke O’Neill

19. Tolerance and Immunoregulation
Jean Fletcher

Tutorials:
Five tutorial sessions will accompany the lectures; relevant reviews will be discussed at each session. The aim of these tutorials will be to use these reviews to explore the material presented at lectures in more depth and to discuss misunderstandings or misconceptions. Students will be expected to contribute, ask questions and engage in discussion at each tutorial. These contributions will be assessed. Each student will be expected to have read the relevant review prior to the tutorial and will be expected to bring 3 relevant Multiple Choice Questions (MCQs) that have 5 answer options (a-e) (one of which must be the correct answer; so over the course of the Module, each student will have submitted 15 MCQs). At the end of the module, an MCQ exam covering the tutorial material will be set and 1 question from each student will be used in the exam.

Tutorial Leaders: TBC

Assessment:
2 MCQs (70%)
Tutorial MCQ and assignment (30%)
Reading/Learning Resources:


Reviews to be covered in tutorials will be given out at the beginning of the course.
Immunological Technologies (IM7102)

Term: Michaelmas
Credit weighting: 10 ECTS
Module co-ordinator: Nigel Stevenson

Overview:
This course will introduce the theory and practice of basic technologies used in immunological research. Specifically, students will learn how to dissect and section immunological organs and tissues; they will culture and analyse cells of the immune system; they will become proficient with flow cytometry and microscopy. They will learn how to identify and quantify specific genes by Polymerase Chain Reaction (PCR) and proteins using a range of assays including ELISAs and Western Blotting. At the end of this module, students will be proficient in the techniques required for their research projects, as well as understanding the underpinning science.

Learning Outcomes:
Having completed this module students will be able to:

- Describe key immunological technologies
- Perform each immunological technique described
- Apply technologies to specific research questions

Lectures:
Animal models in research                        Peter Nolan
Introduction to antibody technology-western blotting,  Andrei Budanov
Introduction to Flow cytometry                   Jean Fletcher & Barry Moran
Introduction to PCR                              Nigel Stevenson

Practicals:
Cells and Organs of the Immune System             Stephen Lalor
Activation & assessment of cellular inflammatory responses   Andrei Budanov
ELISA Assay                                     Michelle Mucahy
Flow Cytometry                                  Jean Fletcher & Barry Moran
PCR                                             Nigel Stevenson

Assessment:
Practical write-ups x 5 (80%)
MCQ (20%)
Reading/Learning Resources:

Lab coat and spectacles:
Specific “TCD designed” Howie style lab coats (designed by the College Safety Office to conform to the appropriate NISO standards) and safety spectacles must be worn during all practicals and should be purchased in advance by each student (from Student Union shops on the TCD campus).
Communicating Science and Critical Analysis (IM7103)

Term: Michaelmas and Hilary
Credit weighting: 5 ECTS
Module co-ordinator: Nigel Stevenson

Overview:
Students will attend research seminars organised by the Biochemistry Society during both the Michaelmas and Hilary Terms. During these seminars talks in the areas of Immunology will be presented by specialists in their field. Students are expected to engage actively with the topic of the talk and the speaker. Students will be allocated a speaker and will be asked to:

A. Write a short biographical summary on the scientist and list 3 of their key scientific publications. The summary and list of publications (Title, author list, journal details and abstract) should be emailed to the entire M.Sc. class 48 hours before the seminar.

B. Each student will prepare a written assignment based on their allocated seminar the following week. The assignment consists of two parts:
   1. An article written for a lay audience (e.g. a newspaper article or a blog), 200-300 words.
   2. An academic summary of the research presented during the seminar, 200-300 words.

   For both parts of the assignment, the student is expected to consult and incorporate appropriate additional sources of information (e.g. research papers, news articles, position papers, interview with the speaker).

C. The week after the scientific talk the student will present their written summary and the class will discuss each article.

To help students prepare these pieces, a series of lectures on general issues of importance in science communication will be presented including presenting scientific principles to the layman, ethical issues in scientific research and critical thinking.

Learning outcomes:
Having completed this module students will be able to:

- Critically assess and discuss current research findings in Immunology
- Interpret scholarly activity in Immunology for a non-specialist audience
- Formulate a summary suitable for a specialist academic group
Lectures:
Series of Biochemistry Society Immunology lectures
Scientific communication and critical analysis  
Nigel Stevenson
Why bother communicating science?               
Gillian Markey
Science Communication from an SFI perspective    
Alva O’Cleirigh
Science Communication                           
Joseph Roche
Translating science to the layman: Science Gallery Tour  
Science Gallery staff
Communication Techniques                        
Caroline Forseyth
Plagiarism                                      
James Murray
Thesis Writing                                  
Kingston Mills
Careers workshop                               
John Wynne

Assessment:
Two articles based on a seminar attended by the student
1. one written for a lay audience (50%)
2. one written for a scientific audience (50%)

Reading/Learning Resources:
The Elements of Style. Strunk and White (1999)
Tumour Immunology (IM7109)

Term: Michaelmas
Credit weighting: 5 ECTS
Module co-ordinator: Joanne Lysaght & Melissa Conroy

Module overview
The aim of this module is to provide a fundamental understanding of important immunological concepts and how they apply to the field of tumour immunology. The module will explore how both the innate and adaptive immune system recognises and eliminates cancerous cells and how immune cells can be hijacked by the tumour to support cancer development. This module will also incorporate lectures on the exciting and rapidly progressing field of cancer immunotherapy. Both new and emerging immunotherapies will be discussed.

