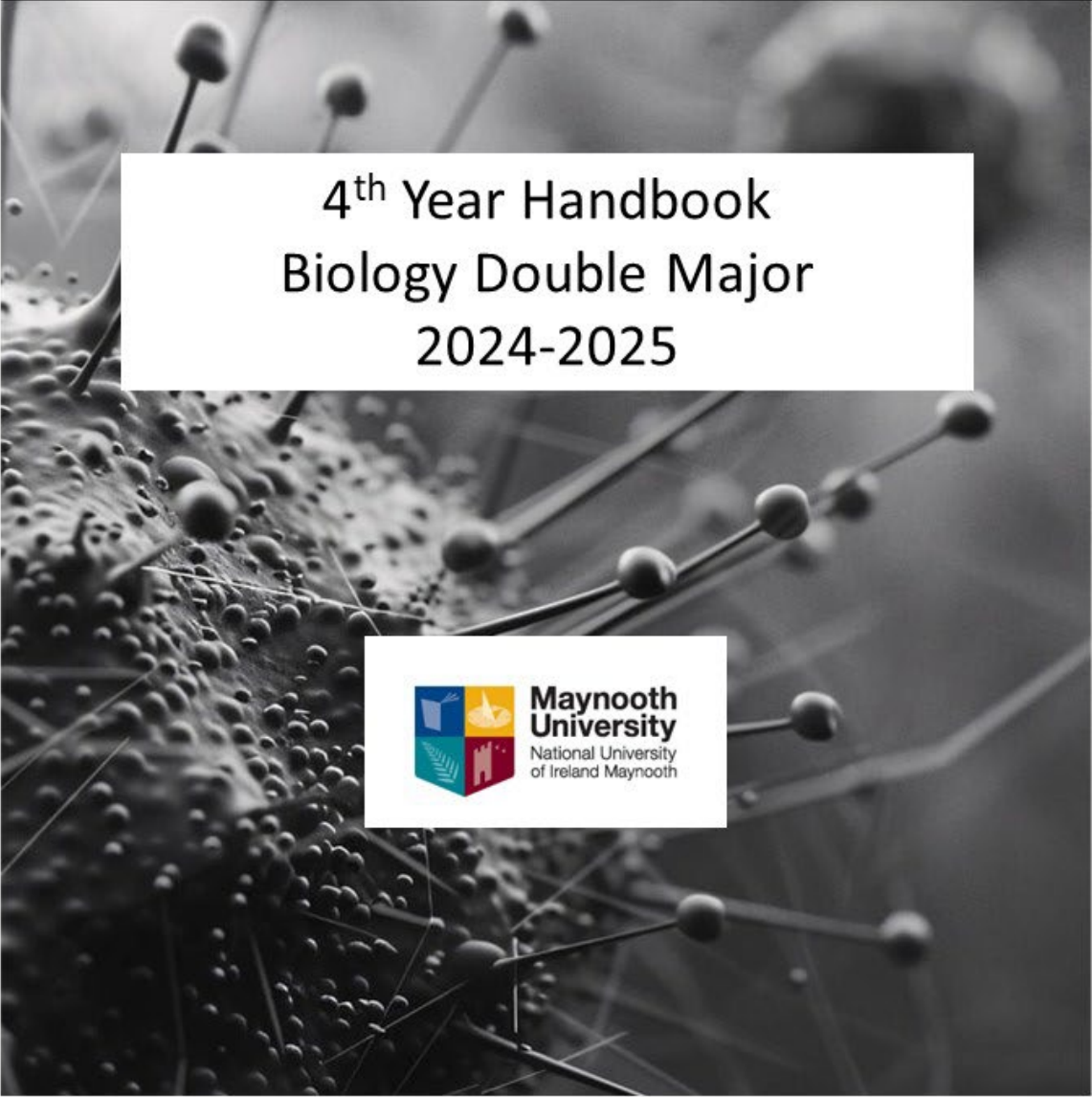


Department of Biology



4<sup>th</sup> Year Handbook  
Biology Double Major  
2024-2025



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## Maynooth University Biology Department:

### Aims of the department

To enhance students' knowledge and understanding of important concepts in the Biological Sciences and to develop their analytical, practical and communication skills and appreciation of environmental and other bioethical issues.

### Our commitment to equality, diversity, and inclusion.



The Maynooth University Biology department is committed to equality, diversity and inclusion. We are proud to have been the first department in the University to receive an externally validated Athena Swan Silver Department Award for our work toward promoting gender equality, diversity, and inclusion within the Department of Biology.

Our goals in this area include supporting and advancing women's careers in Biology, promoting work-life balance in the department and addressing any gender equity or diversity issues within the department. We look forward to engaging with all members (students and staff) of the department as we implement our Gender Equality Action Plan. As part of this we will continue to seek input from the student population (through surveys and focus groups) and will endeavor to keep you informed of our progress in this area.

For more information on the Department of Biology's Gender Equality Action Plan, please see <https://www.maynoothuniversity.ie/biology/athena-swan> or contact Dr Mark Robinson (Biology Athena Swan Chair): [Mark.Robinson@mu.ie](mailto:Mark.Robinson@mu.ie)

**Biology Department Athena SWAN Committee.  
September 2024**

## Information for Fourth Year Double Major Students 2024 – 2025

**Please read this manual carefully and keep it safely, so that you can refer to it during the year.**

The biology staff extends a warm welcome back to all Fourth Years; we hope you will enjoy your final year with us and gain valuable skills and knowledge. We advise you to carefully consider the demands of a double major over a single major choice. **You should only select a double major if you have found your courses to date in both subjects quite straightforward.** If you are not sure, then a single major course might be a safer option.

### Calendar 2024-2025 (see also page 49 for project deadlines)

<b>First Semester</b>	
Monday 23rd September	Lectures commence/compulsory introductory talk 2pm/ Tea & Coffee with staff 3.30-5pm
Friday 11th October	Deadline for change of registration
Monday 28th October to Friday 1 <sup>st</sup> November	Study week
Monday 4th November	Lectures resume
Friday 20th December	Conclusion of First Semester Lectures
Monday 23rd December to Friday 3rd January	Christmas Vacation
Monday 6th January to Thursday 9th January	Study Period
10-25 <sup>th</sup> January	Examination period
<b>Second Semester</b>	
Tuesday 4th February	Lectures commence
Monday 17th March to Friday 21st March	Study week
Monday 21st April to Friday 25th April	Easter Vacation
Monday 28 <sup>th</sup> April	Lectures resume
Friday 9th May	Conclusion of Second Semester Lectures
Monday 12th to Thursday 15th May	Study Period
16th May-June	Examination period

### Important notes about registration and your responsibilities.

Most final year students will have to amend their registration to reflect the allocation of projects etc after the first week of semester 1. You must make these changes to your registration **in the first THREE weeks of semester 1**. Other changes to lecture based modules in semester two can be made in the first two weeks of semester 2.

Changes **cannot be made after these deadlines**, and if you do not amend your registration appropriately, you may face allocation to modules you do not wish, or more seriously not being able to sit exams in modules you have taken.

## Biology Staff

Teaching Staff	Phone ext*	Room	E-mail	Consultation Time
Prof. Paul Moynagh <i>Head of Department</i>	6105	B3.15	fidelma.byrne@mu.ie	By appointment only
Dr. Özgür Bayram	6879	2.31	ozgur.bayram@mu.ie	Tuesday 11.00-13.00
Dr. Marion Butler	3856	B3.18	marion.butler@mu.ie	Monday 11.30-13.30
Dr. Jim Carolan	6367	2.29	james.carolan@mu.ie	Monday 11.00-14.00
Dr. Noreen Curran	3834	1.18	noreen.curran@mu.ie	Friday after lecture
Dr. John Devaney	7496	2.27	john.devaney@mu.ie	Wednesday 11.00 - 13.00
Dr. Tara Dirilgen	7261	F2	tara.dirilgen@mu.ie	Thursday 14:00-16:00
Dr. Paul Dowling	6368	2.35	paul.dowling@mu.ie	Tuesday 11.00-13.00
Prof. Sean Doyle	3858	1.24**	sean.doyle@mu.ie	Tuesday 10.00-11.30
Prof. Karen English	6290	B3.17	karen.english@mu.ie	Monday 14.00-16.00
Dr. David Fitzpatrick	Teams	1.26**	david.fitzpatrick@mu.ie	Monday 10.00-11.00
Dr. Emmanuelle Graciet	6255	B1.25	emmanuelle.graciet@mu.ie	Tuesday 10.00-12.00
Dr. Andy Hogan	6118	B2.16	andrew.e.hogan@mu.ie	Monday 11.00-12.00
Dr. Grace Hoysted	Teams	2.25	grace.hoysted@mu.ie	Tuesday 10.00-12.00
Prof. Kevin Kavanagh	3859	2.39	kevin.kavanagh@mu.ie	Monday 14.00–16.00
Dr. Lorna Lopez	Teams	2.36	lorna.lopez@mu.ie	Monday 10.00-11.30
Dr. Abigail Maher	6117	F6	abigail.maher@mu.ie	Tuesday 11.00-12.00
Dr. Joanne Masterson	6369	B2.17	joanne.masterson@mu.ie	Monday 14.00-16.00
Dr. Eoin McNamee	6148	B2.19	eoin.n.mcnamee@mu.ie	Monday 10.00-11.30
Dr. Conor Meade	6386	2.34	conor.meade@mu.ie	Monday 12.00-13.00
Dr. Sinead Miggin	3855	B3.14	sinead.miggin@mu.ie	Tuesday 12.00-13.00
Dr. Dania Movia	Teams	F1	dania.movia@mu.ie	Tuesday 12.00-13.00
Dr. Jackie Nugent	3857	B1.23	jackie.nugent@mu.ie	Tuesday 10.00-12.00
Dr. Shirley O’Dea	6480	F7	shirley.odea@mu.ie	Monday 10.00-11.30
Dr. Diarmuid O’Maoileidigh	Teams	B3.08	diarmuid.s.omaoidigh@mu.ie	Monday 10:00-12:00
Prof. Kay Ohlendieck	3842	2.33	kay.ohlendieck@mu.ie	Monday 12.00-13.00
Dr. Rebecca Owens	3839	2.30	rebecca.owens@mu.ie	Wednesday 10.00-12.00
Dr. Mark Robinson	Teams	B1.21	mark.robinson@mu.ie	Wednesday 14.00-16.00
Dr. Martina Schroeder	6853	B2.18	martina.schroeder@mu.ie	Monday 10.00-11.00
Prof. Fiona Walsh	7246	B1.24	fiona.walsh@mu.ie	Thursday 11.30-12.30

\*Phone prefix: (01) 708 *except* numbers in red which are prefixed by (01) 474...

\*\*=Located on ground floor Callan Building; F=Located in Foyer, 1st floor Callan Building; B=Biosciences & Electronic Engineering Building

The times when staff are normally available for consultation are given above. Appointments for other times must be arranged with individual lecturers. Staff with Teams listed under Phone No. can be contacted via Microsoft Teams.

Administrative Offices 2.40, 2.41 open daily: 9.30am-12.30pm; 2.30-4.30pm e-mail: [biology.department@mu.ie](mailto:biology.department@mu.ie)

### Programme Coordinators:

OMNIBUS SCIENCE:

Dr. Jackie Nugent

BIOTECHNOLOGY:

Dr. Shirley O’Dea

SCIENCE EDUCATION:

Dr. Jackie Nugent

BIOLOGICAL & BIOMEDICAL SCIENCES:

Prof. Kevin Kavanagh

BIOLOGICAL & GEOGRAPHICAL SCIENCES:

Dr. Conor Meade

INTERNATIONAL COORDINATOR

Dr. Paul Dowling

MAP (MATURE AND ACCESS STUDENTS) ACADEMIC ADVISOR:

Dr. Joanne Masterson

POSTGRADUATE COORDINATOR:

Dr. Martina Schroeder

MSc IN IMMUNOLOGY & GLOBAL HEALTH:

Dr. Sinead Miggin

For **urgent** matters please contact [biology.department@mu.ie](mailto:biology.department@mu.ie) to make an appointment with the relevant Programme Coordinators.

**4<sup>th</sup> Year Committee:** The members will be Prof Kevin Kavanagh, Dr Jackie Nugent, Dr Paul Dowling and 5 fourth year students elected by the MSU (1 Single Honours, 1 Double Honours student and 2 Biological & Biomedical Science students, 1 Biological & Geographical student). The committee will discuss problems and matters of interest. If you have issues which you would like to be considered, you should tell your representative.

**MODULE COORDINATORS:**

CODE	NAME	Coordinator	e-mail address
BI403	Plant Biotechnology	Noreen Curran	Noreen.Curran@mu.ie
BI405	Advanced Immunology	Martina Schroeder	martina.schroeder@mu.ie
BI406	Behavioural Ecology	Abigail Maher	abigail.maher@mu.ie
BI407	Tumour Biology	Marion Butler	Marion.Butler@mu.ie
BI410	Plant Developmental Biology	Jackie Nugent	jackie.nugent@mu.ie
BI411	Bioethics & Biotechnology	Sean Doyle	sean.doyle@mu.ie
BI422	Research Methodology 1	Fiona Walsh	fiona.walsh@mu.ie
BI424	Literature Project	Paul Dowling	Paul.dowling@mu.ie
BI426	Advanced Practicals/Prof Modules	Fiona Walsh	fiona.walsh@mu.ie
BI428	Laboratory Project	Paul Dowling	paul.dowling@mu.ie
BI435	Molecular Ecology and Biogeography	Conor Meade	conor.meade@mu.ie
BI436	Medical Mycology	Kevin Kavanagh	kevin.kavanagh@mu.ie
BI437	Neuromuscular Biology	Kay Ohlendieck	kay.ohlendieck@mu.ie
BI439	Antibiotics: Discovery, Modes of Action & Resistance	Fiona Walsh	fiona.walsh@mu.ie
BI440	Control of Protein Activity	Emmanuelle Graciet	emmanuelle.graciet@mu.ie
BI441	Fungal & Bacterial Secondary Metabolism	Ozgur Bayram	ozgur.bayram@mu.ie
BI443	Clinical Proteomics: Discovery, Validation & Medical Utility	Paul Dowling	paul.dowling@mu.ie
BI444	Human Nutrition & Metabolic Disease	Andrew Hogan	andrew.e.hogan@mu.ie

The delivery of all fourth-year modules is in-person. It is expected that all students will have access to a laptop and on occasion you will be required to have your own laptop for practical assignments and quizzes.

For information on several schemes to provide you with a laptop or financial assistance towards the purchase of one, please contact the Maynooth University Access Office [access.office@mu.ie](mailto:access.office@mu.ie)

**Double Major (sometimes called Double Honours) Course Outline**

You must attend the 4<sup>th</sup> year Introduction talk on **Monday 23 September 2-3pm Teaching Lab 3** where you will learn about your choices. The information below will be discussed in detail.

To obtain a degree you have to obtain 60 credits for the year, 30 in Biology and 30 in your second subject. To achieve your 30 credits of Biology, you must take a combination of

- 1 Compulsory Module** (BI422 General methodology 1 (2.5 credits) +
- 1 Capstone Project** 7.5 credits (see figure 1) +
- 4 Lecture based modules** (20 credits).

Figure 1- The capstone Project Options

<b>Options in 4<sup>th</sup> year</b>		
BI422 General methodology (2.5 credits)		
BI424 Literature Project (5 credits)	BI428 Lab research Project (7.5 credits)	
BI426 Adv Practicals (2.5 credits)		
Select 4 lecture modules (20 credits)	Select 4 lecture modules (20 credits)	
<b>=30 Credits Biology</b>		
Second /Other subject e.g. Maths (30 credits)		
<b>=60 credits (overall)</b>		

THE ABOVE IS DELIVERED OVER THE TWO SEMESTERS:

**DOUBLE MAJOR SEMESTER 1 OUTLINE:**

**Compulsory module**

BI422 General methodology 1 (2.5 credits)

**Capstone Projects**

Option 1: BI424 Literature Project (5 credits) AND BI426 Advanced Practicals/Professional Modules 1, OR  
 Option 2: BI428 Laboratory Project (7.5 credits) (note: If you select BI428, your lab project may be assigned to either Semester 1 (group 1) or Semester 2 (group 2)

**LECTURE MODULES (5 credits each)**

Select lecture modules from:

Module code	Module Name	Restrictions	Lecturer Initials
BI403	Plant Biotechnology	None	NC
BI444	Human Nutrition & Metabolic Disease	None	AH
<i>Either</i> BI405	Advanced Immunology	Cannot be taken with BI441	MR/MS
<i>Or</i> BI441	Fungal & Bacterial Secondary Metabolism	Cannot be taken with BI405	OB
<i>Either</i> BI407	Tumour Biology	Limited to 125 students, cannot be taken with BI411	MB
<i>Or</i> BI411	Bioethics & Biotechnology	Cannot be taken with BI407	SOD/SD

**DOUBLE MAJOR SEMESTER 2 OUTLINE:**

**Capstone Projects**

Option 1. BI424 (5 credits) & BI426 (2.5 Credits) (Continuing from semester 1); OR  
 Option 2. BI428 Laboratory Project (7.5 credits) (note: If you select BI428, your lab project may be assigned to either Semester 1 or Semester 2.

**LECTURE MODULES (5 credits each)**

Module code	Module Name	Restrictions	Lecturer Initials
<i>Either</i> BI406	Behavioural Ecology	Cannot be taken with BI443	AM
<i>Or</i> BI443	Clinical Proteomics: Discovery, Validation & Medical Utility	Cannot be taken with BI406	PD
<i>Either</i> BI436	Medical Mycology	Limited to 150 students, cannot be taken with BI440	KK
<i>Or</i> BI440	Control of protein activity	Limited to 50 students, cannot be taken with BI436	EG
BI410	Plant Development	None	JN
BI435	Molecular Ecology & Biogeography	None	CM
BI437	Neuromuscular Biology	Limited to 150 students	KO
BI439	Antibiotics: Discovery, Modes of Action & Resistance	Limited to 100 students	FW

The number of lecture modules depends on your requirement to achieve 30 credits in Biology and 60 overall and whether you are assigned Group 1 (BI424 Lit project -5 credit with BI426 Adv practicals/Prof modules 2.5 credits) or Group 2 BI428 Lab project (7.5 credits)

There are some limits (caps) on the numbers of students per module, and some modules cannot be taken together for timetable reasons and available space reasons.

## BIOLOGY Double Major Students -The Course in detail (also called Double Honours)-

### INTRODUCTORY LECTURE (compulsory):

**MONDAY 23rd SEPT 2.00-3.00pm:** Teaching Lab 3, (in person) followed by an opportunity to meet peers and chat with lecturers 1 to 1 about capstone projects and the courses in general, in the foyer of the Biosciences building from 3.30pm. This is a very important introduction to the year where the choices you have to make are explained to you

### Compulsory Module BI422

**Note:** There is no “resit” option for compulsory modules in the autumn exams as these modules require full year attendance and/or demonstrating basic lab competences. Failure or incomplete “technical fails” in these modules may require you to retake the year.

### BI422 Research Methodology.

Schedule: (9 x 1hr lectures; 6 x 120–180 minute practicals as below).

### INTRODUCTORY LECTURE: MONDAY 23<sup>rd</sup> SEPT 2.00-3.00pm: Teaching Lab 3

Meet the staff Tea & Coffee: **MONDAY 23<sup>rd</sup> SEPT 3.30-5.00pm: Biosciences building foyer.**

DATE	TIME	PLACE	TITLE	GIVEN BY
Tues 24 Sept	1-2pm	JHL2	Laboratory Safety Lecture 1*	A. Power
Tues 24 Sept	3-6pm	Lab 2	Introduction to Lab Techniques	J. Nugent
Wed 25 Sept	9-10am	ARTSALT	Laboratory Safety Lecture 2*	A. Power
Wed 25 Sept	2-4pm	Lab 2	Basic Biochemical Techniques 1	O. Bayram
Fri 27 Sept	1-4pm	Lab 2	Microbiology Techniques	K. Kavanagh
Mon 30 Sept	11-1pm	ARTSALT	Introduction to Excel	A. Maher
Mon 30 Sept	2-4pm	Lab 2	Molecular Biology Techniques 1	F. Walsh
Wed 2 Oct	9-10am	ARTSALT	GM Induction	A. Power
Wed 2 Oct	2-4pm	Lab 2	Molecular Biology Techniques 2	F. Walsh
Wed 2 Oct	4-5pm	Lab 2	Intro to Lab Techniques/ Microbiology Techniques MCQ	J. Nugent/ K. Kavanagh
Thurs 3 Oct	1-2pm	Lab 2	Basic Biochemical Techniques 1 MCQ	O. Bayram
Fri 4 Oct	1-2pm	JHL3	Accessing Information-Library	A. Ní Bharáin
Fri 11 Oct	1-2pm	JHL3	Plagiarism/Turnitin	C. Meade
Fri 18 Oct	1-2pm	JHL3	Thesis Writing	A. Maher
Mon 25 Nov	11am-1pm	ARTSALT	Careers: Options with your degree and How to write a Science CV** (incl. introduction to career planning, postgrad study & employment)	A. Mooney
Mon 2 Dec	11am-12pm	ARTSALT	Postgraduate Studies	M. Schroeder

\*Students must pass a LABORATORY SAFETY EXAM before they can begin BI426 or BI428. This will be a Moodle based exam; arrangements for this exam will be discussed at one of the Laboratory Safety lectures above.

\*\*There is an optional CV assignment at the end of the Careers lecture.



## Capstone research project options

Your fourth year is a defining year in your studies. You build on the work of the previous years. Greater emphasis is put on using knowledge and understanding, rather than a simple accumulation of information. Consequently, poor academic practices, mis-use of AI and plagiarism are treated more strictly (see below).

As fourth year students you are ready to undertake a research project under the supervision of an active scientist. This forms a major part of your final year experience and mark. We describe these in detail at the introductory lecture and how to make your choice. The choice is between a literature-based project (Group 1 BI424 with BI426) or a lab based project (Group 2 BI428). Both options are designed to give students research skills, and a grounding in professional development to establish a future career.

**Remember: There is no “resit” option for capstone modules in the autumn exams as these modules require full year attendance and/or demonstrating basic lab competences. Failure or incomplete performance in these modules may require you to retake the year.**

### Capstone Group 1: BI424 Literature Project & BI426 Advanced Practicals/Professional modules

A **6-week** independent literature offered in either semester. The topics will be set by the academic staff of the Department (see below). Topics will collectively cover a wide range of biological disciplines, and where possible the student will have an element of choice on the subject area, typically taking the broad topic set and refining it to a specific question. Individual topics will have a narrow enough focus to ensure a survey of the primary literature is appropriate. Projects will be assessed based on thesis write-up (70%), planning & development (10%) and a compulsory oral presentation (20%) of the research topic. Deadlines for submission are given in the table on page 49.

### Descriptions of BI424 literature projects offered in 2024/2025

Supervisor	Indicative Title (Students & Supervisors agree a refined, final title early in module)
Bayram, Özgür (Fungal Genetics and Secondary Metabolism Laboratory)	Preventative strategies to reduce mycotoxin contamination in food and feed sources.
	Use of fungi as novel sustainable food.
	Use of fungal enzymes in food industry.
	Degradation of man-made polymers by microorganisms
Butler, Marion (Cell Signalling Lab.)	The HER family of kinases in Cancer
	Sex differences in immune Responses.
	Sex differences in diseases (Student Choice on disease)
	The Impact of Ageing on the Immune Response.
	Sex differences in Autoimmune diseases (Student pick disease)
	Mechanisms underlying chemoresistance
Carolan, Jim (Applied Proteomics Lab.)	The molecular basis of plant-insect pest interactions
	A bioinformatic characterisation of the aphid salivary proteome
Dirilgen, Tara	Urban soil biodiversity

(Terrestrial Ecology Lab.)	Linking aboveground and belowground diversity
Dowling, Paul (Clinical Proteomics Lab.)	CAR T-cell therapy in multiple myeloma
	Minimal residual disease in multiple myeloma: state of the art and future perspectives
	Advances in the treatment of extramedullary disease in multiple myeloma
	Daratumumab: a game changer in myeloma therapy
	The role of bispecific antibodies in the treatment multiple myeloma
	Melflufen: a potential new treatment backbone for multiple myeloma
Doyle, Sean (Molecular Biotechnology Lab.)	Siderophores and wound healing <b>OR</b> Recombinant monoclonal antibody generation from B cells.
	Nucleic acid detection by Point Of Care Testing (POCT).
	CRISPR/Cas9 applications in fungal molecular biology.
	Celastrol: biosynthesis and applications as an antimicrobial.
English, Karen (Cellular Immunology Lab)	Targeting macrophages in Mycobacterium Tuberculosis infection
	Macrophage based cellular therapy in infectious disease
	Immunotolerance in Sepsis
	Anti-inflammatory innate immune training
Fitzpatrick, David (Genome Evolution Lab.)	Climate change and the emergence of novel microbial pathogens.
	The era of Eukaryotic Pangenomes. History, implications and methodology.
	Aneuploidy as a mechanism to drive antimicrobial resistance in important Fungal pathogens.
	Metataxonomics of diverse environments. Uncovering the unculturable.
	Alterations to the Universal Genetic Code and how they may act as a barrier to later gene transfer.
Graciet, Emmanuelle (Plant Biochemistry Lab.)	Epigenetic mechanisms of plant priming to abiotic stresses.
	Plant responses to multiple combined environmental stresses.
Hoysted, Grace (Microbial Ecology Lab.)	Molecular mechanisms of host-parasite interactions in plant parasitic nematodes
	The dual role of symbionts and pathogens in plant health
Kavanagh, Kevin (Medical Mycology Lab.)	Azole resistance in agricultural and clinically relevant filamentous fungi
	Temporal changes in populations of pulmonary pathogens in cystic fibrosis patients
	Models for studying fungal pathogenesis

	Pathogen recognition receptors in invertebrates and vertebrates – variations on a theme ?
Lopez, Lorna (Human Genomics Lab.)	Advances in Autism Genetics: A Focus on Emerging Insights
	From Genes to Behaviour: Genetic Contributions to Autism
Masterson, Joanne (Allergy, Inflammation Remodeling Research Lab.)	The role of climate change in mechanism's underpinning the development of allergic diseases
	An update on hypoxia inducible factor signaling mediated regulation of fibrotic mechanisms of disease
	A contemporary update on matrisomal characteristic's and fibrostenotic processes in Eosinophilic Esophagitis
Meade, Conor (Molecular Ecology Lab.)	Options for Protected Areas and their Conservation under Climate Change
	Organic Farming: Is sustainable Agriculture Possible?
McNamee, Eoin (Mucosal Immunology Lab.)	How does the RNA viruse sensor, Protein kinase R (PKR), control inflammation?
	Protein kinase R(PKR) interactions with the interferon response: implications for inflammatory disease.
	IRF1 and IRF2 proteins controlling Intestinal stem cells and regeneration: Implications for inflammtory bowel diseases?
	Therapeutic targeting of the Endoplasmic reticulum (ER)-stress response pathway to treat inflammatory disease
	Is defective Endoplasmic reticulum (ER)-stress the cause of inflammatory bowel disease?
Miggin, Sinead (Immune Signalling Lab.)	Inflammation and bovine reproduction
	Pregnancy establishment in cattle
	Bovine zoonotic diseases-implications for human health
	Biologics for the treatment of inflammatory diseases
	Role of bovine seminal proteins in bovine fertility
Movia, Dania (Humane Biomedical Research Lab.)	The rise of Organ-on-a-Chip technology
	Efficacy of in vitro models as alternatives to animal testing
	Sustainaibility of animal testing for a healthy society
	Policy and regulatory perspectives on non-animal testing methods
	Challenges and innovations in Nanomedicine
	Nanomedicine in oncology
	Nanotechnology in regenerative medicine

	Advances in therapy for lung cancer
Nugent, Jackie (Plant Molecular Biology Lab.)	Mitochondrial RNA editing in plants
	Plant responses and tolerance to salt stress
O'Dea, Shirley (Cell Engineering Lab.)	Cell therapies for gastrointestinal cancers
	Cell therapies for non-cancerous diseases
	Cellular mechanisms of chronic inflammatory diseases
	Long covid: Mechanisms and treatments
Ohlendieck, Kay (Muscle Biology Lab.)	Biochemical regulation of muscle carbohydrate metabolism
	Molecular physiological analysis of skeletal muscle ion channels
	Regulation of skeletal muscle enzyme kinetics
	Biochemical regulation of muscle mitochondria
	Annexin proteins and skeletal muscle membrane repair
	Integration of bioenergetic pathways in skeletal muscle
	Mass spectrometric analysis of muscle protein complexes
	Pathobiochemical mechanisms of muscular atrophy
	Biochemical regulation of muscle carbohydrate metabolism
Owens, Rebecca (Chemical Microbiology Lab.)	Antimicrobial activity in plant protein hydrolysates from legumes
	Role of bovine milk and colostrum proteins in enhancing immune function
	Extracellular vesicles from milk: Cargo and biological function
Robinson, Mark (Chronic Disease Immunology)	Molecular mechanisms controlling type I IFN signalling
	Non-canonical type I IFN signalling
	Immunological role of galectins
	Liver-resident lymphocytes
	Autoantibodies targeting inflammatory cytokines
	Recirculation of tissue-resident lymphocytes
Schroeder, Martina (Host-Pathogen Interaction Lab.)	Regulation of mRNA translation by cap-binding proteins
	Regulation of alternative mRNA splicing
	Interferon-stimulated genes: Expression regulation and function

	Endoplasmic Reticulum (ER) Stress and disease
	X-linked immunity
Walsh, Fiona (Antimicrobial Resistance and Microbiome Research Lab.)	Molecular mechanisms of conjugation
	Infectious disease modelling from 1970s to date
	Recent developments in antimicrobial discovery
	Conjugation of antimicrobial resistance

## BI426 Advanced Practicals/Professional Modules 1

**Attendance at all Advanced Practical/Professional module sessions is COMPULSORY without a valid reason for absence. Missing scheduled sessions may result in failure of the module.**

**NOTE WELL: Continuous Assessment components are not carried over, if you fail BI426 you will have to repeat all components!**

*You will be allocated 1 advanced practicals and 2 professional modules designed to give you sufficient technical skill to commence work in a scientific industry, in a research lab, or more broadly.*

**Students indicate preferences for Advanced practicals from the following list and will be allocated one:**

### SEMESTER 1:

- **Applied Medical Mycology** (K. Kavanagh): week 4, 14-16 Oct, Mon 3-5.30pm, Lab 1 Tues 3-5pm, Lab 1; Wed 3-4.30pm; Lab 2
- **Protein Bioinformatics** (K. Ohlendieck): week 5, 21-23 Oct, Mon 3-6pm, Lab 1; Tues 2-5pm, Lab 1; Wed 3-6pm, Lab 3
- **BioPharma: producing human therapeutics in plants** (J. Nugent/E. Graciet): week 8, Tues 12 Nov Prelab 2-3pm, Lab 4; week 9, 18-21 Nov, Mon 3-6pm, Wed 2-5pm, Thurs 2-5pm; Lab 4
- **Biomarker Discovery** (E. McNamee): week 11, 2-5 Dec, Mon 3-6pm, Wed 2-5pm, Thurs 2-5pm; Lab 1
- **Bacterial Sequencing** (F. Walsh): week 12, 9-12 Dec, Mon 3-5pm, Tues 3-5pm, Wed 4-6pm, Thurs 2-5pm; Lab 1

### SEMESTER 2:

- **Fungal Ecology** (G. Hoysted): week 20, 4-6 Feb, Tues 2-5pm, Wed 2-5pm, Thurs 2-5pm; Lab 2
- **Comparative phosphoproteomics analysis of signaling pathways in cancer** (P. Dowling): week 21, 10-12 Feb, Mon 2-5pm; Tues 2-5pm, Wed 2-5pm; Lab 5
- **Clinical Applications** (E. McNamee): week 22, 17-19 Feb, Mon 2-5pm, Lab 1; Tues 2-5pm, Lab 1; Wed 2-5pm, Lab 2
- **Immunology: assessment of antibody response by ELISA** (M. Schroeder): week 23, 24-26 Feb, Mon 2-5pm, Tues 2-5pm, Wed 2-5pm, Lab 4
- **Mammalian Cell Culture** (A. Hogan): week 24, 3-4 Mar, Mon 2-5pm & Tues 2-5pm, Lab 1; week 25, Tues 11 Mar 2-5pm; Lab 1
- **Comparative Genomics of Pathogenic Bacteria** (D. Fitzpatrick): week 27, 24-27 Mar, Mon 2-5pm LC, Wed 2-5pm, TSI239; Thurs 2-5pm, TSI239
- **Cleanroom Technology** (S. O'Dea/K. Kavanagh): week 28, 31 Mar-3 Apr, Mon 2-5pm; Tues 2-5pm, Wed 2-5pm, Thurs 2-3pm; Lab 5

**IMPORTANT: CHECK THE TIMES AGAINST YOUR SECOND SUBJECT SCHEDULE AS SOME PRACTICAL OR PROFESSIONAL MODULE TIMES MAY CLASH.**

**Also Students will indicate preferences and then be allocated 2 professional modules from the following:**

### SEMESTER 1:

- **Business Risk Management** (S. O'Dea): weeks 4 & 5, 14-17 Oct & 21-24 Oct, Mon 3-4pm CB2; Wed 3-5pm CB2; Thurs 3-4pm CB1
- **Scientific Communication and Public Engagement** (G. Hoysted): weeks 7 & 8, 4-7 Nov & 11-14 Nov, Mon 3-4pm CB2; Wed 3-5pm CB2; Thurs 3-4pm CB1
- **End User Computing (A. Yaseen)**: weeks 9 & 10, 18-21 Nov & 25-28 Nov, Mon 3-4pm CB2; Wed Computer Lab TBC; Thurs 3-4pm CB1

### SEMESTER 2:

- **Data Visualisation and Interpretation** (E. McNamee): weeks 20 & 21, 5-6 Feb & 10-13 Feb, Wed 3-5pm CB1; Thurs 3-4pm SLT; Mon (week 21 only) 3-4pm SLT;
- **Peer-review and Scientific Communication** (O. Bayram): weeks 22 & 23, 17-20 Feb & 24-27 Feb, Mon 3-4pm SLT, Wed 3-5pm CB1, Thursdays 3-4pm SLT
- **Patenting and Licensing of Biological Products** (S. Doyle/A. Hogan): weeks 28 & 29, 31 Mar-3 Apr & 7-10 Apr, Mon 3-4pm SLT, Wed 3-5pm CB1, Thurs 3-4pm SLT; week 30, Mon 14 April Questionnaire 3-3.30pm venue tbc

## **BI426 Advanced Practicals Detailed Descriptions:**

### **SEMESTER 1**

#### **Applied Medical Mycology (Prof. Kevin Kavanagh)**

A number of yeasts have been implicated in superficial and systemic diseases in humans. In general, the superficial diseases (oral candidosis, 'Thrush', cutaneous infection) can be effectively treated with either azole or polyene drugs and under most circumstances are not life threatening. However, systemic diseases occur in severely debilitated individuals and are potentially fatal. Treatment may be protracted and often fails to arrest the dissemination of the yeast. The ability to differentiate yeasts is critically important since it facilitates treatment and allows the tracking of yeasts implicated in recurring bouts of superficial disease. In this practical we shall examine means of morphologically distinguishing between pathogenic yeast species and of discriminating between them on the basis of their altered susceptibilities to antifungal agents. Restriction Fragment Length Polymorphisms may be used to differentiate between the main fungal pathogens and this technique will be used in conjunction with the variations evident in the whole cell protein banding pattern to identify and distinguish yeast strains. At the end of this practical the student will be familiar with the main techniques used to rapidly identify the most common yeast pathogens of humans and the reasons why identification is important for patient recovery.

#### **Protein Bioinformatics (Prof. Kay Ohlendieck)**

This practical introduces students to the basics of protein bioinformatics. Many proteins consist of more than one polypeptide chain and these individual subunits may be identical or different in primary structure. Importantly, oligomeric proteins can assemble to become even larger supramolecular structures. A crucial biochemical method for determining the subunit composition and spatial configuration of large protein complexes is the XL/MS (chemical crosslinking mass spectrometry) technique. The main bioanalytical objective of this practical is the demonstration of how mass spectrometry-based proteomics can be combined with protein bioinformatics to determine patterns of protein oligomerisation. In addition, an introduction to gel electrophoretic separation approaches and related biochemical methodology is given in order for students to understand how one can unequivocally identify specific subunits in a complex mixture of proteins. Individual sessions will focus on (i) protein identification by gel- and mass spectrometry-based proteomics (principles of peptide mass spectrometry; comparative gel-based proteomics; fluorescence two-dimensional difference gel electrophoresis), (ii) protein oligomerisation analysis using chemical crosslinking/mass spectrometry (principles of interaction proteomics; chemical crosslinking of proteins; XL/MS analysis), and (iii) bioinformatic protein complexome analysis (proteomic establishment of protein families, bioinformatics of protein network analysis, protein pathway analysis).

**BioPharma – producing human therapeutics in plants (Dr. Jackie Nugent, Dr. Emmanuelle Graciet)** Plants are emerging as a major platform for industrial-scale production of a range of recombinant products including many human therapeutics. The purpose of this advanced practical is to provide familiarity with some of the methods involved in producing human therapeutic proteins in plants. Students will: carry out plant transformation with a gene of interest for therapeutic applications; assess gene expression in planta; purify the human therapeutic protein from total plant protein and assess the purity of the isolated protein by polyacrylamide gel electrophoresis (PAGE). This practical will allow students to gain competence in a range of highly transferable molecular laboratory techniques including reporter gene assays, protein isolation, protein purification and PAGE.

#### **Biomarker Discovery (Dr. Eoin McNamee)**

Central to the diagnosis and subsequent treatment of disease is biomarker discovery, involving the identification of molecules (usually proteins) that are more or less abundant in samples taken from patients with and without a disease. The most commonly used biomarkers are those that are found in the fluid fractions of our body such as saliva, urine or blood as their identification generally involves non-invasive and rapid procedures. Samples are screened for the presence or quantity of the biomarker protein and thus give the clinician an idea of whether the patient is suffering

from a disease and the stage of disease progression. Although biomarker screening involves focusing on one or two individual proteins, their initial discovery require high throughput analysis of thousands of proteins (e.g. the blood serum proteome) to find those that are consistently different or diagnostic for a disease.

One of the most commonly used methods for high throughput proteome characterisation is 2-Dimensional Electrophoresis (2DE). During these practicals you will conduct 2DE and LC-MS/MS on samples representing serum obtained from patient's that have been diagnosed with ovarian cancer. By comparing the 2D profiles of sufferers and non sufferers it is anticipated that differentially expressed proteins will be identified; proteins which could represent novel biomarkers for ovarian cancer. Differentially expressed protein spots will be excised and identified using mass spectrometry. The techniques and experience you obtain during these practicals will be valuable to those interested in immunology, clinical research, drug discovery, proteomics and mass spectrometry.

### **Bacterial sequencing (*Prof. Fiona Walsh*)**

This practical will incorporate some of the molecular techniques and bioinformatics analysis used to determine the complete DNA sequence of bacteria using Oxford Nanopore technology (ONT). This course will cover the wet lab preparation of libraries from genomic DNA, with a focus on the critical steps and potential pitfalls and understanding what constitutes a 'good' sample for purpose of best results using the technology. Advances in sequencing now allow scientists to sequence a bacterial genome in a week using a small machine and a laptop known as ONT. The practical experiment will involve extracting the DNA from bacteria and checking the quality and quantity is sufficient for sequencing. The samples will be prepared for sequencing by generating a library prep. The flow cell will be loaded with the prepared samples. The sequencing run will be performed by the machine. The sequencing data will be analysed for quality and filtered. The resulting data will be mapped to known bacterial genomes and assembled using software tools such as Minimap2 and Canu. The bacterial genome will be visualised and investigated for mutations or inserted genes of interest.

#### **Learning Outcomes**

After this course you should be able to:

1. Prepare libraries from genomic DNA for whole genome approaches to nanopore sequencing
2. Run Oxford Nanopore Technology (ONT) device and assess sequencing performance during a run
3. Understand the basics of ONT data handling and analysis
4. Analyse and interpret ONT whole genomic data from bacterial samples

## **SEMESTER 2**

### **Fungal Ecology (*Dr. Grace Hoysted*)**

Fungi represents one of the most diverse groups of organisms on Earth, with an essential role in ecosystem processes and functioning including regulating nutrient and carbon cycles. Fungal symbionts of plant roots, known as mycorrhizal fungi, form mutualistic and often beneficial relationships with >90% of terrestrial plant groups, allowing them to acquire essential nutrients. This module will investigate the symbiotic fungi that are ubiquitous in most plant roots and soil. Students will gain an appreciation for the influence of invisible soil organisms on plant growth, learn about symbioses and their range of outcomes in nature by comparing host and non-host plant species associated with and without mycorrhizal fungi. This Advanced Practical will include both fieldwork and laboratory skills (plant physiological analysis, soil biochemical analysis, root staining and microscopy). Techniques and experiences gained during the Fungal Ecology Advanced Practical will provide students with experience using the scientific method and promotes inquiry-based science learning by integrating biological and mathematical problem-solving skills. Students will also develop communication skills to convey scientific concepts. Skills obtained during these practicals will be valuable to those interested in conservation, ecology, ecosystem restoration, environmental biology and sustainability.

### **Comparative phosphoproteomics analysis of signaling pathways in cancer (*Dr. Paul Dowling*)**



The aim of this practical is to identify increased levels of phosphorylation on NF- $\kappa$ B (nuclear factor kappa-light-chain-enhancer of activated B cells) using a combination of immunoprecipitation and mass spectrometry. Phosphorylation plays critical roles in the regulation of many cellular processes including cell cycle, growth, apoptosis and signal transduction pathways, with abnormal phosphorylation a cause or consequence of many diseases. Tumor necrosis factor (TNF) stimulated cells (which will increase phosphorylation levels on NF- $\kappa$ B) will be analysed using immunoprecipitation, a technique of precipitating a protein antigen out of solution using an antibody that specifically binds to that particular protein (in this case NF- $\kappa$ B). This precipitated protein will then be digested with trypsin prior to mass spectrometry, an analytical chemistry technique that helps identify the amount and type of chemicals present in a sample.