Learning Outcomes:
On successful completion of this module students will be able to:

- Describe how the innate and adaptive immune systems identify and respond to malignant cells.
- Describe how the tumour microenvironment and cancer treatments impact anti-tumour immunity.
- Outline the mechanisms by which the tumour can evade or subvert the immune system in order to support the tumourigenic process.
- Analyse current strategies being employed clinically to combat malignant disease and the associated challenges

Lectures:
1. Tumour immunosurveillance Melissa Conroy
2. Inflammation and innate immune responses in cancer Fred Sheedy
3. Tumour associated macrophages and MDSC Fred Sheedy
4. Innate lymphocytes; new players in cancer immunity Derek Doherty
5. Innate lymphocytes (cntd) and B cells and cancer Derek Doherty
6. Dendritic cells and cancer Ed Lavelle
7. Effector T cells in anti-tumour immunity Melissa Conroy
8. Regulatory T cells cancer Jean Fletcher
9. Tumour microenvironment and immunity Melissa Conroy
10. Cancer associated fibroblasts Melissa Conroy
11. Immunometabolism Melissa Conroy
12. Infection and cancer Derek Doherty
13. Chemotaxis and cancer Melissa Conroy
14. Effects of cancer treatment on immunity
15. Tumour immune evasion I
16. Tumour immune evasion II
17. Cancer Immunotherapies I
18. Cancer Immunotherapies II

Assessment:
100% module will be a written assignment; The student will write a 2000 word report on a given cancer type and this report will have to cover the following topics:

- A short introduction to the cancer type (to include for example incidence rates, survival rates, epidemiology).
- What is known about the role of the immune system in that cancer type.
- What are the current immunotherapies in that cancer type (www.cancerresearch.org).
- What are the future immunotherapies in clinical trials for that cancer type (www.clinicaltrials.gov).
- Can you suggest an immunotherapy for this cancer type that is currently not in clinical trials and why.

Must include word count and similarity index (www.turnitin.com) on the title page, student name and number. Include diagrams (reference or create your own). References and figure legends are not included in the word count. Must reflect ~7 weeks work.

The written assignment is due by 5pm on the 2nd December (email to jlysaght@tcd.ie).

Lecture locations (will be communicated by Dr. Conroy during term):

1. William Fetherson Montgomery Lecture Theatre (WMLT), Ground floor, Trinity Centre at SJH
2. Robert Smith Lecture Theatre (RSLT), Ground floor, Trinity Centre at SJH
3. Durkan Lecture theatre (DLT), Institute of Molecular Medicine at SJH
4. Dorothy Stopfort Price Seminar Room (DSSR), Trinity Centre at SJH

Reading and Learning Resources:
Selected original and review articles
Immunogenetics (IM7105)

Term: Michaelmas
Credit weighting: 5 ECTS
Module Coordinators: Kieran Meade and Nigel Stevenson

Overview:

Immunological responses are controlled by genes encoding contributing proteins and other molecules. Many immune genes are highly conserved and thus most human immune genes have homologues in other mammalian species. Non-coding regions of the genome are also now known to have important regulatory functions. However, important differences exist in the numbers and sequences of DNA, which account for differences in immune responses both between species and individuals. Similarly, variation in the copy numbers of immune genes or in their sequences can have major impact on their function in immunity thus accounting for the significant inter-individual variation seen in all immune responses.

The aim of this module will be to provide sufficient background in basic genetics, genomics and epigenetics in order to better understand the relationship between genome and immune function. A key aspect of this module will be to enable student to critically assess studies focused on high-throughput analyses at the DNA and RNA levels and introduce the technologies which enable the identification of genes associate with disease susceptibility. With the sequencing of genomes becoming quicker and cheaper, it is now possible to explore the immunomes of many species by bioinformatic analyses and to identify the genes linked to disease susceptibility using advanced technologies such as Genome-Wide Association Studies (GWAS). This module will therefore introduce students to high-throughput and systems biology approaches used to investigate the immune response at a systems level. Another important aim of this module is to familiarize students with key immunological studies in diverse species and the relevance of species-specific immune responses to studies of human disease will also be explored. Finally, the threat of zoonotic infections to human health will be introduced in the context of One Health.

Learning Outcomes:

Having completed this module students will be able to:

- Describe the structure of the genome – genes, promoter regions, non-coding regions, copy number variation, alternative splicing and miRNA.
- Understand the potential effects of specific genes and polymorphisms on the outcome of the immune response.
- Understand the multiple levels of control of the immune response - including at the epigenetic level.
- Appreciate the tools and technologies (and their limitations) available to scientists to uncover genetic associations with complex traits, such as immunity and inflammation
- Describe genome-wide association studies
- Understand the main differences in the immune response between man, model and non-model organisms
- Critically evaluate and analyse species-specific information from immunological studies
- Describe the basic concepts of systems biology

Lectures/workshops:

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<tr>
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<th>Lectures/workshops</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Genetics and Genomics</td>
<td>Kieran Meade</td>
</tr>
<tr>
<td>2</td>
<td>Epigenetics</td>
<td>Kieran Meade</td>
</tr>
<tr>
<td>3</td>
<td>Bioinformatics and Systems</td>
<td>Kieran Meade</td>
</tr>
<tr>
<td></td>
<td>Biology – a basic primer</td>
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</tr>
<tr>
<td>4</td>
<td>Comparative Immunology</td>
<td>Kieran Meade</td>
</tr>
<tr>
<td>5</td>
<td>One Health</td>
<td>Kieran Meade</td>
</tr>
</tbody>
</table>

Round table discussion
Discussion of the consequences of the failure to appreciate species-specific differences in human drug design; CASE STUDY: The calm after the cytokine storm: lessons from the TGN1412 trial.

One Health team presentation:
At the beginning of the module, students are split into three teams to work on a major bacterial/viral/protozoan zoonotic disease of their choice. Appropriate terms of reference are discussed – and centre around comparative immunology between host and pathogen, challenges to eradication, recent developments in treatment and prospects for future treatment. Students will agree on a relevant review beforehand and that will focus their group research activity. During the last two lectures in the module, each group will present their findings to the class. Questions are also tabled by other group members.

Assessment:
Examination (80%)
Presentation (20%)

Reading/Learning Resources
Immunology of Infection, 3rd Edition. Kaufmann & Kabelit; 2010
Primer to the Immune Response. Tak Mak 2011.
Lewin’s Genes X. Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick
Microbe Detection and Evasion (IM7106)

Term: Hilary
Credit weighting: 5 ECTS
Module co-ordinators: Andrew Bowie and Nigel Stevenson

Overview:
This module will be a research-led course covering pathogen detection by the innate immune system leading to effective pro-inflammatory and anti-pathogenic signalling responses. The module will explore mechanisms of pathogenic immune evasion and subversion and will also focus on the role of the immune response in health and disease. The past decade has seen huge progress in the discovery and characterisation of pattern recognition receptors (PRRs) such as Toll-like receptors, RNA helicases, DNA sensors and NOD-like receptors, which are now known to be responsible for the sensing of pathogens. This module will describe the pathogen detection and recognition receptor function, and include lectures and workshops by experts in this field, who have made significant contributions to our current understanding of innate immunity.

Learning outcomes:
Having completed this module students will be able to:
• Explain viral and bacterial infection at a molecular and pathogenic level
• Describe the concept and examples of pathogenic detection
• Describe proinflammatory and anti-pathogenic responses at a molecular and cellular level
• Describe key immune evasion strategies of viruses and bacteria

Lecture/workshop sessions:
1. Overview of pathogen detection
   Nigel Stevenson
2. PRRs for viruses: TLRs and cytosolic detection pathways
   Andrew Bowie
3. Role of inflammasomes in innate detection of pathogens and PRRs for bacteria: TLRs and NOD-like receptors
   Gareth Brady
4. Anti-viral interferon response
   Nigel Stevenson
5. Viral Immune evasion of innate immunity I
   Andrew Bowie
6. Viral Immune evasion of innate immunity II
   Andrew Bowie
7. Bacterial Immune evasion
   Rachel McLoughlin

Assessment:
MCQ (25%)
3000-word literature review (75%)
Reading/Learning Resources:

**Cellular & Molecular Immunology.** Abbas, Lichtman, Pillai 8th Edition (2014)


Clinical Immunology (IM7107)

Term: Hilary
Credit weighting: 5 ECTS
Module co-ordinators: Eleanor Wallace and Nigel Stevenson

Overview:
The Departments of Clinical Immunology at St. James’s Hospital and St.Vincent’s University Hospital are involved in the investigation and treatment of patients with a range of different immunological disorders including allergy, autoimmunity, immunodeficiency and malignancy. They have particular experience and expertise in diagnosis and management of patients with immunodeficiency, vasculitis and autoimmune diseases. The Department of Clinical Immunology at St. Vincent’s University Hospital has a key role in providing diagnostic services for the leading National Referral Centre for Rheumatology and musculoskeletal disease. In addition, the Department supports the National Liver Transplant Programme providing services for the diagnosis of liver disease and a regional service for monitoring patients post-liver transplant. An overview of clinical immunology will be presented. The immunotechniques used in these laboratories to investigate common immunological clinical problems will also be presented and explored. Students will be given real life case histories to discuss; the class will decide on tests should be done; results will be presented and analysed; treatments and alternative strategies will be discussed.

Learning outcomes:
On successful completion of this module students should be able to:

• Outline the range of medical clues that lead to the possible diagnosis of immunodeficiency
• Discuss the molecular processes and genetic influences that can result in primary immunodeficiency disorders
• Explain the nature of inflammatory events leading to many diseases
• Describe mechanisms of autoimmunity and various common autoimmune disorders
• Explain the mechanisms of hypersensitivity reactions
• Describe the clinical manifestations of atopy and allergic inflammation
• Describe the investigation, diagnosis and management of conditions within paediatric allergy and immunology.
• Describe liver immunology, pathology & transplantation
• Discuss the rationale for a range of immunotherapies
• Describe the range of tests that help specifically diagnose immunological disorders including immunodeficiency, autoimmunity, allergy and transplant
Lectures/workshops:

1. Immunodeficiency                Eleanor Wallace
2. Immunodeficiency: Case Studies   Con Feighery
3. Autoimmunity                    Eleanor Wallace
4. Autoimmunity: Case Studies       Con Feighery
5. New approaches to diagnosis and treatment of autoimmune disease: MS Case studies I  Jean Fletcher
6. New approaches to diagnosis and treatment of autoimmune disease: RA Case studies II  Sarah Wade
7. Liver Immunology, Pathology & Transplantation  Cliona O’Farrelly
8. Liver Immunology, Pathology & Transplantation: Case Studies  Tom Gallagher
9. Allergy                         Eleanor Wallace
10. Allergy: Case studies           Niall Conlon
11. Paediatric Immunology          Eleanor Molloy/
                                     Lynn Kelly

Assessment:

Written examination (100%)

Reading/Learning Resources:


Global Infectious Diseases (IM7110)

Term: Hilary
Credit weighting: 10 ECTS
Module co-ordinator: Derek Doherty and Derek Nolan

Overview:
This module aims to give an in-depth overview of the interactions that take place between viruses, bacteria and parasites and the human host; focusing on the most important global infectious diseases in humans. Students will be familiarised with the mechanisms by which the immune system senses, contains and eliminates pathogens, while tolerating harmless commensal organisms. The mechanisms by which infecting organisms subvert host immune responses, leading to pathology, will be examined in detail. Students will also learn about how infectious diseases spread, leading to epidemics. Much of the module will focus on progress towards immunisation, treatment and eradication of infectious diseases. By the end of the module, students should have an understanding of the biology, pathology and current challenges that we face in the fight against global infectious diseases such tuberculosis, HIV/AIDS, hepatitis, influenza, Salmonella, diarrhoeal disease, trypanosomiasis, malaria and schistosomiasis. The module will introduce parasite immunology and consider why parasites so successfully infect humans and evade immune mechanisms. Interactions between parasites and host that potentiate the parasite’s prime objective of life cycle completion will also be considered. Research programmes dedicated to the discovery and analysis of parasite derived immunomodulatory molecules will also be explored. Part of the assessment of this module will involve the student researching on an infectious disease of global importance and presenting their research to the class.