### **Clinical Applications (Dr. Eoin McNamee)**

The successful treatment of disease depends on early detection, which in many cases involves screening patient samples for specific diagnostic biomarkers. These biomarkers are usually proteins that vary significantly in quantity during the disease. Mor *et al.*, (2005) identified a number of biomarkers associated with ovarian cancer (OVCA). One of these proteins, prolactin, was shown to be consistently higher in abundance in patients with OVCA. Subsequently prolactin has been used in clinical situations as a pre-screen for OVCA and to monitor the success of treatment in patients with OVCA. In the following set of Advanced Practicals the presence and progression of ovarian cancer will be investigated using antibodies for prolactin. Students will initially assess patient serum samples for the presence of elevated prolactin (compared to a negative control) and then evaluate the success of different cancer treatments. Over the course of these practicals, you will be introduced to many of the core methods used to study proteins, including protein extraction and quantification, SDS PAGE, Western Blotting and ELISA. These techniques and the experience you obtain during these practicals will be valuable to those interested in immunology, clinical research, drug discovery and proteomics.

### **Immunology: Assessment of Antibody response by ELISA and detection of Proteins by Western Blotting (Dr. Martina Schroeder)**

The immune system responds to proteins on infectious organisms and in vaccines, by mounting cellular and humoral immune responses to foreign *antigens*. Antigens are simply short amino acid sequences that are recognized as foreign, or non-self, in the host organism. B cells produce antibodies that can bind to almost any antigen and these can be detected in serum or mucosal secretions of immune individuals. The immunoglobulin molecules (antibodies) in the serum can be detected by a variety of techniques, including enzyme-linked immunoassay (ELISA). The ELISA is based on the principle that the protein antigen binds to plastic on the wells of an assay plate and when the serum is added the antibodies specific for that antigen will selectively bind to the antigen (other antibodies in the serum specific for other antigens will not bind and can be washed away). The bound antibody can be detected by using a second antibody raised against the immunoglobulin of the species from which the serum was obtained (e.g. anti-mouse IgG) coupled to an enzyme, which converts a colourless substrate to a coloured product, which can be detected by measurement of absorbance.

The ability of antibodies to bind to other proteins, coupled with the ability of the immune system to generate endless antibody variants all with their own antigenic specificity, make antibodies the perfect tools with which to identify almost any protein. These characteristics are taken advantage of in Western blotting where antibodies raised against a specific protein (e.g. a HIV protein) can be used to detect the presence of this protein in a complex protein mixture that may contain thousands of other proteins. Western blotting is a technique where complex mixtures of proteins that have been separated by electrophoresis and blotted onto a solid support (e.g. PVDF, nitrocellulose) are probed for the presence of the protein of interest using an antibody raised against that protein. The bound antibody is subsequently detected by a method similar to that described for the ELISA procedure above.

### **Mammalian Cell Culture (Dr. Andrew Hogan)**

Cells that previously grew in humans or animals (*in vivo*) can be modified to grow (culture) in glass or plastic vessels in the laboratory (*in vitro*). Cultured mammalian cells are used widely and extensively as an alternative to using animals in research. Whole animals are highly complex and contain many different cell types with diverse and interacting activities. Cell cultures (for example lung epithelial cells, skin cells, bone cells etc.) reduce this complexity and enable more specific questions to be addressed in a simplified context. In addition, cell culture reduces the numbers of animals required to address scientific questions.

Specific growth conditions must be maintained to keep the cells alive outside the body and a number of special skills are required to preserve the structure, function, behavior and biology of the cells. The conditions and skills include using specialised growth media, storing the cells at 37°C and importantly, using ‘aseptic’ technique to prevent microbial contamination and death of the cultures which lack the immune defense system present in the full organism. This course describes the basic skills required to maintain and preserve cell cultures: aseptic technique, medium characteristics, passaging, freezing and storage, recovering frozen stocks, and counting viable cells. Students will then use these skills to carry out experiments to study factors that affect the growth and structure of lung cells.

### **Comparative Genomics of Pathogenic Bacteria (Dr. David Fitzpatrick)**

Genomics is defined as the study of an organism’s complete genome sequence. The first complete genome to be sequenced was the bacterium *Haemophilus influenzae* in 1995 at a cost of millions of dollars. Today more than 1,300 bacterial genomes have been sequenced. With the advent of next generation sequencing technologies the costs of sequencing a bacterial genome are decreasing rapidly and it is now possible to sequence a complete bacterial genome for approximately two thousand dollars. This practical will examine next generation sequence techniques and use computational approaches to assemble a bacterial genome from the raw sequence reads. Once we have an assembly, we will computationally locate genes and perform a partial annotation by comparing them to a database of genes with known functions. When annotated we can determine if our bacterial genome contains any genes normally associated with disease. Finally, we will use comparative genomics to compare the genomic sequence of a pathogenic bacterium to a non-pathogenic bacterium in an attempt to determine putative virulence factors.

### **Cleanroom Technology (Dr. Shirley O’Dea, Prof. Kevin Kavanagh)**

‘Cleanroom’ describes a controlled environment where pollutants like aerosol, airborne bacteria, and dust are present only in very small amounts. A broad range of clinical and industrial sectors such as (bio)pharmaceutical, food, cosmetics, hospitals and research facilities use cleanrooms at certain stages of their processes when their products must be protected from contamination. Cleanrooms require both technological (equipment and infrastructure) and operational (work practices) measures in order to limit the presence of contaminating particles and micro-organisms. In this Advanced Practical, students will be introduced to cleanroom concepts and technologies and will learn processes such as gowning, aseptic cell culture techniques and environmental monitoring. Familiarity with cleanroom processes is highly desirable for a range of graduate positions in industry, research and clinical sectors.

## **BI426 Professional Modules Detailed Descriptions:**

### **SEMESTER 1**

#### **Business Risk Management (Dr Shirley O’Dea)**

To ensure the success of a business, or indeed any project, venture or endeavor, proper planning is essential and risk management forms a crucial part of this planning. A risk assessment is fundamental to any organizational risk management program and is a methodology used to identify, assess, and prioritise organizational risk. A risk assessment allows you to get a clear picture of where your strengths lie and what potential threats to your success might exist. You can then assess the likelihood and impact of those threats and so prevent them from actually happening. In this module we will learn how to perform a risk assessment and practice examples that will demonstrate the value in planning for success in any project or business. The skills obtained will be advantageous for any student following a business management or leadership career path.

### **Scientific Communication and Public Engagement (*Dr Grace Hoysted*)**

Scientific communication and public engagement involve intentional interactions that foster mutual learning between scientists and the public. Effective engagement allows both scientists and the public to discuss the benefits and risks of scientific advancements, leading to a better understanding and addressing of questions and concerns. Despite the clear benefits, many scientists face barriers to public engagement, such as time constraints and concerns about diverting focus from their research. This module aims to equip final-year biology undergraduates with the skills to effectively communicate scientific information and research findings to diverse audience, with a strong emphasis on public and lay communication. By the end of this module, students will be able to articulate the importance of communicating science to non-specialist audiences and describe various approaches for conveying complex scientific information. Students will also be able to explain the impact of information and misinformation on the public, governments, and policymakers. The module will include a series of lectures and a workshop, providing both theoretical knowledge and hands-on experience to enable the student to communicate their own research to a public audience in an accessible and engaging manner.

### **End User Computing (*Azeema Yaseen, Dept. Computer Science*)**

This professional module helps students gain logical thinking skills and use a programming language. Students will learn ways to represent their work over the internet, which would be beneficial in developing e-portfolios to showcase their learning. *Week 1:* Introduction to python would focus on developing an idea about programming skills and working on a biological dataset for simple analysis and graphical plots. *Week 2:* Website development using CSS and HTML coding would enable students to create live webpages and portfolios of their works or research on the internet.

### **Public Health & Emergency Planning (*Prof Bernard Mahon*)**

Despite decades of pandemic preparedness, the Covid-19 pandemic took private businesses of all scales and major public functions (eg schools, social welfare etc) by surprise and revealed a lack of expertise and capacity to respond. Designed for final year biology and biomed students, this course focuses on professional skills to allow a Maynooth graduate to meet future challenges facing business or public sector institution to help crisis and response planning. We will:

- Cover the basics of public health planning and preparedness.
- Work in small groups to prepare simulated “Response plans” for local businesses in response to different threats.
- Present and critique plans in class, before team submission.

Assessment will be “group marked” with an element of peer marking for individuals by their team.

## **SEMESTER 2**

### **Data Visualisation and Interpretation (*Dr Eoin McNamee*)**

Global industries such as the pharmaceutical and biotechnology sectors rely on information to function. Information, in a readable format requires interpreting huge volumes of data and the communication of that material to global networks with diverse fields. The biopharmaceutical industry relies on visualization tools not only for the clear and comprehensive representation of data but also for exploration leading to new insights and drug discovery. From R&D to Venture capital investment, regulatory affairs to competitor analysis and marketing; how information is managed, analyzed and visually presented is a critical skill. Taking examples from the drug development industry, this course will consider how interpretation of early experimental data is processed to generate usable biologic information that can inform decision making. We will discuss these processes in the context of early clinical trials and the progress of new drugs through regulatory procedures and to market.

### **Peer-review and Scientific Communication (*Dr. Ozgur Bayram*)**

Scientists publish the outcomes of their research findings at the end of a certain period. Publication is often a tedious and difficult process that requires writing and submitting a manuscript to a journal for peer-review. Once published, these research papers are also discussed by the public and experts in the field in various forms using social media,

newspapers, websites and blogs. This module will focus on peer-review process and scientific communication of the researchers. On peer-review side, preparation of the manuscripts, presentation of the key data, selecting an appropriate journal, submission process, evaluation process of the manuscript and correspondence of the researcher with the journal will be analysed and discussed in the first part of the course. The public rely on mass media, in all its forms, for information and appreciation of science to drive innovation and sustainable development and underpin continuing progress in health and social welfare. In turn, the scientific community, in all its various manifestations, relies on 'public trust' in science, in particular in its integrity, credibility, and expertise, to maintain their enterprise. In the second part of the course, scientific communication will be discussed with examples. An introduction to basic skills necessary for effective science communication and public engagement will be given. At the end of this course, students will be able to distinguish these two interconnected processes and discuss the common and different sides of them and able to communicate in a peer review and scientific communication process.

### **Patenting Evaluation and Licensing of Biological Products (*Prof. Sean Doyle, Dr. Andrew Hogan*)**

Following discovery of a new biological product or process in the laboratory, the first step to commercialization is to establish intellectual property rights by submitting a patent application. This involves a thorough search of existing patents in the area and close scrutiny of submitted material, including supporting experimental data, by national and international patent agencies. Once a patent has been issued the next step is to seek an industrial partner or raise the finance to scale up production and begin the process of evaluation prior to licensure. The transition of a biological product (e.g. vaccine or blood product) from laboratory to the market place requires evaluation in humans in clinical trials and approval by regulatory authorities. Biological products are evaluated in a sequence of clinical trials, which provide increasingly stringent tests on safety and efficacy. Successful completion of three phases of clinical trials is normally required prior to licensure, after which further observational studies are undertaken to monitor performance in the field. The World Health Organization (WHO) establishes minimal requirement for biological products, which form the basis for assuring acceptability of products globally. In general, they specify the need for appropriate starting materials, including seed pools; strict adherence to established protocols; tests for purity, potency, and safety at specific steps during production; and the keeping of proper records. These requirements provide guidelines for those responsible for production and control procedures and national regulatory Authorities, such as the Federal Drug Administration (FDA) in the US or the Irish Medicines Board usually adopt them. Each product has to be approved by the local regulatory authority prior to marketing in that country.

## Capstone Group 2 BI428 Laboratory Project

If you select, and are allocated to BI428, you will undertake a **6-week** independent laboratory research project in either Semester 1 or Semester 2. Students complete a research project under the guidance of a supervisor. Students may be provided with a reading list but are expected to perform a literature search to familiarize themselves with the topic assigned. Over the period of the project students must become competent in the techniques and equipment relevant to the project. The module is assessed based on student performance in the lab (20%), a 12-minute oral presentation of research findings (20%), and on thesis write-up (60%).

### Descriptions of BI428 Laboratory Projects 2024/25

Supervisor & laboratory	Project Title and Description	Possible Timing (blank if flexible)
Butler, Marion (Cell Signalling Lab.)	<p><b>Mechanistic understanding of SHP2 regulation of TLR3-interferon signalling.</b></p> <p>"SHP2 is a cytoplasmic protein tyrosine phosphatase that has been shown to have a negative regulatory role in the TLR3 and RIG-I-interferon-<math>\beta</math> signalling pathway. More recently, a positive role for SHP2 in the TLR7-NF-<math>\kappa</math>B pathway was reported, with increased SHP2 levels found in immune cells from psoriatic patients contributing to the pro-inflammatory disease state. We have generated research tools for SHP2 including SHP2-deficient macrophage cell lines. This project will examine the type I interferon signalling pathways downstream of the TLR3. The SHP2-IRF7 axis has not been examined in these TLR signalling pathways to date which is the focus of this project.</p> <p>Reference: Zhu et al (2022). EMBO Mol Med. Allosteric inhibition of SHP2 uncovers aberrant TLR7 trafficking in aggravating psoriasis. "</p>	Sem 2
	<p><b>Targeting proteins of interest in Ovarian cancer.</b></p> <p>Ovarian cancer (OvCa) is the 4th most common female cancer in Ireland and accounts for 270 women losing their lives from this disease each year. Ireland has the lowest 5-year survival rate (2010-2014) for ovarian cancer (36%), when compared to 7 other high-income countries. High-grade serous ovarian cancer (HGSOC) accounts for approximately 70% of epithelial ovarian cancers. This project will focus on HGSOC and will involve examining the role of a protein of interest in this cancer type. The work will involve cellular assays to assess the impact of inhibitors of this protein of interest on the growth of ovarian cancer cells. This work will involve cell culture work, cell viability assays and colony formation assays.</p>	Sem 2
Carolan, Jim (Applied Proteomics Lab.)	<p><b>Investigating pesticide resistance mechanisms in aphids</b></p> <p>One of the most alarming consequences of chemical insecticide use in agriculture is the emergence of pesticide resistant insects. This resistance may relate to changes in the insecticide target (neuronal receptors/channels) or altered forms or expression of detoxification enzymes. This project will investigate the molecular basis of pyrethroid resistance in the English grain aphid <i>Sitobion avenae</i>, a persistent pest of cereal crops worldwide. Mass spectrometry data will be analysed from susceptible and resistant biotypes that were exposed to field relevant doses of pyrethroid.</p>	
	<p><b>A Bioinformatic characterisation of the Aphid Salivary proteome</b></p> <p>Aphids (greenfly) represent a serious economic pest to our crops and each year billions of euros are lost due to aphid feeding. Aphids feed from the phloem of their plant host and have evolved very intricate mechanisms to evade and counteract the plant immune system. Central to their success are</p>	

	<p>the salivary proteins that it secretes into its host plant. However very little is known about these proteins and their diversity across different aphid species. This project aims to characterise the salivary proteins derived from a recently produced mass spectrometry-based dataset for the pea aphid <i>Acyrtosiphon pisum</i>. Many of these proteins have never been associated with aphid saliva and their function in terms of the plant-aphid interaction is completely unknown. Using bioinformatic techniques you will characterise and classify these proteins and produce hypotheses on their potential functions.</p>	
Devaney, John (Forest Ecology & Global Change Lab.)	<p><b>The role of diversity in mediating responses of trees to climate warming.</b> Increasing tree diversity in planted forests can enhance ecosystem services and improve climate resilience. Understanding interactions between diversity and climate change will aid the design of climate-smart forests. This project will examine plant responses to climate warming. Using mesocosm experiments in environmental growth rooms, the project will measure morphological and physiological traits of oak seedlings growing in monocultures and mixtures under control and increased temperatures. The results of the experiment will help inform how resilient monocultures and mixtures are to a warming climate.</p>	Sem 1
	<p><b>Reconstructing vegetation history in ancient woodlands using pollen</b> In Ireland, ancient woodlands are defined as areas that have been continuously wooded since at least the 17th century. These remnant ancient woodlands are now a rare and fragmented feature of a once heavily forested landscape. Despite their substantial environmental and cultural significance, major gaps in our understanding of their distribution and conservation status remain. This project will use palaeoecological approaches to determine the vegetation history of selected sites to determine woodland age. Using soil cores collected at woodland sites around Ireland, soil samples will be prepared, and microscopy will be used to determine the species and abundance of pollen at different depth profiles in soil cores. This information can be used to reconstruct the vegetation history of sites over the past 500 years.</p>	Sem 1
	<p><b>Can handheld smart devices be used to quantify chlorophyll in plants?</b> Measuring leaf chlorophyll content is one of the most commonly used diagnostic tools to measure plant health. Measuring chlorophyll in plants is typically carried out using time consuming spectrophotometry. Increasingly, Relative Chlorophyll Content (SPAD) is broadly used as indicator of plant health, by measuring the relative transmissions of red (650 nm) and infrared (940 nm) light in handheld devices. Recent low-cost devices that connect to smartphones offer quick and easy measurements of Relative Chlorophyll Content, however their accuracy remains unclear. Using plants grown under controlled conditions, this project will compare Relative Chlorophyll Content using a SPAD meter to chlorophyll content measured in the lab using spectrophotometry. The results of this project will help determine the most accurate and cost-effective methods for determining plant health.</p>	Sem 2
Dowling, Paul (Clinical Proteomics Lab.)	<p><b>Identification of Molecular Mechanisms Associated with Extramedullary Disease in Myeloma: Focus on Damage-associated molecular patterns (DAMPs)</b> Multiple myeloma (MM) is a debilitating malignancy that is part of a spectrum of diseases ranging from monoclonal gammopathy of unknown significance (MGUS) to plasma cell leukaemia. On a worldwide scale, it is estimated that about 86,000 incident cases occur annually, accounting for about 0.8% of all new cancer cases. Although MM remains incurable, several drug therapies are</p>	Sem 1

	<p>valuable in the treatment of patients with MM. Over the past two decades, novel therapeutics options including Proteasome inhibitors (PI) and Immunomodulatory drugs (IMiDs) are changing the treatment paradigm in MM and improving overall survival. Extramedullary multiple myeloma (EMM) is an aggressive subentity of multiple myeloma, characterized by the ability of a subclone to thrive and grow independent of the bone marrow microenvironment, resulting in a high-risk state associated with increased proliferation, evasion of apoptosis and treatment resistance. This project will focus on the characterisation of abnormal protein pathways in extramedullary multiple myeloma.</p>	
	<p><b>Identification of Deregulated Phosphorylation-Based Signaling Pathways in Multiple Myeloma Cells: Opportunities for Therapeutic intervention</b></p> <p>Multiple myeloma is a rare type of cancer that affects bone marrow and alters your blood's plasma cells. This project will focus on using protein abundance data to identify abnormal phosphorylation levels associated with drug sensitivity/resistance in clinical samples from multiple myeloma patients. Since the inception of phosphoproteomics, research has focused on changes to the phosphoproteome during disease progression. Phosphoproteins could be markers useful as diagnostics and also be therapeutic targets. It is predicted that up to 30% of all proteins may be phosphorylated, some multiple times. Phosphoproteins from highly sensitive (Group I), sensitive (Group II), resistant (Group III) or highly resistant (Group IV) patient plasma cell samples will be investigated using proteomics platforms to identify abnormal signalling pathways associated with drug sensitivity.</p>	Sem 2
Doyle, Sean (Molecular Biotechnology Lab.)	<p><b>Recombinant monoclonal antibody characterization.</b></p> <p>We have recently expressed a recombinant monoclonal antibody which reacts with its target antigen on Western blot. This indicates that the antibody recognizes a linear epitope on the target protein antigen. Using a coupled enzymatic digestion/LC-MS strategy this project aims to define the nature of the epitope recognized by the recombinant monoclonal antibody. In addition, we hope to generate sub-fragments of the antibody and characterize their interaction with the antigen. Techniques: SDS-PAGE, protein assays, enzyme digestion for epitope excision/extraction strategies, LC-MS, antibody digestion and characterization.</p>	Sem 1
	<p><b>Optimisation of fungal metabolite purification by Flash Chromatography.</b></p> <p>We have found that metal ion presence can prevent the biosynthesis of certain fungal metabolites associated with virulence. In this project we hope to exploit this observation by defining how metabolite production can be optimized in the absence of metal ions, along with developing a facile chromatographic method for metabolite purification. We also wish to deploy specific commercial culture media to investigate if it also supports the biosynthesis of valuable fungal metabolites. Techniques: Fungal culture, RP-HPLC, TLC, Flash chromatography, quantitative analytical methods.</p>	Sem 2
Graciet, Emmanuelle (Plant Biochemistry Lab.)	<p><b>Identifying new growth inhibitors of the plant pathogenic fungus Sclerotinia sclerotiorum (project only for students taking double honours Biology/Chemistry)</b></p> <p>The fungus Sclerotinia sclerotiorum is a broad-host necrotrophic fungus capable of infecting several crops of economic importance, such as oilseed rape, causing severe crop losses. Agriculture relies on the application of multiple fungicides on crops to limit the spread of infection, with negative effects on the environment</p>	Sem 2

	<p>and on human health. In addition, in the EU, the range of fungicides that can be applied to crops is decreasing, so that new methods to control plant fungal pathogens are needed. This project is a follow-up on a semester 1 project in the group of Dr. Trinidad Velasco-Torrijos, during which the student will synthesize new sugar-based molecules with potential anti-fungal activity on <i>Sclerotinia sclerotiorum</i>. In this Biology project, the same student will test the anti-fungal activity of these sugar-based molecules on <i>S. sclerotiorum</i>. The student will learn microbiology and aseptic techniques. If time permits, the activity of these new molecules will be tested in plants as well as on synthetic media.</p>	
Lopez, Lorna (Human Genomics Lab.)	<p><b>Genetic Contributions to Autism: Implications for Sleep and Circadian Rhythms in The Adolescent Brain Cognitive Development (ABCD) Study</b></p> <p>"Sleep-related phenotypes such as insomnia, are highly prevalent in neurodevelopmental conditions including autism. Insomnia occurs more often in individuals with autism than in the general population, and these patients are more likely to have an evening, rather than a morning, chronotype. Genetic factors contribute to autism, with approximately 90% of phenotypic variation attributable to genetic factors. While many sleep-related phenotypes, such as insomnia and chronotype, are also heritable, their genetic contribution is somewhat lower. Genome-wide association studies (GWAS) have uncovered common genetic variants linked to autism and sleep-related phenotypes. These findings indicate a polygenic nature for these traits, with significant genetic correlations reported between autism and sleep-related phenotypes. This study aims to investigate how genetic risk for autism contributes to sleep and circadian rhythm disruptions in the Adolescent Brain Cognitive Development (ABCD) "</p>	Sem 2
	<p><b>Genetic Contributions to ADHD: Implications for Sleep and Circadian Rhythms in The Adolescent Brain Cognitive Development (ABCD) Study</b></p> <p>" Sleep-related phenotypes such as insomnia, are highly prevalent in neurodevelopmental conditions including attention deficit hyperactivity disorder (ADHD). Insomnia occurs more often in individuals with ADHD than in the general population, and these patients are more likely to have an evening, rather than a morning, chronotype. Genetic factors contribute to ADHD, with approximately 90% of phenotypic variation attributable to genetic factors. While many sleep-related phenotypes, such as insomnia and chronotype, are also heritable, their genetic contribution is somewhat lower. Genome-wide association studies (GWAS) have uncovered common genetic variants linked to ADHD and sleep-related phenotypes. These findings indicate a polygenic nature for these traits, with significant genetic correlations reported between ADHD and sleep-related phenotypes. This study aims to investigate how genetic risk for ADHD contributes to sleep and circadian rhythm disruptions in the Adolescent Brain Cognitive Development (ABCD) study"</p>	Sem 2
McNamee, Eoin (Mucosal Immunology Lab.)	<p><b>PACT in the Macrophage inflammatory response</b></p> <p>PACT proteins regulate gene silencing by integrating into the RNA-induced silencing complex (RISC). This complex is critical for controlling how non-coding RNA called microRNA's regulates mRNA stability. In doing so, these conserved protein complexes play a major role in controlling protein output of all cells, but their impact on the immune response is not fully defined. This project will use drug interventions and molecular biology techniques to selectively block PACT function and define the impact on macrophage inflammatory responses. These studies have implications for our understanding of how gene silencing control innate inflammatory processes</p>	Sem 1



	and inflammatory diseases. Potential techniques covered by this project include in vitro cell culture, ELISA, western immunoblot, transient transfection-gene silencing or immunoprecipitation.	
	<p><b>Endoplasmic reticular stress in controlling macrophage inflammatory response</b></p> <p>Macrophage are a critical immune cell that acts as sentinels in our tissues, patrolling for infection or damage. However, their over-activation leads to a variety of inflammatory diseases and aberrant responses to infections. The ER-stress signaling pathway is a master regulator stress sensing withing immune cells and has the capacity to control the inflammatory protein circuits that a macrophage produces. Using gene silencing and drug intervention studies in vitro, this project will assess the role of IRE1a and PERK pathways in controlling the response of macrophage to defined inflammatory stimuli and shape macrophage function. Potential techniques covered by this project include in vitro cell culture, ELISA, western immunoblot, RNA degradation/deadenylation assays or RNA stability assays.</p>	Sem 1
	<p><b>Interferon signaling in Intestinal epithelial stem cells.</b></p> <p>How the immune cells of the inflamed intestine control epithelial stem cells is a critical for understanding tissue regeneration (in the context of inflammatory bowel diseases, Crohn’s disease and Ulcerative colitis. This project will utilise intestinal “mini guts” organoids to understand how interferon cytokines impact stem cell compartment and regeneration capacity. Potential techniques covered by this project include in vitro cell culture, Immunopathology and immunohistochemistry.</p>	Sem 1
Miggin, Sinead (Immune Signalling Lab.)	<p><b>Exploring the anti-inflammatory properties of honey</b></p> <p>Toll-like receptors (TLRs) are generating intense interest amongst immunologists because of their clear role in the initiation of innate immunity during infection and their participation in inflammatory diseases. Activation of TLR signalling elicits the activation of MyD88 dependent and independent signalling cascades and production of inflammatory mediators. Studies have reported that honey has an anti-inflammatory properties, however, the work is not exhaustive. The project aims to explore the ability of honey to modulate the inflammatory response in vitro. To this end, immune responsive cells will be exposed to the various types of honey and the inflammatory response will be measured. The student will acquire expertise in RNA isolation, RT-PCR, agarose gel electrophoresis and gene expression analysis/interpretation.</p>	Sem 1
	<p><b>Exploring the anti-inflammatory properties of green-tea</b></p> <p>Green tea is purported to have strong anti-inflammatory properties due to the presence of polyphenols. The projects aims to explore the ability of green tea to modulate inflammatory cytokine production following activation of Toll-like receptors. To this end, immune responsive cells will be exposed to green tea in conjunction with Toll-like receptor ligands and mRNA levels of inflammatory and anti-inflammatory cytokines will be measured. The student will acquire expertise in RNA isolation, RT-PCR, agarose gel electrophoresis and gene expression analysis/interpretation.</p>	Sem 1
Nugent, Jackie (Plant Molecular Biology Lab.)	<p><b>Investigating salt stress reponses in Arabidopsis cybrid lines</b></p> <p>Plants continually adjust how they grow and develop in response to environmental signals. Recent studies suggest that cytoplasmic organelles (mitochondria and plastids) act as important environmental sensors capable of perceiving stressful environmental conditions and triggering genetic and physiological responses that ultimately regulate the balance between plant growth and plant protection/defense. To study the contribution of organellar</p>	Sem 1

	<p>variation to plant stress responses we generated a panel of Arabidopsis cybrid lines - plant lines with the nucleus of one accession and the cytoplasm from another accession. The aim of this project is to assess stress-responses in parental and cybrid lines using phenotypic and molecular analyses. Project students will gain experience and competence in a range of lab techniques/skills including good experimental design, microscopy, plant handling, DNA extraction, PCR, data handling, statistics and data analysis and presentation.</p>	
	<p><b>Investigating salt stress responses in Arabidopsis cybrid lines</b> Plants continually adjust how they grow and develop in response to environmental signals. Recent studies suggest that cytoplasmic organelles (mitochondria and plastids) act as important environmental sensors capable of perceiving stressful environmental conditions and triggering genetic and physiological responses that ultimately regulate the balance between plant growth and plant protection/defense. To study the contribution of organellar variation to plant stress responses we generated a panel of Arabidopsis cybrid lines - plant lines with the nucleus of one accession and the cytoplasm from another accession. The aim of this project is to assess stress-responses in parental and cybrid lines using phenotypic and molecular analyses. Project students will gain experience and competence in a range of lab techniques/skills including good experimental design, microscopy, plant handling, DNA extraction, PCR, data handling, statistics and data analysis and presentation.</p>	Sem 2
O'Maoileidigh Diarmuid (Plant Evolution & Genetics Lab.)	<p><b>Identification of cis regulatory elements driving GLK2 expression</b> Photosynthesis is essential for life on Earth. Transcription factors (TFs) regulate the expression of photosynthesis associated nuclear genes (PhANGs) but how the spatial and temporal expression of those TFs is controlled is unclear. The GOLDEN-2-LIKE (GLK) genes are present in all land plants and are key regulators of PhANGs. In Arabidopsis, there are two paralogs of GLK, GLK1, and GLK2. The glk2 mutant is unique as it is the only mutant that has pale siliques whereas the glk1 mutant resembles wild-type. To understand which cis regulatory elements control GLK2 expression, glk1 glk2 double mutant plants have been transformed with different vectors that lack different cis regulatory elements. The project will focus on segregation analysis of these transgenic plants, selecting new transgenic plants, and verifying the presence of the correct genotypes using PCR.</p>	
	<p><b>Disruption of stomatal development specifically on siliques</b> Photosynthesis is essential for life on Earth. Photosynthesis that occurs in the leaf has received most attention as it is essential for plant growth and development. However, photosynthesis in the silique (or fruit) provides nutrients specifically for the developing seeds within the silique. Stomata (epidermal pores) mediate gas exchange between the plant and its environment and are used to uptake carbon dioxide for photosynthesis and in turn they release oxygen and water vapour. To understand more about the role of stomata during silique photosynthesis, we have transformed plants that express an artificial microRNA that targets genes that are essential for stomatal development specifically in the pistils. The project will involve selection of these transformants, genotyping them with PCR, assessing their stomatal phenotypes, and analysing expression of the targeted genes by RT-PCR.</p>	

	<p><b>Disruption of stomatal development specifically on siliques</b>  Photosynthesis is essential for life on Earth. Photosynthesis that occurs in the leaf has received most attention as it is essential for plant growth and development. However, photosynthesis in the silique (or fruit) provides nutrients specifically for the developing seeds within the silique. Stomata (epidermal pores) mediate gas exchange between the plant and its environment and are used to uptake carbon dioxide for photosynthesis and in turn they release oxygen and water vapour. To understand more about the role of stomata during silique photosynthesis, we have transformed plants that express EPIDERMAL PROMOTING FACTOR 1 (EPF1), which represses stomatal development, specifically in the pistils. The project will involve selection of these transformants, genotyping them with PCR, assessing their stomatal phenotypes, and analysing expression of EPF1 by PCR.</p>	
	<p><b>Identification of cis regulatory elements driving GLK2 expression</b>  Photosynthesis is essential for life on Earth. Transcription factors (TFs) regulate the expression of photosynthesis associated nuclear genes (PhANGs) but how the spatial and temporal expression of those TFs is controlled is unclear. The GOLDEN-2-LIKE (GLK) genes are present in all land plants and are key regulators of PhANGs. In Arabidopsis, there are two paralogs of GLK, GLK1, and GLK2. The glk2 mutant is unique as it is the only mutant that has pale siliques whereas the glk1 mutant resembles wild-type. To understand which cis regulatory elements control GLK2 expression, glk1 glk2 double mutant plants have been transformed with different vectors that lack different cis regulatory elements. The project will focus on segregation analysis of these transgenic plants, selecting new transgenic plants, and verifying the presence of the correct genotypes using PCR.</p>	
<p>Owens, Rebecca  (Chemical Microbiology Lab.)</p>	<p><b>Conjugation of antimicrobial resistance</b>  Protein from plants represents an alternative, sustainable source of an essential dietary requirement, providing an alternative to animal-based protein. These protein isolates have potential additional benefits aside from just nutrition and this research project will aim to determine what bioactive properties these materials have (faba bean). This will include antimicrobial testing to see if they can control the growth of pathogenic bacteria/fungi, and determining if there are any components that would reduce the nutritional value of these protein isolates (antinutritional factors). This project will involve antimicrobial susceptibility testing, protein purification and characterisation, mass spectrometry-based analysis and enzyme assays, with all training in these highly transferrable laboratory skills provided during the project.</p>	<p>Sem 1</p>
	<p><b>Exploring bioactivity in sustainable plant-based protein sources (lupin)</b>  Protein from plants represents an alternative, sustainable source of an essential dietary requirement, providing an alternative to animal-based protein. These protein isolates have potential additional benefits aside from just nutrition and this research project will aim to determine what bioactive properties these materials have (lupin). This will include antimicrobial testing to see if they can control the growth of pathogenic bacteria/fungi, and determining if there are any components that would reduce the nutritional value of these protein isolates (antinutritional factors). This project will involve antimicrobial susceptibility testing, protein purification and characterisation, mass spectrometry-based analysis and enzyme assays, with all training in these highly transferrable laboratory skills provided during the project.</p>	<p>Sem 1</p>

<p>Robinson, Mark (Chronic Disease Immunology)</p>	<p><b>Pathway analysis of transcriptomics datasets from patients with decompensated liver disease and elevated PAMPs/DAMPs</b> Chronic liver disease is associated with the development of immune dysregulation and systemic inflammation. It is thought that elevated levels of pathogen-associated molecular patterns (PAMP) and danger-associated molecular patterns (DAMP), drive this systemic inflammation. This data project will analyse high-throughput transcriptomic RNA sequencing datasets to assess statistical differences in inflammatory pathway activation between liver disease patients who have elevated PAMPs/DAMPs and those that have normal levels.</p>	<p>Sem 1</p>
	<p><b>Expression profiling of glycosyltransferases in activated human natural killer (NK) cells</b> N-glycosylation is a common chemical post-translational modification observed in human cells, where polysaccharide chains are sequentially added onto asparagine residues of polypeptide chains. This addition is regulated by the cellular expression of glycosyltransferase enzymes. This lab project aims to quantify the changes in glycosyltransferases in expanded human natural killer (NK) cells upon activation using quantitative PCR.</p>	<p>Sem 2</p>
<p>Schroeder, Martina (Host-Pathogen Interaction Lab.)</p>	<p><b>Identifying functional differences between DDX3X isoforms 1 and 3: eIF4e binding</b> Dysregulation of the human DDX3X gene is linked to disease, including cancer, neurological conditions, and viral infections. However, it appears that it can have paradoxical outcomes with oncogenic and tumour suppressor, as well as pro- and anti-viral functions having been described for DDX3X. Our lab has recently started to explore alternative splicing of DDX3X, because we are wondering whether some of the observed paradoxical effects could be caused by expression of different DDX3X isoforms. Isoform 3 caught our eye because it lacks a putative interaction site for the translation initiation factor eIF4e, and should therefore be impaired in its ability to regulate translation initiation. In this project, the student will use two different methods (His-pulldowns and co-immunoprecipitations) to compare the interaction of DDX3X Isoform 3 and the conventional Isoform 1 with eIF4e. Apart from these two methods, the student will also learn how to express and purify recombinant DDX3X protein, carry out mammalian tissue culture and transfect cells with plasmids, SDS-PAGE and Western Blotting. We are particularly interested in applications from students who may wish to do a PhD next year.</p>	<p>Sem 1</p>
	<p><b>Identifying functional differences between DDX3X isoforms 1 and 3: cap binding</b> Dysregulation of the human DDX3X gene is linked to disease, including cancer, neurological conditions, and viral infections. However, it appears that it can have paradoxical outcomes with oncogenic and tumour suppressor, as well as pro- and anti-viral functions having been described for DDX3X. Our lab has recently started to explore alternative splicing of DDX3X, because we are wondering whether some of the observed paradoxical effects could be caused by expression of different DDX3X isoforms. Isoform 3 caught our eye because it lacks a putative interaction site for the cap-binding translation initiation factor eIF4e, and should therefore be impaired in its ability to regulate translation initiation. In this project, the student will test whether DDX3X can bind to the 5'methylguanosine cap of mammalian messenger RNAs and whether this interaction is dependent on eIF4e. The student will then determine whether DDX3X isoform 3 lacks the ability to interact with mRNA</p>	<p>Sem 2</p>

	cap structures. During the project, the student will learn how to express and purify recombinant DDX3X protein, carry out pulldown assays, and carry out SDS-PAGE and Western Blotting. If the project is successful, there is potential for co-authorship on a scientific publication, and we are particularly interested in applications from students who may wish to do a PhD next year.	
Walsh, Fiona (Antimicrobial Resistance and Microbiome Research Lab.)	<b>Phenotypic killing of Gram-negative bacteria</b> The ability of a range of beta-lactams to inhibit the growth of Escherichia coli and Klebsiella pneumoniae will be analysed using phenotypic methods including disk testing and kill curves.	Sem 1
	<b>Phenotypic killing of Gram positive bacteria</b> The ability of a range of antimicrobials to inhibit the growth of Enterococcus faecium and Staphylococcus aureus will be analysed using phenotypic methods including disk testing and kill curves.	Sem 2
	<b>Antimicrobial resistance phenotyping</b> The antimicrobial susceptibility profiles of bacteria isolated from soil will be analysed using disk tests.	Sem 2
	<b>Protein analysis of bacteria</b> The data from the mass spec analysis of proteins extracted from bacteria will be analysed and assigned to metabolic pathways.	Sem 2

## Descriptions of Lecture Modules Available 2024/2025

(SEE [Course Finder](#) FOR FULL MODULE DESCRIPTIONS)

You must register (and successfully complete) sufficient lecture modules to achieve 60 credits.

*FAILURE TO ATTEND AND ENGAGE IN THE CONTINUAL ASSESSMENT COMPONENT OF A MODULE WILL HAVE A SIGNIFICANT EFFECT ON YOUR FINAL MODULE GRADE, AND MAY BE COMMENTED ON IN STUDENT REFERENCES*

### BI403 Plant Biotechnology

In the first half of the course, the commercial use of tissue culture methods for rapid clonal population of crop plants is followed by a consideration of the potential for producing valuable chemicals in cell cultures, and the potential for mutation breeding at the cell level. The remainder of the course looks at the procedures for genetic transformation of crops, examines the relative merits of nuclear vs. plastid transformation, and reviews the progress in relation to a range of traits including herbicide, pest, stress and disease resistance, improved nutritional and storage quality of foods, and the production of valuable pharmaceuticals.

The different methods for transforming crop plants are explained, including infection with modified pathogens such as *Agrobacterium tumefaciens*, and direct DNA delivery methods such as particle bombardment (the “gene gun”), and chemically or electrically induced uptake into protoplasts. The importance of regulation of gene activity, and stability of the transgene are considered, alongside ethical and safety concerns about exploiting the technology. Particular traits, which can be tackled by this approach, are evaluated as a number of case histories. Foremost among these are those which have already led to a marketed product, e.g. tomatoes with a long storage life, cotton resistant to boll weevil, and herbicide resistant soybean. Several other characters are under development in this rapidly moving field, and new case histories will be introduced every year. [BI403](#)

### BI405 Advanced Immunology

This module will provide the students with a detailed understanding of the immune system, including the signalling pathways and effector molecules that mediate immune effector functions. Topics covered include: Innate Immunity, Pattern recognition receptor signalling, the Major Histocompatibility complex, antigen processing and –presentation, T and B cell activation, Immune effector mechanisms, Cell migration and Inflammation, Transplantation immunology, the

immune response to viruses and viral immune evasion. **Assessment:** Total marks 100%. 70% for two hour written examination at the end of the semester, **30% continuous assessment: Moodle based assessment 10%; MCQ 20%.**

**Pass standard:** 40% overall with minimum 30% in written exam and 40% in continuous assessment. [BI405](#)

### **BI406 Behavioural Ecology**

This module will enable students to develop an understanding of the adaptive value of behaviours to animals and how these behaviours evolve. Specific topics covered include the altered behaviour of parasitised animals (parasite manipulation and alternative explanations), optimal foraging (how animals make decisions about what food to eat and where to look for it) and a range of topics associated with reproductive behaviour (sexual selection, sperm competition, partitioning of reproductive effort between mating and parenting, mating systems, and sexual conflict). The overall objective is to understand how behavioural strategies contribute to animals' fitness. [BI406](#)

### **BI407 Tumour Biology**

The course is lecture based with prescribed additional reading and self-directed private study. The course examines the question "What is Cancer?" To answer this, the following topics are explored: Control of the Cell division cycle; Cyclins and cyclin dependent kinases; Oncogenes, Tumour suppressor genes; DNA and RNA tumour viruses; Familial cancers; a detailed study of the role of the Rb gene; P53 as the guardian of the genome; Cell death; Positive and negative induction of apoptosis; the execution phase of apoptosis; beyond the molecular biology of cancer; how the body resists neoplasia; tumour progression; Angiogenesis, how diagnosis is made; the major therapeutic interventions (existing therapies and new therapies). **Assessment:** Total marks 100%. 75% for two hour written examination at the end of the semester, **25% continuous assessment:** Moodle based assessments (5%), 1 MCQ 20%

**Pass standard:** 40% overall [BI407](#)

### **BI410 Plant Developmental Biology**

The course is lecture based with prescribed additional reading and recommendations for self-directed study. Topics may vary from year to year but typically include: meristems and their importance for plant development, how meristem architecture is established and maintained; changes in meristem identity; how flower pattern is established. An evolutionary approach to aspects of plant development is emphasized as much as possible.

On successful completion of the module, students should be able to:

- Discuss current views on the molecular and genetic factors that regulate aspects of plant development e.g. meristem architecture, meristem identity, flower development.
- Explain how developmental models established for model species can contribute to our understanding of how plant diversity has been generated.
- Evaluate recent primary literature relevant to enhancing their understanding of this subject.
- Take personal responsibility for their learning.