Learning outcomes:
On successful completion of this module students will be able to:
• Describe how the immune system deals with infectious viruses, bacteria and parasites
• Describe the biology of the most important global infectious diseases in humans and the interactions between the causative pathogens and the host immune system
• Analyse current strategies being employed to design vaccines and to combat global infectious disease and the associated challenges
• Describe basic mechanisms of parasite-induced immunopathology and immunity against parasite infection
• Explore the pros and cons of using animal models for studying parasite infection
• Identify the challenges in researching the immunology of infectious diseases
• Read, interpret and critically analyse primary literature on the immunology of global infectious disease
Lectures/workshops:
1. Overview of global infectious disease challenges, vaccine-preventable diseases and progress in eliminating infectious pathogens. Derek Doherty
2. Immunisation and current progress in vaccine design for global infectious diseases Derek Doherty
3. Antimicrobial resistance. Rachel McLoughlin
4. Biology and immunology of tuberculosis Joe Keane
5. Human immunodeficiency virus and AIDS Derek Doherty
6. Hepatitis viruses Derek Doherty
7. The pathogenesis of diarrheal disease in developing nations Derek Doherty

Parasite Immunology Introduction Lectures Derek Nolan
1. Innate mechanisms underpinning basic parasite immunology
2. Adaptive mechanisms underpinning basic parasite immunology
3. Vaccination against parasitic disease

Parasite Immunology Lecture/Workshops:
1. Strategies used by African Trypanosomes to evade the mammalian humoral immune response and how they overcome human innate defences to cause human sleeping sickness. Derek Nolan
2. Basic mechanisms of parasite induced immunopathology and how they might be manipulated using Schistosomes as a model Padraic Fallon
3. Malaria and the immune response Marian Brennan

Oral presentations of literature assignments Derek Doherty

Assessment:
Examination (70%)
Presentation (30%)

Reading/Learning Resources:
Immunotherapeutics and Product Development (IM7111)

Term: Hilary
Credit weighting: 5 ECTS
Module co-ordinator: Nigel Stevenson

Overview:
Research in the field of immunology has led to the generation of effective vaccines against a number of infectious diseases and also anti-inflammatory biologics that are routinely used for the treatment of autoimmune disorders such as rheumatoid arthritis, inflammatory bowel disease and multiple sclerosis. This module will give a detailed overview of drugs targeting both innate and adaptive immune responses and will describe in detail the drug development process from bench to bedside with particular focus being placed on vaccine adjuvants, cancer immunotherapeutics and treatments for autoimmune disease. In addition, the module will offer workshops detailing the intellectual property/technology transfer process as well as matters relating to regulatory affairs and clinical trial design.

Learning outcomes:
On successful completion of this module students will be able to:

• Describe how agents that target innate/adaptive immune pathways can modulate immune responses and provide therapy for immunological disorders.

• In addition students will have a clear understanding of the drug development process from bench to bedside.

Workshops:
1. Pre-clinical Development workshop: Road to a successful product TBC & Peter Nowlan
2. Intellectual property/Technology transfer workshop Aoife Tierney
3. Clinical Trial design workshop TBC
4. Regulatory Affairs workshop David Murray
5. Pharmaceutical Marketing TBC
6. Finance of Product Development Kingston Mills
7. Biotech start-ups from Academic research: The ‘How To…’ Jeremy Skillington

Lectures:
1. Introduction Nigel Stevenson
2. Infectious disease vaccines and adjuvants - innate immune activators Ed Lavelle
3. Immunotherapeutics for cancer – TLR agonist and Treg cell inhibitors Kingston Mills
4. Immunotherapeutics for autoimmunity – Inhibitors of pro-inflammatory cytokines

Kingston Mills

5. Therapeutic strategies that modulate the immune system

James Murray

Assessment:

Group assignment: Groups of students will be asked to identify/predict a new immunological therapeutic target, invent a ‘virtual’ therapeutic, carry out patent searches on existing products to ensure novelty and pitch their product to experts in product development, asking for realistic financial investment. The groups should pitch their therapeutic at the stage between pre-clinical and clinical development. Students will be assessed on their background knowledge from a scientific and intellectual property point of view, as well as their overall ability to market the product to potential investors (70%). A written summary of each project (with each student’s contribution/section clearly outlined) must also be submitted 48 hours prior to the group presentation (30%).

Immunotherapeutics & Product Development (IM7111) Judging marks sheet for presentations

<table>
<thead>
<tr>
<th>Marking Topics</th>
<th>Comments</th>
<th>Mark out of 10</th>
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<tbody>
<tr>
<td>Presentation skills, Quality of slides &amp; overall innovation</td>
<td></td>
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<tr>
<td>Target identification (novelty, patent checks, product/solution value (national &amp; global)</td>
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<tr>
<td>Pre-clinical development (appropriate in vitro assays, animal trials etc)</td>
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<tr>
<td>Clinical Development (Clinical trials, subject selection, blinding etc)</td>
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<tr>
<td>Product Patenting &amp; Licencing</td>
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<tr>
<td><strong>Product marketing</strong></td>
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<tr>
<td><strong>Understanding of development costs, financial returns and financial impact of this solution</strong></td>
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<td></td>
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<tr>
<td><strong>Ability to answer questions</strong></td>
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<tr>
<td><strong>Total (out of 80)</strong></td>
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**Reading/Learning Resources:**

Reviews and research papers as directed in lectures
Research Project (IM7112)

Term: Hilary
Credit weighting: 30 ECTS
Module co-ordinators: Nigel Stevenson & Cliona O’Farrelly

Overview:
This module is a key element of the course where the theoretical and technical aspects of immunology which have been presented, analysed and discussed in other modules are brought into practical and innovative focus on specific research questions. Each student will be expected to engage in a piece of original research to reveal novel aspects of immune activity or function. Emphasis will be placed on generating publishable and/or patentable data. A list of project titles will be made available during Term 1. Students will rank their choices 1-5. The Course Directors will then decide the final allocation of projects. Students will then meet with their project supervisor who will discuss the project and help plan a 3000 word literature review on a title based around the topic of their project. After the research project, students will submit a 10,000 word dissertation based on the results obtained during their research project. All students will also be required to present the findings of their research project at the M.Sc. in Immunology poster session.