**Assessment:** Total marks 100%: 100% for two hour written examination at the end of the semester.

**Pass standard:** 40% overall. [BI410](#)

### **BI411 Bioethics & Biotechnology**

Module Content: How ethicists work; basic Western ethical ideas including classical and preference utilitarianism, Kant and deontological theory, rights approaches, virtue ethics, feminist thought, the void; application to issues in biology, biotechnology, medicine and environment. Current cases histories with stakeholder analyses: these may include genetic engineering, cloning, patenting of biological material. Detailed knowledge of relevant biotechnological science will form a central part of the bioethics component of this module. Fungi are amazing reservoirs of bioactive molecules, such as penicillin and statins, which are used to treat human diseases. Collectively, these molecules are known as natural products (NP) or secondary metabolites (SM) and are made by fungi, and bacteria, using processes known as non-ribosomal peptide synthesis or polyketide synthesis. This course will provide the student with a thorough understanding of these biosynthetic processes at the molecular and proteomic level. This topic is of special relevance as many microbial genome

mining programmes are identifying ever more genes involved in NP biosynthesis. Consequently, research in this area is beginning to reveal a range of new molecules with biomedical potential. [BI411](#)

### **BI435 Molecular Ecology & Biogeography**

This module considers the broad topic of natural history in a global context. Section 1 begins with a general recap on the principles of DNA variation, and how this understanding influences our reading of observed patterns of genetic variation in natural populations. We also consider the utility and application of molecular markers to understand inheritance, natural selection and genetic divergence using standard population genetics techniques. To support the development of our understanding, we consider a wide range of field examples, including case studies of gene-flow in the wild, including animal and wind-based dispersal patterns and gene flow between crops and wild plants. We also apply this knowledge to consider Conservation genetics of endangered mammals. In section 2, we review the theory of Plate-tectonics and the inferred dynamics of past climate cycles and glaciations. We then consider historical biogeography in the broad sense, and the tracing of historical migrations using nuclear, mitochondrial and chloroplast DNA markers; with special emphasis on the postglacial colonization of Europe by animals and plants and the biogeographic impact of continent collisions, illustrated by case studies of recent invasions in Europe and Tropical Central America and Southeast Asia. In each case we review evidence for dispersal waves, hybridization zones and extinction events. [BI435](#)

### **BI436 Medical Mycology**

Fungal pathogens are a major cause of superficial and systemic disease in immunocompromised (e.g. HIV+ patients) and immunodeficient (e.g. transplant recipients) patients and may contribute to over 4% of hospital-based deaths. The diagnosis and treatment of fungal infections can be difficult and there is a limited range of effective anti-fungal agents currently in use. This module will examine the molecular and cellular mechanisms employed by fungal pathogens to colonise and disseminate within the host, and to evade the immune response. Specific sections will examine the biology of the yeast *Candida albicans* and its ability to colonise mucosal surfaces. The role of toxins in the pathogenesis of *Aspergillus fumigatus*, a pulmonary pathogen, will be discussed. The emergence of 'new' fungal pathogens will be studied and the factors that have led to their emergence will be characterized. Other areas to be studied include means of diagnosing fungal infections, treatment options, mode of action of antifungal agents, and the immune response to fungal infection. [BI436](#)

### **BI437 Neuromuscular Biology**

This advanced module focuses on the molecular and cellular mechanisms of normal skeletal muscle functions, as well as the molecular pathogenesis of selected neuromuscular disorders. Specific sections will be concerned with the biochemistry, physiology, cell biology and ultrastructure of skeletal muscle fibres, focusing on the molecular mechanisms underlying development, differentiation, fibre transitions and metabolic adaptations to changed functional demands. The diagnosis of muscle diseases and pathobiochemical aspects of major neuromuscular pathologies will be examined, including a discussion of disorders related to myasthenia gravis, myotonia, motor neuron disease, malignant hyperthermia, x-linked inherited muscular dystrophy, disuse atrophy and sarcopenia of old age. Cell biological and biochemical research tools in the study of the molecular pathogenesis of genetic, autoimmune and pharmacogenetic muscle disorders are described. The potential sites for genetic and cell biological interventions at different stages of the neuromuscular disease process will be discussed. [BI437](#)

### **BI439 Antibiotics: Discovery, Modes of Action & Resistance**

The series of lectures would start with a short introduction into how the antibiotics that we use today were discovered and developed over the past century. This would incorporate the discovery of the first antibiotics all the way to the use of screening genomes for the 'next big thing', to explaining that most pharmaceutical companies have abandoned their R & D in this area. The next section would introduce the students to the different classes of antibiotics, how they differ and how they interact with the bacteria to inhibit their growth or kill them. This section would also give a brief introduction to the pharmacodynamics and pharmacokinetics that are necessary for the antibiotic to function in the body. The following lectures would be a discussion of the different mechanisms of resistance and emerging resistance problems and

epidemics of resistance currently of concern. The techniques used to measure antibiotic susceptibility or resistance in hospital laboratories and the molecular methods that we can now use would be described to highlight how a combination of phenotypic and molecular tools can aid the understanding of resistance. There will also be a section on the origins of antibiotic resistance and how resistance mechanisms may have entered into the human food chain or other possible routes of transmission to human pathogens and the importance of human waste in the propagation of resistance in the water supply and environment. The module would encompass human, agricultural and environmental antibiotic use and resistance to discuss the problem from a One Health perspective.

**Lecture content** (two lectures for each topic):

1. Antibiotic history and discovery from 20<sup>th</sup> to 21<sup>st</sup> century.
2. Antibiotic classes, mode of action and bacterial inhibition or killing.
3. Pharmacokinetics and pharmacodynamics of antibiotics.
4. Mechanisms of antibiotic resistance.
5. Emerging antibiotic resistance problems and epidemics worldwide.
6. Measuring antibiotic resistance in a hospital laboratory.
7. Molecular methods used to detect the emergence and spread of resistance.
8. Origins and transfer of antibiotic resistance prior to the pathogen.

[BI439](#)

#### **BI440 Control of Protein Activity**

Proteins are fundamental cellular components that regulate practically all processes in the cell. The control of their activity and abundance is essential for their physiological function and therefore needs to be tightly regulated. This course focuses on the cellular mechanisms leading to the control of protein activity and abundance and describes how changes in protein function affect biological processes (e.g. transcription, developmental programs, immunity...). Topics covered include: basic notions of protein structure; changes in protein activity through protein-protein interactions; control of protein activity by ligand binding; regulation of protein activity and localization by different types of covalent modifications; role of signaling cascades involving kinases; control of protein stability by the ubiquitin/proteasome system. These topics will be introduced and illustrated using examples from a wide range of research areas, as well as from different organisms such as bacteria, yeast, plants and animals. [BI440](#)

#### **BI441 Fungal & Bacterial Secondary Metabolism**

Fungal and bacterial secondary metabolites have great potential due to their potent physiological influences on cellular functions such as antibiotics, antivirals, antifungals, anti-apoptotics, cytotoxics, immunosuppressives, and deadly mycotoxins. Therefore, they are extremely important for medical, biotechnological and chemical applications. The focus of this advanced module is the fungal and bacterial secondary metabolites and the control of their production by genetic and epigenetic factors. Specific sections found in this module will be connected with chemical biology, genetics, epigenetics and fungal molecular biology. The major classes of microbial natural products and their biosynthetic pathways will be introduced. Potential impact of the bioactive metabolites in biotechnology, medicine and chemical biology will be discussed in depth. The term “gene clusters” will be introduced by analogy to prokaryotic operons. Control of gene clusters in fungi at the chromatin and epigenetic level will be examined by examples of histone modifications. Cellular signaling elements (MAPK, PKA, PKC) regulating the biosynthesis of fungal secondary metabolites will be analyzed. [BI441](#)

#### **BI443 Clinical Proteomics: Discovery, Validation & Medical Utility.**

This advanced module focuses on the field of clinical proteomics, which can be divided into the analysis of body fluids and tissues. Soluble biomarkers will be discussed, which are found in biofluids including blood, urine and saliva, are considered indicator biomolecules that assist in detecting diseased conditions at an early stage, make discrimination between different diseases, and are useful for monitoring progression and response to specific therapeutic strategies. Established clinical biomarkers such as carcinoembryonic antigen (CEA) will be discussed, and problems associated with their



diagnostic utilities will be addressed. Expression of tissue-based proteins (up-regulation or down-regulation) in various pathological conditions will be explored with emphasis on metabolic and signalling pathways as potential therapeutic targets for treatment of disease. The relationship between biomarkers and therapeutic targets will be examined and the role of companion diagnostics in this area assessed. Underpinning clinical proteomics are the recent developments in quantitative mass-spectrometry, array-based high-throughput protein microarrays and novel fractionation technologies, which will be examined in detail. The role of other "omic" methodologies that are complementary and synergistic to clinical proteomics will be reviewed, specifically looking at metabolomics as an example.

**Assessment:** Total marks 100%; 80% for two hour written examination at the end of the semester; Continual Assessment 20% (made up of 2 MCQ's – 10% each, the first MCQ in the middle of the lecture series and the second MCQ at the end).

### [BI443](#)

#### **BI444 Human Nutrition and Metabolic Disease**

*Module Objective: To expose students to biochemical and cellular aspects of human nutrition and metabolic disease.* This advanced module focuses on the molecular and cellular mechanisms of human metabolism, as well as the pathogenesis of selected metabolic disorders. Specific sections will be concerned with:

- The major macro and micro nutrients, and the bodies physiological response to their intake,
- The biochemical and cellular regulators of food intake and bodyweight,
- The diagnosis of metabolic disease and pathobiochemical aspects of major metabolic disease will be examined, including Obesity and Type 2 Diabetes Mellitus (T2DM).

The current therapeutic strategies for treating metabolic diseases including lifestyle modification, GLP-1 analogues and bariatric surgery. Discussing the impact each has on the biochemistry and physiology of food intake and the cellular regulators of metabolism. Learning Outcomes:

1. Outline the major macronutrients and micronutrients.
2. Discuss the factors which regulate food intake and bodyweight.
3. Discuss the cellular players involved in the regulation of bodyweight.
4. Identify the main diagnostic methods of detecting metabolic diseases in humans.
5. Define major aspects of metabolic diseases including obesity and T2DM.
6. Define the major strategies for treating metabolic diseases in humans.

Examine the mode of action of defined interventions including molecular and cellular aspects. [BI444](#)

**Capstone group 3 (BI448) Prior Research Project.** Available to pre-approved students only.

**Capstone group 4 (BI447) is not an available option for double major students.**

### **When should I email a lecturer about a module?**

This communication guideline tells you tells you:

- how your lecturers and module coordinators will communicate with the class
  - how your lecturers and module coordinators will communicate with individual students
  - how students can best communicate with lecturing staff and with each other
1. General guidelines
    - you should indicate your name and student number in any e-mail you send to a lecturer.
    - you should always check that your question(s) has/have not already been answered in documents posted on Moodle and Teams, or in a previous e-mail or module announcement.
    - regarding general questions on module content, seek to find module information on Course Finder first.
    - unless an emergency, contact lecturers and module coordinators during normal working hours.

- members of staff will do their best to answer new queries within 48h (working days). Allow 48h for a reply before contacting the same person or a different staff member in relation to the same query. If your query has already been answered in a previous e-mail or post, your reply will be of a low priority and take longer.

## 2. Class announcements by lecturers and module coordinators

Class announcements can be done using three platforms:

- e-mails to the class. We will always use your MU e-mail address.
- and/or lecturers' announcements on a specific module's Moodle page
- and/or using the chat function in a specific module page on Teams

Class announcements can be used by your lecturers to send reminders, but also to answer queries received by e-mail from individual students, if the query is relevant to the whole class. In this case, you may not receive an individual reply to your original e-mail. It is your responsibility to check e-mails regularly, Moodle and Teams as well. We encourage you to turn on automatic notifications. A lecturer or module coordinator may not prioritize replying to your e-mail if the answer is already available to the class. Read the class material first!

## 3. Lecturing staff communication with individual students

If a query received by e-mail does not affect the whole class, lecturing staff will do their best to answer to the student individually in a timely manner (e.g. within a couple of days). While we are happy to help you study and provide an environment that promotes learning, some queries are not acceptable and cannot be answered.

## 4. What queries are NOT acceptable?

- asking for answers or corrections to previous exam questions. This query is not acceptable, because it is your work that is assessed and so your submissions need to reflect your own writing, ideas, and thoughts.
- asking for details of calculation, answers or corrections for lab-write ups or theses before these are handed in. This query is not acceptable, because it is your work that needs to be assessed. Practical-related questions should be asked to demonstrators or lecturers during the lab sessions (in teaching labs or on Teams). Technical and project queries can be resolved in meetings with your project supervisor.
- demonstrators should not be asked to provide details of calculations or to pre-correct your lab write ups at any time. All questions to demonstrators should be asked during the lab sessions (online or in teaching labs).
- asking for slides or lecture notes of a module that you are not registered for.

## 5. Communication among students in a class

Students in a class can use multiple 'official' platforms to communicate among themselves. We encourage these because they foster group work and mutual help. Posts and communications on different platforms (Moodle, Teams, e-mails) should be linked to the course/module, courteous and respectful. Note that these platforms are accessible to the whole class, including lecturers.

Platforms available:

- Class discussion forum on a specific module's page on Moodle Or
- Teams chat on a specific module's Teams group.

Communications to lecturers that do not include your name, student number (and preferably subject code) risk being missed and unanswered. Communications in the days immediately prior to deadlines and exams should be specific and brief. Answers are likewise likely to be very brief during these periods.

## DEPARTMENT OF BIOLOGY STAFF RESEARCH INTERESTS

Name & Qualifications	Key Words	Research Interests
Dr O. Bayram, MSc PhD	Secondary metabolism, Fungal foods, Mycotoxins, Fungal development, Cell signalling, Epigenetics, Environmental remediation	<a href="https://www.maynoothuniversity.ie/biology/our-people/ozgur-bayram#2">https://www.maynoothuniversity.ie/biology/our-people/ozgur-bayram#2</a>
Dr M.P. Butler BSc PhD	Ovarian Cancer, Mechanistic insight into diseases, Toll-like Receptor Signalling, sex differences in immune responses.	<a href="https://www.maynoothuniversity.ie/biology/our-people/marion-butler#2">https://www.maynoothuniversity.ie/biology/our-people/marion-butler#2</a>
Dr J.C. Carolan B.A. (Mod) PhD	Proteomics, Mass Spectrometry, Genomics, Molecular Biology, Sustainable Agriculture, Aphids, Bumblebees, Crop-pest Interactions, Pesticides	<a href="https://www.maynoothuniversity.ie/biology/our-people/james-carolan#2">https://www.maynoothuniversity.ie/biology/our-people/james-carolan#2</a>
Dr J. Devaney BSc PhD	Ecology, Forest Ecology, Climate Change, Biodiversity-Ecosystem Function, Invasive species	<a href="https://www.maynoothuniversity.ie/biology/our-people/john-devaney#2">https://www.maynoothuniversity.ie/biology/our-people/john-devaney#2</a>
Dr. T. Dirilgen BSc PhD	Ecology, Biodiversity (aboveground and belowground), Soil-Plant-Pollinator interactions, Soil biology and ecology, Sustainability	<a href="https://www.maynoothuniversity.ie/people/tara-dirilgen">https://www.maynoothuniversity.ie/people/tara-dirilgen</a>
Dr P. Dowling BSc PhD	Oncoproteomics, Biomarkers, Detection, Biofluids, Mass Spectrometry	<a href="https://www.maynoothuniversity.ie/biology/our-people/paul-dowling#3">https://www.maynoothuniversity.ie/biology/our-people/paul-dowling#3</a>
Professor S. Doyle BSc PhD	Disease diagnosis, Antimicrobial resistance, <i>Aspergillus fumigatus</i> , protein mass spectrometry, proteomics, nonribosomal peptide synthesis, Disease diagnosis, immunoassays and enzymology.	<a href="https://www.maynoothuniversity.ie/biology/our-people/sean-doyle#2">https://www.maynoothuniversity.ie/biology/our-people/sean-doyle#2</a>
Professor K. English MSc PhD	Cellular therapy, mesenchymal stem cells, immune modulation, pre-clinical models of inflammatory disease, organ transplantation, acute respiratory distress syndrome, asthma, gene therapy, muscular dystrophy	<a href="https://www.maynoothuniversity.ie/biology/our-people/karen-english#2">https://www.maynoothuniversity.ie/biology/our-people/karen-english#2</a>
Dr D.A. Fitzpatrick BSc PhD	Computational Biology, Bioinformatics, Genome Evolution, Phylogenomics, Comparative genomics, Genomics, Transcriptomics, Proteomics, Genome sequencing, Fungi, oomycetes.	<a href="https://www.maynoothuniversity.ie/biology/our-people/david-fitzpatrick#2">https://www.maynoothuniversity.ie/biology/our-people/david-fitzpatrick#2</a>
Dr E. Graciet MSc PhD	Protein degradation, biochemistry, plant molecular biology, plant-pathogen interactions, abiotic stresses, crop improvement	<a href="https://www.maynoothuniversity.ie/biology/our-people/emmanuelle-graciet#2">https://www.maynoothuniversity.ie/biology/our-people/emmanuelle-graciet#2</a>
Dr A. Hogan BSc PhD	Immunology, obesity, cancer, metabolism, immunometabolism, immunotherapy	<a href="https://www.maynoothuniversity.ie/biology/our-people/andrew-hogan#2">https://www.maynoothuniversity.ie/biology/our-people/andrew-hogan#2</a>
Dr. G. Hoysted BSc PhD	Fungal Ecology, Microbial Ecology, Mycorrhizal fungi, Plants, Bacteria, Above-below ground interactions, Plant-insect interactions, Sustainability	<a href="https://www.maynoothuniversity.ie/people/gracie-hoysted">https://www.maynoothuniversity.ie/people/gracie-hoysted</a>
Professor K.A. Kavanagh BSc PhD	<i>Aspergillus</i> , <i>Candida</i> , Fungi, Metal-cell interactions, Innate immunology, Insects, Proteomics	<a href="https://www.maynoothuniversity.ie/biology/our-people/kevin-kavanagh#3">https://www.maynoothuniversity.ie/biology/our-people/kevin-kavanagh#3</a>
Dr L.M. Lopez BA PhD	Genomics, Human Health, Circadian Rhythms, Sleep, Neurodevelopmental Conditions.	<a href="https://www.maynoothuniversity.ie/biology/our-people/lorna-lopez#2">https://www.maynoothuniversity.ie/biology/our-people/lorna-lopez#2</a>

Dr A.M. Maher BSc PhD	Entomopathogenic nematode, microbes, symbiosis, biodiversity	<a href="https://www.maynoothuniversity.ie/biology/our-people/abigail-maher#2">https://www.maynoothuniversity.ie/biology/our-people/abigail-maher#2</a>
Professor B.P. Mahon BSc PhD	Cell Biology, Immunology, microbiome/immune interaction	<a href="https://www.maynoothuniversity.ie/biology/our-people/bernard-mahon#2">https://www.maynoothuniversity.ie/biology/our-people/bernard-mahon#2</a>
Dr J. Masterson BSc PhD	Allergy, Inflammation, Epithelial Cell Biology, Stem Cells, Fibrosis, Mucosal Barrier, Cellular Metabolism	<a href="https://www.maynoothuniversity.ie/biology/our-people/joanne-masterson#2">https://www.maynoothuniversity.ie/biology/our-people/joanne-masterson#2</a>
Dr E. McNamee BSc MSc PhD	Autoimmunity, Mucosal Immunology, Translational Immunology, Chemokines, microRNAs	<a href="https://www.maynoothuniversity.ie/biology/our-people/eoin-mcnamee#2">https://www.maynoothuniversity.ie/biology/our-people/eoin-mcnamee#2</a>
Dr C. Meade BSc PhD	Plant & Soil Ecology; Molecular Ecology; Phylogeography, Biogeography & Population Genetics; Sustainability	<a href="https://www.maynoothuniversity.ie/biology/our-people/conor-meade#1">https://www.maynoothuniversity.ie/biology/our-people/conor-meade#1</a>
Dr S. Miggin MSc PhD	Innate immunity, toll-like receptors, inflammation, Type-2-Diabetes, bovine reproduction	<a href="https://www.maynoothuniversity.ie/biology/our-people/sinead-miggin#2">https://www.maynoothuniversity.ie/biology/our-people/sinead-miggin#2</a>
Dr D. Movia MSc PhD	In vitro alternatives to animal models, non-animal preclinical research, new approach methodologies, lung cancer, respiratory research, nanomedicine	<a href="https://www.maynoothuniversity.ie/faculty-science-engineering/our-people/dania-movia">https://www.maynoothuniversity.ie/faculty-science-engineering/our-people/dania-movia</a>
Professor P. Moynagh B.A. (Mod) PhD	Molecular Immunology, Inflammation, Inflammatory Diseases, Signal Transduction,	<a href="https://www.maynoothuniversity.ie/biology/our-people/paul-moynagh#3">https://www.maynoothuniversity.ie/biology/our-people/paul-moynagh#3</a>
Dr J.M. Nugent MSc PhD	Plant molecular biology, evolution and development	<a href="https://www.maynoothuniversity.ie/biology/our-people/jackie-nugent#3">https://www.maynoothuniversity.ie/biology/our-people/jackie-nugent#3</a>
Dr S. O’Dea BSc PhD	Cell therapy, cell engineering, cancer research	<a href="#">Shirley O’Dea   Maynooth University</a>
Dr D. O’Maoileidigh BSc PhD	Plant development, flower development, fruit development, photosynthesis, transcription factors, genomics	<a href="https://www.maynoothuniversity.ie/people/diarmaid-omaoileidigh">https://www.maynoothuniversity.ie/people/diarmaid-omaoileidigh</a>
Professor K. Ohlendieck DipBiol PhD DSc	Skeletal muscle biology, protein biochemistry, proteomics, biomarker discovery	<a href="https://www.maynoothuniversity.ie/biology/our-people/kay-ohlendieck#3">https://www.maynoothuniversity.ie/biology/our-people/kay-ohlendieck#3</a>
Dr N. Curran BSc PhD	Plant Biology	<a href="https://www.maynoothuniversity.ie/people/noreen-curran">https://www.maynoothuniversity.ie/people/noreen-curran</a>
Dr R. Owens BSc PhD	Pathogenic fungi, secondary metabolites, proteomics, antimicrobial agents, food proteins	<a href="https://www.maynoothuniversity.ie/biology/our-people/rebecca-owens#3">https://www.maynoothuniversity.ie/biology/our-people/rebecca-owens#3</a>
Dr M. Robinson BBioMedSc PhD	Cytotoxic natural killer cells, liver disease and cirrhosis, chronic inflammation, glycosylation of lymphoid immune cells	<a href="https://www.maynoothuniversity.ie/biology/our-people/mark-robinson#2">https://www.maynoothuniversity.ie/biology/our-people/mark-robinson#2</a>
Dr M. Schroeder BSc PhD	Host-Pathogen interactions, Pattern recognition receptor signaling, Regulation of gene expression, RNA Biology	<a href="https://www.maynoothuniversity.ie/biology/our-people/martina-schroeder#2">https://www.maynoothuniversity.ie/biology/our-people/martina-schroeder#2</a>
Professor F. Walsh BSc PhD	Antibiotic resistance, microbiomes, infectious diseases, bacteriology, metagenomics	<a href="https://www.maynoothuniversity.ie/biology/our-people/fiona-walsh#2">https://www.maynoothuniversity.ie/biology/our-people/fiona-walsh#2</a>