Learning outcomes:
On successful completion of this module students should be able to:

- Identify an area of research interest and formulate a project proposal: outlining the hypothesis behind the project, identifying the specific aims and objectives and designing a work plan that will ensure the project is achieved in a suitable time frame
- Prepare a comprehensive literature review, evaluating previous studies carried out in the specific research area
- Identify suitable research methods to carry out the experimental plan
- Formulate a coherent hypothesis that draws on engagement with, and critical appraisal of, existing knowledge relevant to their research project
- Carry out experimental work that addresses the hypothesis
- Assemble and analyse the data collected in an efficient and logical manner, using appropriate statistical software (e.g. Excel, Prism, SPSS)
- Evaluate potential solutions for experiments that are not working or where unexpected results are obtained
- Interpret the research findings and draw appropriate conclusions based on research outcomes and how this relates to the peer-reviewed literature
- Write a substantial research dissertation in a clear and concise manner with respect to both data illustration and text in accordance with scientific conventions
Module supervision:
The 12 week laboratory-based research project will be carried out in relevant laboratories under the supervision of principal investigators within the School of Biochemistry and Immunology, within other TCD schools or external to TCD.

Please note, depending on your research project, you may need to be vaccinated against Hepatitis B. Please discuss this with your project supervisor in the first teaching term, so that, if required, you can complete the Hepatitis B vaccination schedule before the beginning of your project.

The literature review will be submitted in January (2 hard copies to be submitted to the School Office. The literature review must also be submitted online via Turnitin and a Turnitin report attached to the front of the hard copies.

The 12 week research project will start in March and finish in June.

The final thesis will be submitted 2 weeks after the end of the project and the following week students will present the findings of their research project during a poster session.

(Exact dates will be communicated in the Hilary term)

NB: Literature review and Thesis must be printed double-sided.

Module assessment:

IM7112 will make up 33% of the overall marks of the entire M.Sc. broken down as follows:
Literature review: 10%
Final 10,000 word thesis based on a laboratory research project: 85%
Poster presentation: 5%
Extra Information

Examinations
Details of timing and examinations are indicated. If these dates change, the class will be informed by email in advance.

Assessment Summary
The nature of the assessments will vary from one module to another. Individual teaching staff will give more details of assessment procedures at the beginning of each module. Details of assessments can be found in the module descriptors above.

Submission deadlines
For each item of coursework there will be a submission deadline. Students are expected to meet ALL deadlines.

Deadline penalties
- A 1% mark penalty per day past the deadline will be applied
- Extensions will only be granted in exceptional circumstances
- Cases for special circumstances must be made to the course co-ordinator and director.

Attendance
Attendance will be monitored in all components of the M.Sc. course. Full attendance at all classes is considered a measure of professional behaviour expected of all students. All activities are considered to be core and lack of attendance may affect student progression. All absences must be reported to both the course directors in advance of the class.

Word Limitations
All course assessments must comply with the stated word limit (+/- 10%).

Scheme for marking of projects
The 10,000 word thesis (85%) mark is comprised of the supervisor’s mark and co-ordinator/director marks for the project thesis. The supervisor's mark will be based on the student's performance within the laboratory (technical ability, understanding of the project and literature pertaining to it, critical evaluation of results, demonstration of initiative and independent thought) and on the content of the thesis. The supervisor will also make the other examiner of the project dissertation aware of any unforeseen difficulties that arose during the course of the project.
<table>
<thead>
<tr>
<th>Class</th>
<th>Mark Range</th>
<th>Criteria</th>
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<tbody>
<tr>
<td>I</td>
<td>85-100</td>
<td>Exceptional project report showing broad understanding of the project area and excellent knowledge of the relevant literature. Exemplary presentation and analysis of results, logical organisation and ability to critically evaluate and discuss results coupled with insight and originality.</td>
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<tr>
<td></td>
<td>70-84</td>
<td>A very good project report showing evidence of wide reading, with clear presentation and thorough analysis of results and an ability to critically evaluate and discuss research findings. Clear indication of some insight and originality. A very competent and well presented report overall but falling short of excellence in each and every aspect.</td>
</tr>
<tr>
<td>II-1</td>
<td>60-69</td>
<td>A good project report which shows a reasonably good understanding of the problem and some knowledge of the relevant literature. Mostly sound presentation and analysis of results but with occasional lapses. Some relevant interpretation and critical evaluation of results, though somewhat limited in scope. General standard of presentation and organisation adequate to good.</td>
</tr>
<tr>
<td>II-2</td>
<td>50-59</td>
<td>A moderately good project report which shows some understanding of the problem but limited knowledge and appreciation of the relevant literature. Presentation, analysis and interpretation of the results at a basic level and showing little or no originality or critical evaluation. Insufficient attention to organization and presentation of the report.</td>
</tr>
<tr>
<td>III</td>
<td>40-49</td>
<td>A weak project report showing only limited understanding of the problem and superficial knowledge of the relevant literature. Results presented in a confused or inappropriate manner and incomplete or erroneous analysis. Discussion and interpretation of result severely limited, including some basic misapprehensions, and lacking any originality or critical evaluation. General standard of presentation poor.</td>
</tr>
<tr>
<td>Fail</td>
<td>20-39</td>
<td>An unsatisfactory project containing substantial errors and omissions. Very limited understanding, or in some cases misunderstanding of the problem and very restricted and superficial appreciation of the relevant literature. Very poor, confused and, in some cases, incomplete presentation of the results and limited analysis of the results including some serious errors. Severely limited discussion and interpretation of the results revealing little or no ability to relate experimental results to the existing literature. Very poor overall standard of presentation.</td>
</tr>
</tbody>
</table>
A very poor project report containing every conceivable error and fault. Showing virtually no real understanding or appreciation of the problem and of the literature pertaining to it. Chaotic presentation of results, and in some cases incompletely presented and virtually non-existent or inappropriate or plainly wrong analysis. Discussion and interpretation seriously confused or wholly erroneous revealing basic misapprehensions.