## GUIDELINES FOR UNDERGRADUATE DISSERTATION/CAPSTONE PROJECT MODULES

### The ORAL Component.

For all Capstone projects you have to make a 12-minute, in-person, presentation, with an additional 5 minutes allowed for questions. Oral presentation is a **compulsory** part of your degree and necessary to show that you have developed communication and presentation skills for complex topics, as well as to verify your understanding. **It cannot be delivered on TEAMS or remotely.** If you are hospitalized, or have a registered disability (with the University disability office), and consider that this might hamper your oral presentation, then please inform your supervisor at the **start of your project** who can discuss reasonable accommodations to help you. If you are not registered with the disability office, or have other issues, please engage in early communication with your supervisor who can direct you to supports available. All students are expected to meet the established assessment criteria and fulfil the required academic work and this includes the in-person oral presentation. If something goes wrong on the day or you are nervous, don't worry your supervisor has experience and clear guidelines to help you complete it successfully.

The audience for your oral will include the supervisor, one other member of staff, other fourth-year project students and possibly other research workers (postgraduate and postdoctoral fellows) from the relevant laboratory. You are required to e-mail your presentation (usually in PowerPoint form) to your supervisor at least one day before your talk. Your supervisor will prepare your presentation for the computer projector. If you have any questions about how to deliver your talk, please contact your project supervisor, alternatively more information on improving your oral presentation skills can be found online<sup>12</sup>. If your presentation is too large to e-mail as an attachment, please send it via HEA filesender: <https://www.heanet.ie/services/hosting/filesender>

### Assessment Criteria for 4<sup>th</sup> year Oral presentations

Your lecturers use the criteria below to grade your oral work using the scale described on page 46. As stated earlier, your oral **demonstration of understanding and higher order thinking skills** (ability to synthesise material, analyse data and evaluate meanings) are what is being assessed. So, prepare well with these in mind.

Skill/ Competence demonstrated in oral presentation	
Relevance of material/content presented orally (facts, examples, published work)	15%
Demonstration of understanding material. (synthesis, analysis, evaluation)	20%
Organisation of material (logic, coherence, structure)	15%
Timekeeping	10%
Quality of presentation	10%
Clarity of presentation	10%
Questions	20%

### The Written Components

All capstone projects have at least one significant written component for assessment. A key learning objective for undergraduate thesis modules at the MU Biology Department is that you develop a sense of ownership and responsibility for your dissertations/projects. In supervisor-student relationships during the preparation of theses, responsibility is two-way. You will have expectations in terms of support and advice from the supervisor, and a supervisor will have expectations regarding independent research by you, time-keeping, regularity of work and reporting, etc. In the end, it is your dissertation/project, you are expected to take full responsibility for researching, writing and editing your own work.

*Note: The following guidelines relate to staff-student interactions in preparation of all written theses. Additional specific guidelines for Literature and Laboratory projects, respectively, are provided below.*

<sup>1</sup> Hartigan L & Higgins M. How to prepare and deliver an effective oral presentation *BMJ* 2014; 348 doi: <https://doi.org/10.1136/bmj.g2039>

<sup>2</sup> Bourne PE. Ten simple rules for making good oral presentations. *PLoS Comput Biol* 2007;3:e77

## WRITING A 4<sup>TH</sup> YEAR DISSERTATION/THESIS: ESSENTIAL INFORMATION FOR ALL WRITTEN WORK

### Your Responsibilities

The goal of the dissertation/thesis is to show you have developed higher order thinking in synthesizing, analysing and evaluating complex scientific material. You have to demonstrate the skills that you have developed over your previous years of study. It is essential that what you write is your own work and not a copy of someone else's work (plagiarism) or work written by someone else (essay mills) or by artificial intelligence (eg ChatGPT). To assist with this task, we provide you with several important aids:

(i) a central writing webpage ([Thesis Online Resources](#), accessible on the [All Biology Students 2025](#) Moodle page) where you will find multiple online resources to assist with completing your dissertation, including the many services offered by MU;

(ii) an online self-assessment tool 'Turnitin' (see below); and

(iii) a clear guide to what is, and is not, acceptable in terms of originality: *the Maynooth University Department of Biology Plagiarism policy* (see below).

Please familiarise yourself with all of the above and remember - it is mandatory to follow the guidelines for turnitin and plagiarism. You must not use any AI or LLM tool (e.g. Grammarly, ChatGPT etc) to prepare your thesis.

### Thesis Preparation.

For the BI424 literature project 10% of your final mark is awarded for your demonstration of progression and development over the duration of the project. Details below.

### Literature Searching.

Use the [Thesis Online Resources](#) for more guidance on how to search for peer-reviewed material or scientific information search engines. You must exercise caution when using or citing material that is not peer-reviewed as it can be subjective and biased. You should note that scientific articles are often presented as follows: Abstract, Introduction, Materials & Methods, Results and Discussion References. Some search engines will only give access to abstracts and you may then have to get the entire article either from the library (paper or internet access to journals) or by inter-library loan. You should deposit the complete reference pdf in your TEAMS folder.

You will be given further direction on accessing literature by your project supervisor and in the talks on Moodle in a series of library videos **on Accessing Information**. The material presented above is for quick reference only.

### Assessment Criteria

Your lecturers use the criteria below to grade your oral work using the scale described on page 46. These measure how well you have built on your writing skills developed in earlier years. For final year work the emphasis shifts from writing process/skills (25%) which you have developed in years 1-3, towards critical engagement/higher order thinking/ understanding (75%)

Skill/Competence demonstrated in written material
<b>Writing Process Skills/Composition (25%)</b>
<b>Writing Process</b> (Structure/format as per guidelines, composition -spelling, grammar, use of passive voice) 10%
<b>Writing Skills</b> (abstract) 5%
<b>Writing Skills</b> (referencing & citation) . (appropriate in text citation, correctly formatted bibliography, source material acknowledged) 10%
<b>Critical engagement &amp; demonstration of understanding /higher order thinking (75%)</b>
<b>Understanding/ Use of evidence.</b> (Breadth of survey/Adequacy of introduction, active comparison source material) 15%
<b>Understanding/ Use of evidence</b> including hypotheses/research directions or trends in the current literature. 10%
<b>Analysis/ Relevance</b> (including analysis of experimental approaches & methodologies) 10%
<b>Analysis/Relevance</b> (evaluation and relation to findings in field) 15%
<b>Narrative structure &amp; evidence of personal input</b> Clarity/cohesiveness of Conclusions & Discussion; Logic and structure of narrative, evaluation of findings) (25%)

## Essay Preparation and Submission – the *Turnitin* facility

As you will know from BI305 in third year, all Biology dissertations at Maynooth University must be submitted to the online *Turnitin* Facility on moodle.

Please note

1. The onus is on you to validate your work using *Turnitin*.
2. You should submit your completed work only once you have checked it on *Turnitin* and are satisfied that your written work is truly your own and not a copy of something else
3. Submitted dissertations or theses that are deemed to contain copying/ plagiarism or to have features of AI (eg ChatGPT) use will be dealt with according to the departmental policies on plagiarism and academic integrity (see page 36-38)

### How to use *Turnitin* on Moodle - Recap

There are two steps to using *Turnitin* on Moodle. Once you have signed up for your Literature Review/ Laboratory Project Module, you will be able to access the *Turnitin* portal via the appropriate module page on Moodle. *Turnitin self-check* will be available on your dissertation module Moodle page throughout semester. In addition, each student also has an independent self-check facility supported on their personal moodle interface. Both facilities perform the same function. *Turnitin final submission*, available only on your dissertation moodle page, will be available from two weeks before the final submission date.

#### Step 1. During essay preparation – use *Turnitin self-check*

Submit your draft essay to *Turnitin self-check* to get an originality report and revise as appropriate.

#### Step 2. When your essay is complete - use *Turnitin final submission* before the submission deadline

The final originality report (and an AI detection report) for this submitted copy will only be available to your essay supervisor.

### Submission of your Thesis

You are required to submit your thesis as an online document only. Your thesis must follow the text and composition guidelines for your specific essay module (see detailed description of the 4th year dissertation module relevant to you, below). We have introduced a new **2024/25 Dissertation Cover Page**, which is available to download on your moodle dissertation page. This must be inserted as page 1 in your final (.doc or .pdf) dissertation submission document.

For *Turnitin self-check* you should **only** upload, as a single (.doc or .pdf) document:

1. Abstract
2. Main Body text, including subtitles/ sections, figures, tables, legends and in-text citations. For Research Projects, this section includes materials and methods, results & discussion (see below)

For *Turnitin Final Submission* you should **only** upload, as a single (.doc or .pdf) document:

1. 2024/25 Dissertation Cover Page
2. Abstract and Essay Title
3. Table of Contents (if included)
4. Main Body text, including:
  - a. Section and subsection titles (Literature Projects)
  - b. Materials and methods, results & discussion (Research Projects, see below)
  - c. All figures & legends
  - d. All tables & legends
  - e. All in-text citations
  - f. Full Bibliography
  - g. Appendices

At all times during the preparation of your dissertation you can access 'Turnitin Help for Students' on moodle at [Moodle Help for Students](#).

For **Turnitin problems**, you can contact Moodle Support for further assistance at [moodlesupport@mu.ie](mailto:moodlesupport@mu.ie)

## SPECIFIC GUIDELINES FOR BI424 LITERATURE PROJECT

The literature project prepares you to discover scientific literature, synthesise, analyse data and to use data to make decisions and recommendations. Your aim is to research literature in an area and discuss the topic under consideration, including reference to opposing views on the subject where appropriate. Your supervisor will allocate you to a broad topic, but you must refine this into a specific focus typically as a question. The thesis should not be simply a reproduction of information from review articles or book chapters, but should include your interpretation of the subject, organised to develop the reader's understanding as you think appropriate and written with authority, by one who understands the evidence and issues. The thesis should be broken into sections which should have a *General Introduction*, *Discussion* (should be broken into subsections with appropriate subheadings for sections dealing with different topics), *Conclusions* and *References*. The Conclusions should draw together the discussion points made during the discussion. At the end of the assignment, you should understand your topic fully and be capable of presenting the findings and defending your conclusions at a seminar/oral on your thesis topic. Additional advice material for academic writing can be found at [Academic Writing Support](#) and at [Starting the Process - Academic Writing - LibGuides at National University of Ireland, Maynooth](#).

### BI424 Thesis preparation and development (10%)

After your initial discussion with your supervisor, you will be assigned a unique secure folder on TEAMS. **You will be assessed on the contents of this folder (10% project mark)** and should demonstrate steady progress throughout the course of the module. In this folder you must keep:

- A pdf copy of every source paper you cite in your thesis/dissertation. Thus you will accumulate a library of papers to be used in your thesis. A steady accumulation of papers that correspond to your bibliography will be marked highly, whereas a last minute deposition will be marked down. Fake references or references cited in your work but not present in your folder will be penalised.
- Drafts of your thesis every 2 weeks (time stamped). This creates a digital paper trail that can be used as evidence against your use of AI. Again demonstrating steady progress will be marked highly, whereas a last minute deposition of a finished thesis will be marked down.

**THE LITERATURE PROJECT IS NOT TO EXCEED 3,000 WORDS.** The dissertation **word count** includes the main body text of the thesis, comprising headings, text and in-text citations/ references. Not included in the word count is the abstract (which has its own separate word limit of 200 words), table of contents, table legends and table text, figure legends, bibliography/ reference list, and appendices.

**Quotations.** In general, use direct quotations only where the wording matters to your case, and always credit the author e.g. "Rowan (1932) described the elytra 'in all cases strongly grooved and colourful' but later work (Dods, 1946; Frish, 1983) suggests that the grooving is quite variable and in some cases the elytra are more dull than Rowan thought". It is not acceptable to transcribe large tracts of text from reviews or journal articles. Write your literature survey in your own words.

**Reference Material.** Familiarize yourself with the background literature relating to the project. As suggested above, go to the Dissertation [Thesis Online Resources](#) where you will find multiple resources to help with your initial literature review, as well as training options within MU regarding critical skills in *researching the scientific literature*, *writing*, and *referencing/citation*. You should discuss the outcome of your literature review with your supervisor approximately 3 weeks after beginning the project. Your supervisor may provide you with additional resources if you have been unable to access them. Deposit pdf of every paper you cite in the TEAMS folder assigned to you by your supervisor.

**Referencing.** It must be possible to identify the source of all material which is not your own. The MU Biology Department uses the [Harvard referencing style](#), and all dissertations **must** be written in this format. All references should be given fully, and in alphabetical order, in the reference list at the end of the literature survey.

**Typing.** Always use a spell-checker. Recommended font is Times New Roman (size 12). Thesis should be double-spaced.



**Diagrams.** Should be created by you. Where based on published illustrations/data these should be re-drawn by you to demonstrate the point you wish to make. The legend should contain a credit e.g. "Re-drawn from Adams (1989)", and of course Adams will appear in the reference list at the end. If, for instance, your point concerns a few chemical groupings on a large molecule, you might consider using lines to pick out all or part of the overall shape of the molecule and draw in more fully the few groups that are essential to your discourse. State in the legend any software used to create the diagram (eg Biorender)

**Material beyond your competence.** Where your presentation carries you into e.g. advanced mathematics or chemistry that you cannot reasonably be expected to master; deal only with the conclusions as set out by the author.

**Complex original ideas.** Some topics allow you to develop ideas of your own. You may like to discuss them with your Supervisor before incorporating them in your essay.

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**When submitting your literature project** you will be required to sign a declaration on the **2024 Dissertation Cover Page** stating that you have read and understand the department's Policy on Plagiarism, and that your project is your own work. Please see the sample Cover Page will be available for you to download from your dissertation moodle page. This must be downloaded, signed and placed as page 1 of your final submission dissertation.

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### **Advice on AI /software tools to assist your writing.**

You **must not** use AI or large language models in any way to assist your thesis/dissertation. The department currently uses sophisticated tools to detect this. Use of AI or material that has features typical of AI will be subject to additional verification assessment by the academic integrity committee as detailed below. You are not allowed to use paraphrasing or summarising tools such as (but not limited to) Grammarly. You are also strongly advised not to use *MyBib* for citation/bibliography construction. Instead use the software provided free to students by the University such as Endnote, Mendeley etc. Use the skills you have developed in earlier years and advice from your supervisor.

#### **You are recommended to use**

- PubMed or other reputable portals to find primary literature
- Endnote, Mendeley or the citation manager embedded in MS Word to manage and format your references. Free versions are available to all MU students (<https://nuim.libguides.com/ReferenceManagementSoftware/Overview> ) and you should have learned to use these in your third year courses (eg BI305). Avoid MyBib as a reference tool.
- BioRender may be used to create diagrams or other similar software where you create the material (but not an AI tool). State the tool used in a figure legend.
- Excel, Prism or similar programmes may be used to prepare graphs and figures and perform appropriate statistical analyses.

### **Supervisor Meetings**

In the week following the assignment of topics, students will contact their supervisor to arrange a first meeting. Further meetings will be arranged by agreement.

#### **Role and Responsibilities of Supervisor**

- To set the essay/ project topic and provisional title
- To set up a folder in Microsoft TEAMS for each student supervised
- To provide general background information on the subject area including some starter references and deposit pdf of these in the student's TEAM folder
- To inform student of expected standard of research and citation (eg. the Harvard format)
- To brief student on the importance good essay structure, and provide feedback to the student later in the process regarding their proposed essay title, focus and structure, and to inform the student of the consequences of using AI or plagiarism
- To inform student of likely challenges in terms of planning and deadlines
- To make clear to the student that further reasonable contact (eg attendance at lab meetings) is welcome, including additional meetings as the student progresses with their work

### **Role and Responsibilities of Students**

- Following the first meeting with your Supervisor, to read around the broad topic and inform Supervisor of your chosen essay title (if applicable).
- To deposit in your TEAM folder **all of the material you cite as pdf**, and drafts of your thesis every 2 weeks (time stamped).
- To understand the University policy on Plagiarism and Academic integrity, and to present and discuss only your own work or that supported by a citation
- Consider seriously the advice and recommendations of the supervisor regarding research work, citation and time management
- Understand that the supervisor is there to assist with the task of completing a dissertation to standard and on time through advice which you should follow
- Understand that it is not within the remit of the supervisor to correct any essay or project dissertation text prior to submission.

### **PLAGIARISM & THE 4TH YEAR RESEARCH THESIS - Your responsibilities:**

Your thesis will inevitably draw on the work of others. The effective use and evaluation of existing material are among the skills that you are expected to develop in University. In all cases, when you build on the work of others you must cite the source of the material (an idea or opinion, a quote, data, diagrams etc). It must be acknowledged in a standard form of referencing. Details of the referencing format are given above but here are some practical tips to help you:

1. You must present a work of scholarship in your own words and diagrams.
2. If you state a fact or rely on data from another source, you must acknowledge that source in the form of a citation in the text. Citations must be listed in a bibliography/reference list. The only exceptions are “common knowledge” where citation is not needed eg “The leaves of many plants are green” or “Whooping cough is a childhood respiratory disease” or “Glucose is a six Carbon sugar”. Such knowledge is ubiquitous and does not need citation. Knowing when or when not to cite is a skill you can demonstrate in your thesis.
3. If you use a diagram or figure from another person’s work, you must cite this in the legend and the bibliography. Do not reproduce the copyright material of others without permission.
4. If the exact words used by someone else are important to your argument, then you may use these within quotation marks and must cite the source. Be sparing in using direct quotes, only do so when the precise wording is essential.
5. If you have paraphrased someone else’s argument, data or conclusions, then this must be acknowledged by citation.
6. Paraphrasing that dominates your work, does not include your own intellectual input or is simply a rewrite of another person’s effort is still plagiarism, even if you do use citations. You must provide an intellectual input that adds to the existing material. This point is particularly relevant to students wishing to follow postgraduate study. It should be a warning that your approach is poor if you find yourself changing words to get your Turnitin score lower.

In summary, your work will rely on the work of others. You should understand that material and think about it.

**Use your own words to describe the essential point that is relevant** to your thesis, and cite your source in the text as well as the reference/bibliography section. If you are worried about what constitutes plagiarism, contact your project supervisor.

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**When submitting in your literature/laboratory project** you will be required to sign a declaration, on your 2024/25 Dissertation Cover Page, stating that you have read and understand the department's Policy on Plagiarism, and that your project is your own work. Please see the sample Cover Page available for you to download from your dissertation moodle page.

**This must be downloaded, signed and placed as page 1 of your final submission dissertation.**

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## Department of Biology Policy on Plagiarism and Use of AI tools

### Definition of Plagiarism

Plagiarism involves an attempt to use an element of another person's work, without appropriate acknowledgement in order to gain academic credit. It may include the unacknowledged verbatim reproduction of material, unsanctioned collusion, but is not limited to these matters; it may also include the unacknowledged adoption of an argumentative structure, or the unacknowledged use of a source or of research materials, including computer code or elements of mathematical formulae in an inappropriate manner.