Plagiarism

To ensure that you have a clear understanding of what plagiarism is, how Trinity deals with cases of plagiarism, and how to avoid it, you will find a repository of information at http://tcd-ie.libguides.com/plagiarism

We ask you to take the following steps:
(i) Visit the online resources to inform yourself about how Trinity deals with plagiarism and how you can avoid it at http://tcd-ie.libguides.com/plagiarism. You should also familiarize yourself with the Calendar entry on plagiarism located on this website and the sanctions which are applied;
(ii) Complete the ‘Ready, Steady, Write’ online tutorial on plagiarism at http://tcd-ie.libguides.com/plagiarism/ready-steady-write. Completing the tutorial is compulsory for all students.
(iii) Familiarise yourself with the declaration that you will be asked to sign when submitting course work at http://tcd-ie.libguides.com/plagiarism/declaration;
(iv) Contact your your Course Director, or your Lecturer if you are unsure about any aspect of plagiarism.

Submitting the IM7106 Essay, IM7112 Literature Review & IM7112 Thesis

As well as submitting hard copies to the school office, the IM7106 essay and IM7112 literature review and thesis must be submitted to plagiarism detecting software. You will do this via Blackboard. The software is SafeAssign and your work is automatically routed through SafeAssign when you submit. Your document must be saved in one of the following formats: doc, .docx, odt, .txt, .rtf, .pdf or .html. Go to the Module Code (IM7106 or IM7112) in Blackboard. You will see the Submission Link (left hand menu). Follow the instructions within that link. You are allowed a single “trial run” submission and will receive a plagiarism report. An overall identity score of less than 30% is acceptable, as this will take into account references and commonly used terms picked up by the software.
If your score is in excess of 30% you should consider rewording the highlighted passages and resubmitting. If you have any queries contact Bernie Butler (BBUTLER@tcd.ie). All submissions must be printed double-sided.

**Examination rules**

**General**

- The onus lies on each student to establish the dates, times and venues of their own examinations. No timetable or reminder will be sent to individual students by any office.
- You are expected to familiarise yourself with the location of every examination venue to which you have been assigned.
- Mobile phones, or other electronic or communication devices, are not permitted in examination venues - if a phone rings or an alarm on a phone is heard, or it is discovered in any other way in the venue it will be confiscated.
- Students must follow the instructions given by the invigilators in a co-operative and respectful manner.

**Before entering an examination venue**

- Leave your personal belongings, including bags, coats, hats, etc at the designated place within your examination venue as directed by the invigilator.
- You will not be admitted to the examination after the first half-hour, and will not be allowed to leave during the last half-hour. If you arrive after the first half-hour, contact the module coordinator and course coordinator as a matter of urgency.

**While in an examination venue**

- Once you have entered a venue, complete SILENCE must be maintained at all times.
- Each student must be in possession of their student ID card for each examination session. You should place your student ID card on the right-hand side of your desk for the duration of each examination.
- A ‘Clean Desk’ policy applies for all examinations. In addition to pens, pencils, rulers, student ID card, etc. only materials permitted for an examination may be placed on the desk. Invigilators will be instructed to request students to remove any non-permitted items from their desk. Pencil cases and calculator covers are not permitted. Students are advised that random pocket searches may be conducted during an examination session. Upon request, students should remove all items from their pockets for scrutiny by an invigilator. Failure to empty pockets when requested is considered a disciplinary offence and will be referred to the Dean.
During an examination

- You should check the title of the paper on your desk to ensure that it is the correct examination paper for your course, and read carefully all the instructions given.
- You are not allowed to start your examination until instructed to do so by the invigilators. Please use any spare time at the start to fill in your answer book cover(s), remembering to complete the section at the bottom right-hand corner as requested before sealing the flap on every anonymous booklet used. Write legibly in ink – pencils are only allowed for MCQ forms.
- You will be advised of the time thirty minutes and ten minutes before the end of the examination.
- If you wish to leave the examination venue at any stage during the examination you must be escorted by an Invigilator. If necessary you will be accompanied to a bathroom by an Invigilator.
- If you wish to leave before the end of the examination you must hand your booklet(s) to an Invigilator and ensure you hand up everything you wish to have marked.
- If you are taken ill just before an examination and are unable to sit it, immediately contact your module coordinator and course coordinator. If you feel unwell during your examination, please inform an Invigilator - you will be asked if you wish to go to the College Health Centre and will be accompanied by an Invigilator.
- Smoking breaks are not allowed during examination sessions.
- Dictionaries and Programmable calculators are not permitted at examinations.

On completion of an examination session

You will be advised that:

- you must immediately stop writing and hand up your booklets when instructed to do so by an Invigilator;
- you should ensure that all of your answer books are labelled correctly with your examination number (where appropriate) and all other required information;
- it is your responsibility to hand in everything you wish to have marked by ensuring all materials are fastened securely with a treasury tag;
- you must remain in your seat until all scripts have been collected;
- you must not remove from the examination venue answer books, rough work, or other materials supplied.
- While every effort will be made to give due notice of major changes, the College reserves the right to amend the examination timetable.
- College regulations and further information can be found on the TCD website and at the following web addresses:

  https://www.tcd.ie/academicregistry/exams/
  https://www.tcd.ie/academicregistry/exams/student-guide/
  https://www.tcd.ie/academicregistry/exams/assets/local/guideexam.pdf
Any further information or queries can be made to the course director, coordinator or graduate studies (contact details on page 3).

Student conduct for examinations

Students are forbidden during an examination to do or to attempt to do, any of the following: to have in their possession or consult or use any books, papers, notes, memoranda, mobile phones or written or electronic material of any nature, or to copy from or exchange information with other persons, or in any way to make use of any information improperly obtained.

Where the examination is of such a nature that materials are provided to the candidates, or where the candidates are allowed by the rules of that examination to have materials in their possession, then candidates may of course make use of such materials, but only of such materials, and the general prohibition above continues to apply in respect of any and all other materials.

Where candidates have the prior written permission of the examiner(s), of the Senior Lecturer, or of the Disability Officer, to have materials in their possession during an examination, then candidates may of course make use of such materials, but only of such materials, and the general prohibition above continues to apply in respect of any and all other materials.

Where candidates are allowed to bring personal belongings into the examination venues upon condition that such belongings are stored in an area – such as the back of the venue – away from the area in which the candidates are sitting their examinations, then candidates may bring personal belongings into the hall, provided that they are placed in the indicated area and are not returned to by the candidates until they have finished their examinations and are leaving the hall.

Any breach of this regulation is regarded as a major offence for which a student may be expelled from the University.

Students must not leave the hall before the time specified for the examination has elapsed, except by leave of the invigilator.

Examinations or other exercises which are part of continuous assessment are subject to the same rules as other College examinations. Where submitted work is part of a procedure of assessment, plagiarism is similarly regarded as a major offence and is liable to similar penalties.

Pass/Fail

a) Each module must be passed at a minimum of 50%. The final module mark will be calculated using the weighted assessment components. Students must pass all modules in order to be awarded a M.Sc. in Immunology.
b) Failure of modules

(i) In cases where students fail to achieve a minimum of 50% in a module, a repeat of a written exam or written assignment will be permitted during the appropriate repeat periods. Only one repeat will be allowed. Please note: due to the nature of IM7102, practicals cannot be repeated.

c) Failure of a module.

(i) Students must pass term 1 modules before they can progress to term 2.

(ii) Term 2 modules will be assessed at their end. Any students failing any of the term 2 modules (apart from module IM7112) will be able to repeat.

(iii) Failure on the second attempt indicates failure of the whole course, requiring exit from the course.

d) Compensation.

Students who fail a module (apart from module IM7112), but obtain 45% or more in that module, may compensate from marks awarded for the other modules, as appropriate, up to a total of 5%.

e) IM7112:

To begin the research project, students must have completed and passed all the taught modules. Module IM7112 must be passed in order for the student to be considered for an award of Masters degree. Compensation is not possible for module IM7112; neither can module IM7112 be used to compensate for any of the taught modules. Module IM7112 will make up 33% of the overall marks in the final evaluation of the awarding of the M.Sc. degree. Students must achieve 50% in module IM7112 to fulfil criteria for the award of the M.Sc. course.

f) Progression

i) All students register on the Masters programme.

ii) Students who have successfully passed all the taught modules of the course and accumulated 60 ECTS, but who do not wish to proceed to the module IM7112 stage, or if they have submitted, but then failed the IM7112, will be considered for a Postgraduate Diploma in Immunology (exit award).

(iii) Students who have successfully passed all the taught modules and module IM7112 and accumulated 90 ECTS will be considered for a Masters degree. Students must achieve at least 50% in IM7112 and in all the taught modules (IM7101-IM7111) to fulfil criteria for the award of the M.Sc.

iv) The award of a Masters with Distinction shall require the achievement of at least 70% for module IM7112 and an average of at least 70% (which is weighted on the ECTS credits for each module) in all taught modules (IM7101-IM7111). A distinction cannot be awarded if a candidate has failed any module during the period of study.
Course Feedback

A Feedback Form will be given out at the end of each module. These anonymous forms are a mechanism whereby students can make comments and suggestions that will help us to maintain and indeed improve the quality of the teaching offered.

Please note that any aspects of this handbook and timetable are subject to change during the year.
The Class Representative

Within the first few days of term the class should elect a Class Rep. The role of the class rep is to act as a contact point for the class. The class rep can bring important issues to the attention of the Course Directors and can act as a contact point should the course Directors or Module Coordinators need to contact the whole class. The class rep may also lead in organisation of class social events.

The Biochemical Society

The student led Biochemical Society aims to stimulate interest in the fields of Biochemistry and Immunology amongst its members, which include postgraduates, undergraduates, postdocs and PI's. The society hosts weekly talks throughout the academic year. These are given by invited, high-profile speakers from Ireland and abroad. On a social level, the society organises table-quizzes, a December/Winter party and BBQs, which are an enjoyable way of meeting other members of the School.

Details of broader College social and sport activities are provided at: http://trinitysocieties.ie/

The Graduate Students Union

Trinity's Graduate Students' Union (GSU) is the main representative body for all postgraduate students in College (https://www.tcdgsu.ie/). Established in 1973, the GSU has supported members and advocated for improvements to the postgraduate experience here in Trinity. All postgraduate students of the College, including postgraduate research students and those on higher degree and higher diploma courses, automatically become members of the Union upon registering with the College. The GSU has two full-time sabbatical officers who represent postgraduates on every level of College, from class rep issues to structures and policy at Board. The GSU also provides advice on academic and welfare issues faced by postgrads, and offers three main facilities: dedicated postgrad study space in the 1937 Reading Room, the GSU Common Room on the first floor of House 7, and the GSU office in Room 28, House 6. Although the GSU works in partnership with the Students' Union, the GSU is the only postgraduate representative organisation recognised by College. The GSU also produce a Postgrad Handbook and also maintain an active Facebook page detailing events. International Students: GSU sabbatical officers have first-hand experience regarding the steps needed to settle down in Ireland as an international student. It is easy to become overwhelmed while adjusting to jetlag, a new country (sometimes even a new continent!), a second language and separation from family and friends. They can help you with a variety of supports including: dealing with
internal College issues regarding paying fees; registering for your course; the process of securing a visa; opening up a bank account or securing accommodation.

**Postgraduate Advisory Service**

The Postgraduate Advisory Service (PAS) was established in 2009 to extend Trinity’s historic and unique tutorial service to the postgraduate community. We offer free, independent and confidential support, guidance and advocacy to registered postgraduate students at Trinity College Dublin.

**How we can help:**

We are here to provide support on any matter that may impact upon your time as a postgraduate at Trinity. Some of the most common issues students come to PAS to discuss include: study-related stress or worry; concerns about academic progress; supervisor-relationship concerns; extensions and going off-books; queries regarding regulations and academic appeals; bullying; plagiarism and disciplinary cases.