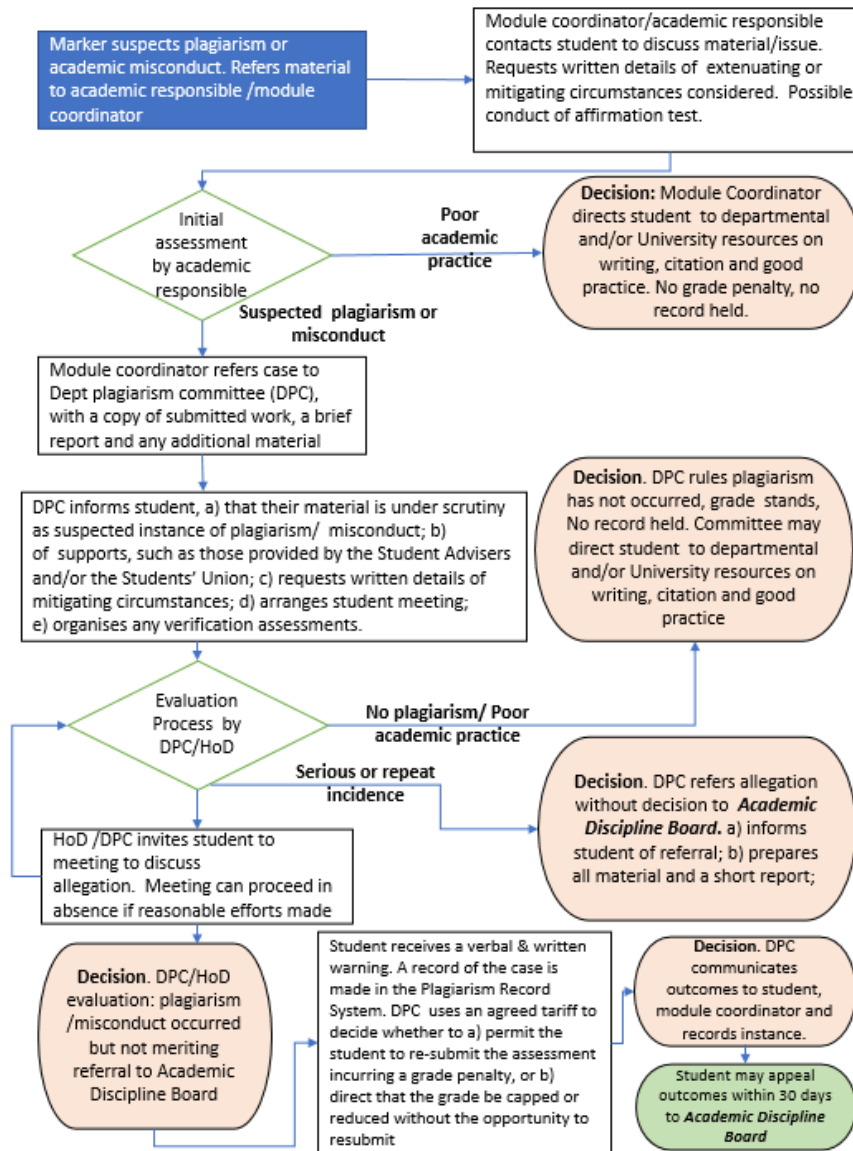
The policies of the University apply within the Department of Biology, as contained on the Maynooth University website (<https://www.maynoothuniversity.ie/university-policies/rules-regulations-students>). Plagiarism is a form of academic dishonesty and will be **treated with the utmost seriousness** wherever discovered. Now that you have reached your final year you have had sufficient training to know what plagiarism is, there is no valid excuse for it to occur and whereas in earlier years the approach was to re-educate students when plagiarism occurred, in fourth year the consequences can be very serious.

### Summary of Characteristics/Available Decisions within the Department to guide academics.

	Decision	Characteristics (not exhaustive)
<b>A</b>	Allow the result to stand.	This will be where the academic responsible (or other eg DPC) considers that any misconduct or plagiarism is very minor (a small number of sentences/<10% total etc) and the result remains a fair reflection of the understanding by the student. The latter may be demonstrated by a verification assessment or otherwise.
<b>B</b>	Adjust the result for the module to reflect the performance demonstrated by the student	This will include cases where the academic refers the case to the DPC and the DPC believes that the initial mark is not a fair reflection of the student's understanding, and is able to determine an appropriate mark. The mark adjustment should be proportionate to the extent of the plagiarism. For example, in the instances of plagiarism such as one or two paragraphs or multiple non-contiguous sentences (between 10-30% overall), then a reduction of between 10-30% might be appropriate. If a student has written a passable assignment, but then pasted in additional material which would have resulted in a higher mark the mark could be reduced to the minimum passing grade. Alternatively, an additional "make up" assignment may be requested by the DPC to achieve the adjusted mark.
<b>C</b>	Set a mark of zero and allow the student to resit, in line with normal resit arrangements.	In instances of major plagiarism, where a significant part (for example >30%) of an assignment is found to be plagiarised, the Department will "award a mark of zero in the assignment" but allow the student to resit in line with normal resit arrangements. There will be no possibility of submitting a 'make-up' assignment, and previous work submitted in connection with the course may be subject to further scrutiny.
<b>D</b>	Set a mark of zero and allow the student to resit, but with a cap on the resit mark.	As "C" but the DPC may decide to cap the resit mark where it is the norm in the Department to cap resit, or where there is a potential advantage in late submission. For example, where access to the feedback given to the rest of the class would be a significant advantage, the department may decide to cap the mark. The department may also decide to cap the mark where it believes there was limited collusion or intentional use of external assistance, or similar.
<b>E</b>	Refer case to the Academic Discipline Board of Maynooth University.	This should be used in the more serious cases which include: a) Students who have had multiple exam/assignment integrity issues in different sittings b) Cases where there is evidence of intent. c) Cases of impersonation or material being purchased or suspected of purchase. This will normally be used for repeat offenders, but may also be used for first offences in the most serious cases such as buying essays, or premeditated cheating.

This policy will be implemented in the following manner: As far as practical and in line with Maynooth University policy, plagiarism will be assessed in the Biology department according to set criteria (levels A-E) reflecting the severity of the issue. Levels are derived from the MU University policy ([Rules & Regulations for Students | Maynooth University](#)).

Thankfully plagiarism in the final year is rare but when it occurs it is often considered at level C or above and can have severe consequences. The following chart outlines the process:



The Academic Discipline Board of Maynooth University has powers to recommend students be suspended or expelled from the University. All members of the Department providing a reference for a student **may be obliged to mention an instance of major plagiarism**, or two or more instances of minor plagiarism, when providing a reference for the student.

### Responsible Use of Artificial intelligence tools for assignments submitted to the Biology Department.

This section lays out the departmental advice and policies on how to use artificial intelligence (AI) ethically and responsibly to support your learning. It details when AI may or may not be used in your assignments.

#### Be cautious when using AI tools for assignments.

ChatGPT does not “know” the material it presents is fake and if you do not understand the output, then neither do you. You must not use AI tools in your final year project

The key to appropriate use of large language model (LLM) tools (e.g. ChatGPT or others) is to use these tools cautiously, critically, and reflectively to support you in your learning, research and writing in Biology. They should not be a replacement for your critical reading in a topic and should build on your understanding of Biology (not replace it). Using clear, limited, and accurate prompts when interrogating AI based tools will certainly help you. However, tools such as ChatGPT do not verify or even discover information, these tools analyse text to give a most probable pattern

that approximates to an answer to your prompt. (In other words, they simply spit out the most likely next word). This is an important consideration, ChatGPT can give you a very well-structured essay which is completely false. **This is why AI tools must not be used in your 4<sup>th</sup> year thesis or dissertations.** ChatGPT does not “know” the material it presents is fake and if you do not understand the output, then neither do you.

LLM tools do not verify material scientifically but do incorporate all the biases inherent in the interpretations of the material of others. Thus, ChatGPT can deliver overtly or covertly racist, sexist or other discriminatory material as apparent fact, when in reality, these have no scientific basis. It can be trained to “support” these outputs with fabricated references or misrepresented material of others. Such outputs should not be used in your work, but *can you tell the difference between real or fake material?* Using an AI tool properly takes more effort than you might expect, as you will need to check the veracity, and sources of the returned material and evaluate it critically before use. Be aware of the implicit and explicit biases in any text produced by AI tools and take steps to mitigate this in work you submit.

#### **What are the acceptable uses of AI tools for Biology department assignments?**

- Before using an AI tool, make sure you understand the basics of your topic, then use prompts that are clear, limited/focused, and accurate;
- Spend time verifying the material returned by your query or prompt;
- Remember that LLM/AI tools generate text without understanding the output, they generate, summarise and predict text, no matter how unscientific or false.

Whilst it is unacceptable to use AI tools in your fourth-year project work, it may be acceptable in other modules but only if specifically stated by your lecturer.

#### **What are unacceptable uses of AI tools for Biology department assignments?**

If you attempt to present the outputs of AI based LLM such as ChatGPT or Quillbot as your own work, then you are attempting to present material that is not the result of your academic judgement or authorship. If you use these tools in the following ways, then you have breached the department and University standards of academic integrity and will be subject to the disciplinary procedures of the department and/or University ([An Introduction to Marks and Standards, a guide for Students \(Ver 03April2020\).pdf \(maynoothuniversity.ie\)](#)).

#### **You must not:**

- **Use AI tools of any kind for any aspect of your final year project work (eg thesis, lit review etc)**
- Use AI tools to create blocks of text (including single paragraphs to complete assignments) and/or submit these as your own work
- Use AI tools to create diagrams, figures or tables and submit these as your own work. Instead learn to use BioRender or Excel to create diagrams and graphs, using your judgement.
- Use AI tools to support your preparation of an assignment without declaring which tools and/or how they were used. (You must not use AI/LLM tools for any form of 4<sup>th</sup> year thesis or dissertation in Biology)
- Use AI-generated false, or inaccurate references or submit AI-generated false, biased or discriminatory claims.

**Consequences of unacceptable AI use in course material submitted to the Biology department could be large and impact you in many years' time.**

Think of your future career. Future tools in the University may detect AI much more accurately than at present. **These may deploy retrospectively and you could face loss of your degree qualification**, public embarrassment, and even loss of a job. Students presenting content that has been generated using AI are subject to the same disciplinary procedures as plagiarism. This can potentially result in denial of a reference, or a permanent notice on your student academic transcript, with career-long negative implications. Where a marker (or detection software) of submitted material

suspects the inappropriate use of AI tools, the following procedure applies. If the module coordinator considers the use to be non-trivial, the issue will be referred to the departmental academic integrity committee who will assess the case and have the option to perform a **verification assessment** in the form of a face-to-face interview as detailed in the University's Marks and Standards. Where a student does not engage fully with the departmental process or in the most serious instances, the case will be referred directly to the University's Academic Discipline Board without further consideration by the department.

**Biology Dept Academic Integrity Committee**  
**May 2023**

### **ADDITIONAL GUIDELINES FOR BI428 LABORATORY PROJECT**

Your project will provide you with an opportunity to get involved in real research, usually on some aspect of the research already ongoing in your supervisor's laboratory. Your project also gives the examiners and future employers an indication of your ability and your initiative. But the other parts of your course are also very important so it is essential to remember this and not to spend most of your time doing project associated work.

**A. Choosing your project.** Try to choose a laboratory which interests you and which suits your scientific background and your general lab skills.

**B. Project organization- Initial steps.**

\* **Reference Material.** Familiarize yourself with the background literature relating to the project. Your supervisor may provide you with a reading list or key review articles papers directly relevant to the project. Go to the [Thesis Online Resources](#) link on your dissertation Moodle page and you will find multiple resources to help with your initial literature review, as well as training options within MU regarding critical skills in *researching the scientific literature, writing, and referencing/citation*. You should discuss the outcome of your literature review with your supervisor approximately 3 weeks after beginning the project. Your supervisor may provide you with additional resources if you have been unable to access them.

\* Become familiar with the equipment and experimental techniques that you will require for your project. It is essential that you become competent in all the research techniques to be used before you start proper experiments and make sure you understand the basis of the techniques.

**C. Project organization. Lab work.**

A percentage of your final project mark is allocated to your performance and dedication in the laboratory.

- Plan experiments carefully following discussion with your supervisor. Make sure suitable controls are included and sufficient replicates of the experiments are carried out.
- Use booking sheets for the equipment in high demand.
- Check time scale of experiments and make sure it fits in with your lecture schedule and the permitted working hours in the laboratory.
- Make note of all the experimental procedure, including calculations for making up solutions etc. in your lab. Notebook as you perform the work, not later on.
- Never rely on your memory. Write your results into your notebook immediately; preferably a hardbound notebook not on pieces of paper.
- Analyse your results as you get them. Draw graphs, etc. now while the material is fresh in your mind and while you are not under too much pressure.
- Record the results from all experiments, even ones which did not appear to work.
- See all experiments through to the end.
- Show courtesy to other workers in your laboratory. Keep your work area clean and tidy; wash glassware and return reagents to shelves, fridges or freezers immediately after use; respect other people's laboratory property: glassware, stock solutions, media, etc.

**D. Writing up your results.** No matter how carefully you conducted and carried out your experiments and how excellent your results are, your overall mark can be pulled down considerably by a poor write-up. Therefore, it is important to leave sufficient time for writing up the thesis.

A research thesis should be no more than **3000 words** of text for double major students. The **word count** includes the main body of the thesis, comprising headings, text and in-text citations/ references. Not included in the word count is the scientific abstract (which has its own separate word limit of 200 words), table of contents, table legends and table text, figure legends, bibliography/ reference list, and appendices. The thesis should be organised under the following sections:-

## RESEARCH PROJECT THESIS LAYOUT

**Typing.** Always use a spell-checker. Recommended font is Times New Roman (size 12). The thesis should be double-spaced.

**Title page/ Cover sheet.** For your project title be brief and accurate. Complete the appropriate sections in the 2024 Dissertation Cover Sheet

**Acknowledgments page.** Optional

**Table of Contents.** All pages should be numbered and the Table of contents should have a list of all sections and subsections. You should also use a separate numbering system to denote each section and subsection as follows: 1. Introduction; 2. Materials and Methods 3. Results; 4. Discussion, 5. References and 6. Appendices (if any). e.g. the first subsection within Materials and Methods would therefore be numbered 2.1, etc.

**Scientific Abstract.** This should be a maximum of 200 words and should briefly summarize the aims of the project, how the problem was tackled and the key findings from the research. This should have the basic content of the thesis without extensive experimental details.

**Introduction.** This section covers the scientific background to your project and the rationale for the study. The Introduction should supply sufficient background information from your literature survey to allow the reader to understand and evaluate the findings of the study.

**Materials and Methods.** A clear and concise description of the techniques you used in the project. This should include sufficient information to allow the experiments to be repeated.

**Results.** The data is presented in this section in the form of Figures (graphs, histograms), Tables and drawings or photographs as appropriate, and a suitable text which should summarize the purpose, significant experimental observations and briefly explain the findings; reserve extensive interpretation of the results for the Discussion section.

**Each results sub-section should begin with text giving a brief description of the rationale and design of the experiments** (not the methods as these will have already been covered under Materials and Methods) followed by details of the findings, referring to all the Figures and Tables. Figures must have a legend **underneath** with the Figure number and title; followed by a short description of the Figure to make the information displayed understandable without frequent reference to the text. Tables must have the Table number and title **above** the Table with the Legend underneath.

**Discussion.** The Discussion should provide an explanation and interpretation of your results and the presentation of evidence (from your own project work and from the literature) which justify the explanations proposed. The significance of your findings should be discussed in the context of published work and should not contain extensive repetition of the Results section or reiteration of the Introduction.

**References.** It must be possible to identify the source of all material which is not your own. The MU Biology Department uses the **Harvard referencing style**, and all dissertations **must** be written in this format. All references should be given fully, and in alphabetical order, in the reference list at the end of the literature survey. Go to the [Thesis Online Resources](#) page and you will find multiple resources to help with writing your dissertation, as well as training options within MU regarding critical skills in *researching the scientific literature, writing, and referencing/citation*. The reference section must contain all relevant sources (original articles from scientific journals, review articles and chapters from books). You must always reference original articles for techniques or statements of fact; reference to

general textbooks and reviews can only be used when you are summarizing points in the Introduction and Discussion. In the **Harvard** Style, all listed references must be cited in the text in parentheses after the relevant section of text. You will be given further directions on accessing literature by your project supervisor and in the talks presented by library staff in early October. The material presented above is for quick reference only.

**Appendix/Appendices.** These are optional and can be used to tabulate raw data which was used to generate the contents of Figures and Tables of analysed data in the results section. These do not count towards the wordcount.

### Assessment Criteria for 4<sup>th</sup> year thesis (Laboratory work)

Fourth year projects vary greatly in the degree of difficulty of the techniques and the ease with which data are obtained. This is taken into consideration by the examiners. So there is no need to be anxious and upset if some of your colleagues are amassing large quantities of data and despite your best efforts, your project appears to be moving very slowly. Keep in contact with your supervisor and if your supervisor is satisfied with your rate of progress, then you shouldn't worry too much about the progress of your colleagues' research. Most people get great satisfaction from doing project work. It is our hope in the Biology Department that you too will enjoy the intellectual challenge of your project and that it will give you some valuable first-hand experience of the procedures used in original research. Chapter 8 in Wedgewood, M.E. "Tackling Biology Projects", Macmillan (1987) gives some very valuable advice on the writing of a project report.

When submitting your laboratory project, you will be required to sign a declaration on the **2024 Dissertation Cover Page** stating that you have read and understand the department's Policy on Plagiarism, and that your project is your own work. A sample cover will be available for you to download from your dissertation Moodle page.

**This must be downloaded, signed and placed as page 1 of your final submission dissertation.**

Once again markers are looking for demonstration of higher order thinking (e.g. synthesis, analysis and powers of evaluation) and critical engagement under each heading. The practical write-ups and your feedback should have prepared you well to write a strong thesis. Your lecturers use the criteria below to grade your project thesis using the scale described on page 46.

Skills/Competencies displayed in thesis work	
<b>Abstract</b>	Research problem, goals, significance, and outcomes/conclusions described and integrated in a concise, effective manner
<b>Adequacy of introduction</b>	in-depth insight into background & published literature, meaningful connections between relevant components are communicated effectively
<b>Referencing and citation</b>	Quality of citation choice/source material, Excellence of format, style
<b>Hypothesis/ Aims</b>	Correct and clearly expressed
<b>Description of methods</b>	Thorough and complete showing sufficient detail and understanding. Repeatable
<b>Presentation and interpretation of results</b>	purpose of each approach/experiment is clear. Data is presented appropriately in figures, tables or text. Statistical tools correct.
<b>Conclusions/ Discussion</b>	Good evidence of evaluation and contextualisation
<b>General presentation</b>	Conforms to formats, free from error, correct use of scientific language/scientific terms.

### LATE SUBMISSION OF COURSEWORK

On occasion, a student may not be able to meet a course deadline on a literature/lab project due to unforeseen exceptional circumstances. If you find yourself in this position, you may request a later submission date. The fourth year modules covered by this policy are **BI424; BI428; BI448.**

If you require a later submission date, you should complete the online [Biology Department Late Submission Request Form](#) available via the [All Biology Students 2025](#) Moodle page. Please note that you will be required to upload your



supporting documentation at the time of submission with the exception of illnesses of 2 days duration or less, which does not require supporting documentation.

All applications must be received 5 working days prior to the original submission date or 24 hours post submission date only in order to be considered. Submission with supporting documentation does not guarantee that an extension will be granted. Approval is at the discretion of the department. Further instructions on the process are available on Moodle.

The form should **NOT** be used to request extensions in relation to Lab Practicals, Lab Write-Ups or MCQ resits. In these cases, you should follow the procedure as outlined in the relevant section of this handbook.

The table below gives examples of instances where late submission requests may be considered.

Reason for Application	Details Needed	Supporting Documentation Needed
Medical Circumstances	<ul style="list-style-type: none"> <li>Specify details</li> <li>(e.g. Illness, injury, hospital appointment, hospitalisation)</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate original supporting evidence must be supplied by a registered general practitioner for illnesses of 3 days or more.</li> </ul>
Personal Circumstances	<ul style="list-style-type: none"> <li>Specify details (e.g., family illness)</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate original supporting evidence must be supplied by a registered medical practitioner or other health professional.</li> </ul>
Bereavement	<ul style="list-style-type: none"> <li>Specify relationship (e.g., parent/guardian, grandparent, sibling, spouse, child, friend)</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate supporting evidence must be supplied (e.g., RIP.ie notice).</li> </ul>
Other	<ul style="list-style-type: none"> <li>Specify circumstances (e.g., jury duty, wedding of a sibling or other immediate family member, victim of crime; participation in a sporting/other event for MU.</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate original supporting evidence must be supplied.</li> </ul>

## IMPORTANT DEADLINES AND DATES FOR PROJECT WORK

	Start work	Finish work	Final Thesis submission (3,000 words)	Oral
Group 1 Literature (BI424) <i>Semester 1</i>	7 October	22 November	22 November [12 noon]	25-29 November
Group 1 Literature (BI424) <i>Semester 2</i>	4 February	14 March	14 March [12 noon]	24-28 March
Group 2 Lab project 6 weeks (BI428) <i>Semester 1</i>	7 October	22 November	4 December [12 noon]	25-29 November
Group 2 Lab project 6 weeks (BI428) <i>Semester 2</i>	4 February	14 March	2 April [12 noon]	24-28 March

### BSc Biology Double Major deadlines:

Extensions to these deadlines will not normally be granted, because there is a risk that you fail to allocate sufficient time for your revision and other modules. The deadlines are here to help students manage their workload. A sample cover sheet for your project will be available on the associated Moodle page. Please type in the following:

- the title of your project,
- statement that the thesis is submitted in fulfillment of the requirements for the degree,
- your name,
- student number,
- the name of your project supervisor,
- the word count for your submitted thesis
- date.