**We support students by:**

- Providing frontline confidential and free support, information, and referral via the Postgraduate Student Support Officer
- Providing, on referral, named academics to provide advice, advocacy, and assistance via the panel of Postgraduate Advisors
- Providing a suite of complementary supports including informal mediation, workshops and training to postgraduates
- Administering the Postgraduate Student Assistance Fund and other financial assistance to postgraduate students.

For more information please visit: [https://www.tcd.ie/seniortutor/students/postgraduate/](https://www.tcd.ie/seniortutor/students/postgraduate/)

**Emergency Procedure**

In the event of an emergency, dial Security Services on extension 1999. Security Services provide a 24-hour service to the college community, 365 days a year. They are the liaison to the Fire, Garda and Ambulance services and all staff and students are advised to always telephone extension 1999 (+353 1 896 1999) in case of an emergency. Should you require any emergency or rescue services on campus, you must contact Security Services. This includes chemical spills, personal injury or first aid assistance. It is recommended that all students save at least one emergency contact in their phone under ICE (In Case of Emergency).
Managing Wellbeing in the Postgraduate Context

At some point throughout your academic career there will be a time where you are feeling challenged. You may be finding communication with your peers or supervisor difficult; your research is not going to plan; or you might be struggling to balance academic work alongside financial obligations, friends and family responsibilities. This is not unusual because postgraduate study is demanding, and this challenge is heightened if you are feeling isolated, exhausted, unwell or unable to concentrate.

It can be helpful to avoid seeing postgraduate study as a general postponing of life, but rather an opportunity to learn how to best support yourself through what is going to be a challenging but hopefully rewarding phase in your life. We know that the academic environment plays a large part in this process, as does your ability to navigate this in a way that helps you best meet your needs. So here are some of our top tips:

STEP 1: Self-care is important not indulgent.

Get the balance right for you: Psychological health encompasses our capacity to work in a generative and meaningful way, our capacity to form and sustain authentic relationships and our capacity to play, be creative and get lost in the moment. Ensuring that you have time for each of these is incredibly important. So make time for those significant relationships in your life, and plan for some positive outlets throughout the academic year because this is will improve your energy levels and your ability to concentrate overall (see https://www.mentalhealthireland.ie/five-ways-to-wellbeing/ for more information).

Name the ‘self-critic’ instead of blaming yourself: There are many things we can do to proactively support our wellbeing going into this next academic year, however good plans often go to the wayside if we feel like: “I’m messing this up!”, “I don’t deserve to take a break”, “I’m not able for this!” These are very common thoughts that tend to get louder the more overwhelmed we feel, and paradoxically, the more we listen to these the less effective we become. Often we rush to feeling self-critical and blaming ourselves for challenging circumstances when we could be more self-compassionate. (see http://wtm.thebreathproject.org/wp-content/uploads/2016/03/COMPASSION-HANDOUT.pdf for more information)

Take a regular step back from it all: Whether you take regular breaks from academic work or make the time to talk with friends, family and course mates about how you are getting on, it’s important to reflect on the bigger reasons you have chosen to study. When we can reconnect with a sense of meaning and purpose in the work we are doing it can become a more enjoyable and rewarding process.

STEP 2: Build a Support Network

Many students feel a sense of being “an imposter” and think things like “Have they made a mistake letting me in?”, “What if I’m not good enough?”, “They are going to find me out one of these days!”. It is hard to believe that others are feeling similarly unless we reach out to them, but often this can feel more difficult in postgraduate courses due to the onus on independent study and the smaller class sizes.
Connect with peers: The Student Counselling Service in conjunction with the Postgraduate Advisory Service and the Graduate Student Union run a weekly drop in support group (“Grad Chats”) during terms times. The Student Counselling Service also runs groups and workshops on general student issues, which can be a good opportunity to learn more about these and connect with other students (see https://www.tcd.ie/Student_Counselling/counselling/groups-workshops/ for more information).

Upskill if necessary: Postgraduate study is designed to be a step up from previous education and may require you linking in with our Student Learning and Development Team who run workshops and training throughout the year and also offer 1:1 appointments (http://student-learning.tcd.ie/).

Ensure you have the right level of support: If you are currently experiencing low mood or anxiety difficulties, or you want to learn more about managing stress you can sign up to our online support programmes at https://ie.silvercloudhealth.com/signup/tcd/.

Enlist the support of other services: see https://www.tcd.ie/students/supports-services/ for a full range of the student support services, clubs, societies available at TCD.

STEP 3: Ask for Help

Even with all of this in place there may come a time where you feel you would benefit from the chance to talk with someone objective about your situation. If you feel that your mental health and wellbeing is being negatively affected or you just need some space to talk through a difficult situation, a disappointment or a loss we would encourage you to book an appointment with us by calling 01 8961407. If you are having difficulty navigating academic processes and procedures, or want some advice about making an academic complaint or an appeal, you can contact the Postgraduate Advisory Service at: https://www.tcd.ie/seniortutor/students/postgraduate/

MyCareer from Careers Advisory Service

An online service that you can use to:

- Apply for opportunities which match your preferences - vacancies including research options
- Search opportunities- postgraduate courses and funding
- View and book onto employer and CAS events
- Submit your career queries to the CAS team
- Book an appointment with your Careers Consultant

Simply login to MyCareer using your Trinity username and password and personalise your profile.

Careers Advisory Service
Trinity College Dublin, 7-9 South Leinster Street, Dublin 2
01 896 1705/1721  |  Submit a career query through MyCareer

MyCareer: mycareereconnect.tcd.ie
www.tcd.ie/Careers/students/postgraduate/
TCD.Careers.Service @TCDCareers
tinyurl.com/LinkedIn-TCD-Connecting

Opening Hours
During term: 9.30am - 5.00pm, Monday - Friday
Out of Term: 9.30am - 12.30pm & 2.15 - 5.00pm, Monday - Friday
Login. Only two steps - it's easy! Find us on tcd.ie/careers or MyDayApp

STEP 1  Login to MyCareer (using your Trinity username and password)

STEP 2  Update your profile with your email preferences, job and study areas of interest and your career readiness

Careers Advisory Service