**If you have a serious problem concerning the fulfillment of any of these deadlines, please consult your supervisor.**

### The Library is a resource for your study

The library staff look forward to meeting you during your studies, whether that's online or in person. Library staff will help you with any questions you have about getting started.

MU Library will be essential to you for:

- finding the right **e-books** and **online material** to help you study & write your assignments and essays,
- borrowing physical **books**,
- short, free **online tutorials & quizzes** that will help you improve your information skills,
- approachable **library staff** who will help you find what you are looking for, and
- booking a [group study room](#) when you are working on projects with fellow-students.

Best thing of all? All the resources above are **FREE to use** when you are a student in MU!



Fig. 1: Exterior of MU Library

### Start Here: Our Library Homepage



Visit our library homepage at <https://www.maynoothuniversity.ie/library>. It's a great starting point for:

- Up-to-date library access information
- Details on using our services, both on and off-campus
- Information skills training classes (LIST & other sessions)
- Support for your studies and assignments

**IMPORTANT!** Use your MyCard (student card) to access the library and borrow books.



For more information, look at our guide "Using the Library" here <https://bit.ly/3LOsIGU> or ask us for a demo.

Your **MyCard** (student card) entitles you to access the library and to borrow books. Click the "Using the Library" tab (see Fig. 2) on the library homepage, for more information.

**Need Help? We're Here for You!**



If you're having trouble finding what you need, our library staff are ready to help. [Photo by Daniel Balteanu]

Whether you're on campus or off, you can:

- Visit the **Library Information Desk** on the ground floor of the library
- Use the live "Library Chat" box on our homepage
- Fill out our "[Online Enquiry Form](#)" on the left side of our homepage

### Explore Our Study Spaces

The MU Library, located on the South Campus, across the road from the TSI building, offers various study spaces to suit your needs:

- **Ground Floor:** Open-access area before the turnstiles, where you can eat, drink, and chat, with over 50 laptops and print facilities.
- **Levels 1 and 2:** Quieter areas with [bookable group study rooms](#), a flexible learning space and a silent study room.



Check out our spaces ahead of time with our VR Tours and Exhibitions here: <https://bit.ly/3WLU41>

### Find the Right Resources



Using the correct information source is crucial for your success. Each subject has a dedicated *Subject Guide* on our website. These guides, available here: <https://bit.ly/3SuB84D> include recommended books, databases, reference styles, online tutorials, and more. There's contact information for our *Teaching & Learning Librarians*, if you need more information on your topic.

### Tech and Tools at the Library

We offer various technological resources, including:

- **Laptop Loans:** Borrow a laptop from the laptop-bank opposite the library desk.
- **Ground Floor Print Hub:** Multifunction printers available for all your print jobs.
- **3D Printing:** Available for free student and staff use; ask at the Information Desk.
- **Charging Stations:** For recharging your devices quickly.
- **Short Story Dispenser:** For a quick, fun read.
- **Wellness Zone:** Try out our 3 Energy Pods & Cubbie on Level 1, for rest and relaxation.



You can also suggest up to 5 books a year for the library to order here: <https://bit.ly/4dcxLYj>

### IT Services

IT Services are available at the Library Information Desk during service hours to help with any IT issues, including photocopying.

### Refreshments

There is a Starbucks Café found on the ground floor of the library, plus vending machines and water fountains available in the library.

## Stay Connected and Informed

Keep an eye on the screens in the library for events. Follow us on social media for updates, tips and events throughout the year:

- **Instagram:** @library\_mu
- **Facebook:** @MaynoothUniLibrary
- **X:** @mu\_library

We wish you every success in your studies and look forward to seeing you soon!

## Useful Links and Contacts

- **Library Homepage:** <https://www.maynoothuniversity.ie/library> 
- **Using the Library:** <https://nuim.libguides.com/library-services/usingthelibrary> 
- **A-Z Subject Guides:** <https://nuim.libguides.com/> 
- **Book a Group Study Room:** [https://nuim.libcal.com/booking/MU\\_GroupStudyRooms](https://nuim.libcal.com/booking/MU_GroupStudyRooms) 
- **Online Tutorials:** <http://nuim.libguides.com/list-online>

## Biochemical Calculations Website: Biochemical™

<http://www.biochemicalc.com>

Students in the Department of Biology now have access to Biochemical™. This website, developed by Professor Sean Doyle (Biology) and Mr Dermot Kelly (Computer Science), allows students to:

**1.** Learn the fundamental concepts of biochemical calculations such as:

What are moles, nanomoles and micrograms? Why do I need to use moles in my calculations? How do I make laboratory solutions such as buffers? What is molarity?

**2.** Use online calculators to help solve biochemical problems.

The online calculators allow students to calculate the weights (in mg or g) of reagents required for making up laboratory solutions of defined molarity, calculate the volume of stock solutions required for preparation of a more dilute reagent, carry out % (w/v) dilutions, work out how to do serial dilutions etc...

**3.** Practice online questions to test their understanding of biochemical calculations.

Biochemical™ offers a suite of pre-formatted questions to help students judge if they understand key concepts required for becoming proficient at undertaking laboratory calculations. These questions are of varying difficulty and style, and are designed for use in association with the online calculators on the Biochemical™ website.

Although primarily designed for students in the 3<sup>rd</sup> and 4<sup>th</sup> years of our degree programmes, it will also be of assistance to students at earlier stages of study. Indeed it may be of use to students taking Chemistry, or any subject requiring knowledge of laboratory calculations. Postgraduates may also find aspects of Biochemical™ beneficial to their own research projects and also find use of its functionalities a useful “double-check” for their own laboratory calculations.

We encourage you to use Biochemical™ and please tell others if you're happy with it. If not, please email: [biochemicalc@gmail.com](mailto:biochemicalc@gmail.com)

**Biochemical™ was funded by the NUI Maynooth CTL Fellowship Programme 2011**

## EXAMINATION ASSESSMENT SCALE

<b>Letter Grade</b>	<b>Descriptive Heading</b>	<b>Representative %</b>	<b>Class</b>	<b>4<sup>th</sup> year Thesis/ Oral description</b>
A++	Answer which could not be bettered.	100	I	Very Good
A+	Exceptional answer displaying unexpected insight.	90	I	
A	Undoubtedly first class, flawless answer, demonstrating originality.	80	I	
A-	Almost flawless answer demonstrating some originality	70	I	
B+	Extremely high competence, perhaps displaying limited originality or technical flaws or minor errors	68	II-1	Good
B	Fundamentally correct and demonstrating overall competence.	65	II-1	
B-	Competent performance, substantially correct answer but possibly containing minor flaws or omissions.	60	II-1	
C+	Awarded on the basis of the answer being somewhat better than a C but below a B-.	58	II-2	Satisfactory
C	Basically correct, answer with minor errors or one major error/omission.	55	II-2	
C-	Awarded on the basis of the answer being somewhat below a C but better than a D+.	50	II-2	
D+	No more than adequate answer.	48	III	Barely satisfactory
D	Adequate answer with serious errors or omissions.	45	III	
D-	Lowest passing grade, barely deserving to pass.	40	P	
E+	The answer is inadequate and does not deserve to pass.	38	F	Un-satisfactory
E	The answer fails to address the question properly but displays some knowledge of the material.	35	F	
E-	Fails to address the question.	30	F	
F+	Little relevant or correct material but some evidence of engagement with question.	20	F	
F	Very little relevant or correct material.	10	F	
F-	Totally irrelevant answer.	0	F	

### Pass standards for lecture modules

<b>Pass standard</b>	40% or higher
<b>Compensation range</b>	Marks of at least 35%, but less than 40%
<b>Incomplete/Not passed</b>	Marks below 35%

Please see the following link for Marks and Standards for programmes at Maynooth University:

<https://www.maynoothuniversity.ie/exams/university-examinations-regulations-and-procedures>

Past examination papers can be obtained from the Quicklinks section (lower left-hand side of the page) of the

Maynooth Library web page. <https://www.maynoothuniversity.ie/library> These may be used as a **guide** to the **type of questions** on exam papers.

## BIOLOGY LABORATORY SAFETY

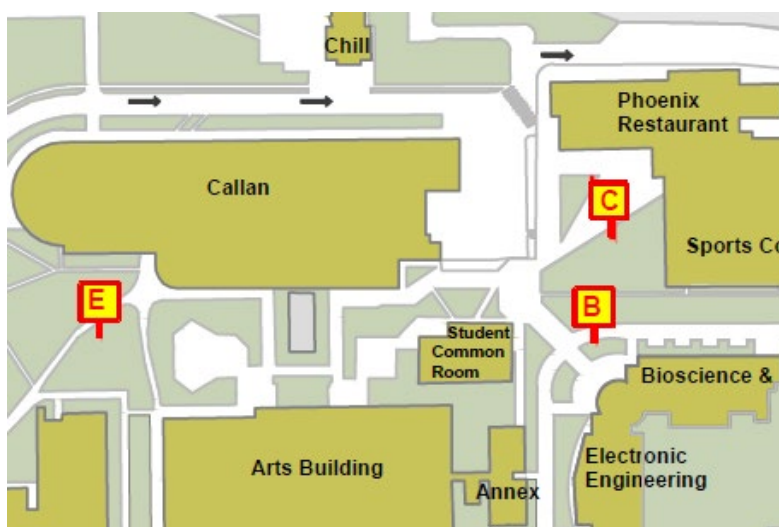
For the protection of yourself and others please read the following notes carefully and obey the instructions. Students taking project work in a research lab should read and comply with the specific additional requirements in their assigned laboratory. It is your responsibility to make yourself aware and to comply with all safety requirements.

### COVID-19 GUIDANCE:

If you have COVID: do not come on campus, follow the HSE guidance for self-isolation (<https://www2.hse.ie/conditions/covid19/>) and University guidance (<https://www.maynoothuniversity.ie/coronavirus/response>).

### FIRE:

- On hearing the fire alarm or on discovering a fire, stop what you are doing and raise the alarm.
- If you are using a Bunsen, switch it off.
- Shut off the Bunsen gas supply to the lab.
- Leave in an orderly manner and close the door behind you. **Do not use the lift.**
- Make your way to the nearest assembly point B, C or E (see the map below).
- Remain at this location until instructed by security staff to return to the building.



### PERSONAL PROTECTION:

Do not smoke, eat, drink or chew gum in any laboratory. University Policy prohibits storage of food and drink and food in all laboratories. You are required to wear a Howie style white laboratory coat with all buttons closed and sleeves fully extended at all times. Laboratory coats may be available for hire from the Biology Department.

You must also wear safety glasses at all times. Please contact the technical staff if you need to purchase a pair. Sandals, flip-flops and other open footwear are prohibited when chemical and biological agents are used.

Long hair must be tied back. You must wash your hands immediately at the end of the practical or as necessary in a research lab.

You will be provided with gloves for your personal protection. Unfortunately, they only protect the wearer and can easily contaminate surfaces. Remove all gloves before leaving the laboratory, even if for a brief period. Remove gloves while using laboratory equipment unless there are specific hazards present. Do not wear gloves when using Bunsen burners unless specifically instructed by the lecturer in charge. If you need to transfer samples or equipment to another laboratory, remove one glove and use the ungloved hand to open doors etc.

### **PERSONAL INJURY:**

You must cover any cuts or grazes with a plaster. Please inform your demonstrator. There are first aid cabinets in all teaching laboratories.

Report any accident or injury, however trivial, to a demonstrator.

We will explain specific hazards or disposal methods, if any. You must follow these instructions carefully.

Please inform your demonstrator or lab supervisor if you have any concerns relating to a pre-existing medical condition, or if chemical/biological agents used in a practical session may affect any pre-existing medical condition.

### **GENERAL SAFETY:**

In accordance with university regulations, you will be expelled from the practical session or research lab. if you do not conduct yourself in an orderly manner, or if you deliberately act in an unsafe manner. We allow students in the teaching laboratory only during timetabled laboratory sessions. You may not use the laboratory at other times unless you obtain permission from the technician in charge. Undergraduate students should not enter the preparation laboratory, research laboratories, growth rooms, storerooms etc. without permission.

Proper regard to the correct use of equipment is required from all staff and students. Intentional interference with safety signs and safety features of any equipment is a criminal offence.

We expect you to leave your bench place and work area, including sink, clean and tidy.

### **It is particularly important to put microscopes away correctly:**

- Remove slides. Your demonstrator will instruct you on how to dispose of slides and coverslips
- Check that a low power lens is in the viewing position.
- Clean all lenses with lens tissue.
- Unplug the microscope and wind flexes neatly, but not tightly.
- Cover the microscope.

You should be aware that we frequently transport chemicals and biological materials around the department. Therefore, it is very important that you walk with due attention in the corridors.

N.B. Follow the instruction of your demonstrator or supervisor at all times. Please check with them if you have any doubts or questions in relation to safety. University safety and public health procedures must be adhered to at all times. Instruction from demonstrators, academics and technical staff must be followed at all times. Failure to do so will result in automatic expulsion from the laboratory and the forfeit of any grades associated with that practical session and an “unexplained absence” will be awarded. Repeat offenders will receive an automatic failure of continuous assessment.

### **Preparing for practicals/work in labs**

- Complete any advance requirements before attending (e.g. Read practical manual, watch any associated videos, complete any required exercises). Details of these requirements will be provided by your lecturer in advance.
- Practical manuals will be available on Moodle in advance of your practical with a printed copy provided to you during attendance at the practical.
- If you are unable to attend a practical, please refer to the instructions in your introductory handbook for completion of an absence form, along with submission of appropriate supporting documentation, as required (Notification of Absence section). Please note the list of acceptable reasons for non-attendance, outlined in the Notification of Absence text.



## **Preparing for Laboratory Projects**

In addition to attending and passing all the safety exercises in the General Methodology module, it is your responsibility to familiarise yourself with the specific safety issues in your assigned research laboratory and to comply with the specific safety measures. You should read the safety manual and protocols in your assigned lab. Do not commence project work until you have familiarised yourself with all safety protocols. As you learn new techniques it is your responsibility to make yourself aware of the safety issues and to always ask your supervisor if you have doubts or need more safety information.

The Department of Biology would appreciate if any student with a medical condition/allergy, or who is pregnant/breastfeeding, to document the details on the form which will be provided during your first workshop class. If the medical condition changes during the year, please inform your Senior Demonstrator or your Course Coordinator.

All staff involved in this process will respect the confidentiality of the students, ensuring that this information is provided to the relevant personnel on a need-to-know basis only.

## NOTIFICATION OF ABSENCE

It is the responsibility of all students to be available for class throughout Semester I and Semester II between the hours of 0900-1800 Monday to Friday, in addition to occasional classes outside these hours (eg. field trips, academic visits).

If you are unable to attend Laboratory practicals, workshops or tests for any reason you must advise the Department of Biology by submitting an on-line **Absence Form** through the **Moodle course [All Biology Students 2025](#)** either before your absence or within FIVE working days of the end of the period of absence. When submitting the absence form you will also be able to upload copies of your medical certificates or other relevant supporting documentation. Instructions on how to do this are on the Moodle page. **Failure to do so may result in the absence being counted as unacceptable and you will be given a mark of zero.**

Please note that if you are submitting a medical certificate, **the cert must be issued during the period of illness.** BACKDATED MEDICAL CERTIFICATES WILL NOT BE ACCEPTED FOR ANY REASON.

**BI422 Research Methodology 1. All practicals are mandatory** and failure to attend these practicals may impact your ability to commence your chosen Laboratory project or Advanced Practical combinations.

Students missing a practical MUST contact the academic in charge of the practical.

Medical certification must be provided for all missed practicals. Failure to provide certification could result in a penalty with your final grade.

**BI426 Advanced Practicals/Professional Modules. Attendance of practical and professional modules is mandatory** and medical certification must be provided for any practicals missed. Failure to provide certification could result in a penalty with your final grade.

If you miss one advanced practical or professional module lecture or workshop you must notify the academic in charge of the practical. If you miss more than one practical, lecture or workshop you must notify the Biology Office.

Please read and take note of your responsibilities relating to absence as, in signing a Notification of Absence Form, you agree that you have read and understood them.

### It is your responsibility to:

**Advise the department of any absence. Submit an [Absence Form](#)** to your department through the **Moodle Absences** course with the relevant supporting documentation either **before** your absence or within **FIVE** working days of the end of the period of absence.

1. **Keep in touch** with your department should you be absent for a prolonged period.
2. **Make up any work** you have missed due to your absence.
3. **Agree a revised deadline** with your department for any missed assessment(s) due to your absence. **Note that alternative arrangements for a missed test will only be made if a medical certificate is supplied.**
4. **Recognise that submission of an Absence Form does not automatically mean that the absence is acceptable** and that it is at the discretion of the department as to whether any absence is deemed acceptable or unacceptable. If the absence should be deemed as unacceptable it will be recorded as such and count against the minimum attendance level.
5. **Recognise that**, although a specific individual absence may be deemed acceptable, if your overall attendance and submission of work drops below the minimum level prescribed by your department, then **disciplinary procedures will still be followed.**
6. **Recognise that notification of absence, whether it is deemed acceptable or unacceptable, does not constitute grounds for appeal** against a course or programme failure or failure to progress to the next stage of study.

## 1. Notification of Absence Forms

Reason for absence	Documentation required ( <i>all to be submitted online through Moodle</i> )
Illness up to and including 5 consecutive term-time days (excluding Saturdays and Sundays)	<a href="#">Absence Form</a>
Illness for more than 5 consecutive term-time days (excluding Saturdays and Sundays)	<a href="#">Absence Form</a> plus formal Medical Certification <u>issued and dated during the period of illness</u> and signed by the Medical Centre, your GP or hospital consultant
Unrelated to sickness	<a href="#">Absence Form</a> plus supporting evidence

## 2. Supporting evidence

The following table gives examples of the kind of supporting evidence that you may be required to provide as justification of absence.

Absence	Evidence
Illness of LESS THAN FIVE consecutive term time days	Self-certification— <a href="#">Absence Form</a> which must be submitted to the department through Moodle <b>within 5 working days of the end of the period of absence</b> . Should students submit repeated self-certifications, the department will require students to produce formal Medical Certification. <b>Note that alternative arrangements for a missed test will normally only be made if a medical certificate is supplied.</b>
Illness of MORE THAN FIVE consecutive term time days	Formal Medical Certification issued and dated during the period of illness and signed by the Health Centre or your GP or hospital consultant
Self-isolation without illness	Self-certification – <a href="#">Absence Form</a> which must be submitted to the department through Moodle. <b>Notify in advance or within 1 day of scheduled continuous assessment component</b> . An alternative assignment/assessment may be made available for you to do remotely and submit online. Supporting evidence can include messages relating to close contacts or instructions to self-isolate.
Outpatient's appointment	Letter from outpatients or appointment card
Doctor or dental appointment	Appointment card
Documented personal problems	Letter from someone, e.g. counsellor, who has direct knowledge of the problem and/or is involved in supporting you
Illness of dependent or family member	Medical Certification and statement explaining illness and why personal attention is necessary
Bereavement	Formal certificate or note from family member who can vouch for the situation
Severe transport problem	A copy of online or newspaper reports on the problem to be submitted to the department <b>within 5 working days of the problem having occurred</b>
Court attendance	Official correspondence from the Court confirming attendance requirement
Victim of crime	Statement of events, police report and crime reference number
Involvement in a significant/prestigious event	Letter of invitation from the relevant organising body
Sport commitment at national/county level	Official correspondence from the relevant sporting body confirming the requirement to be available on specified dates

The following table gives examples of the kind of circumstances where absence **may** be deemed as ‘acceptable’ and ‘unacceptable’ for non- attendance. This is for general guidance; it does not represent an exhaustive list. All absences will be reviewed on a case-by-case basis.

Acceptable	Unacceptable
1. Illness	1. Oversleeping
2. Displaying COVID-19-related symptoms	2. Misreading the timetable
3. Self-isolating due to COVID-19	3. Paid employment and voluntary work
4. Hospitalisation	4. IT and/or computer problems
5. Outpatients appointment (where possible you should try to make any appointment outside of your class commitments)	5. Minor transport problems, e.g. being stuck in normal rush hour traffic, not permitting enough time in travel plans for minor unanticipated delays, missed public transport
6. Doctor or dental appointment (you should try to make any appointments outside of your class commitments)	6. Holidays
7. Documented personal problems	7. Family celebrations
8. Illness of dependent or family member (until other arrangements can be made)	8. Weddings
9. Bereavement	9. Accommodation issues, e.g. moving house
10. Severe transport problems (e.g. severe disruption of train travel due to signaling failure or track problems or major traffic incident on motorways, which can be verified by online or newspaper reports)	10. Extra-curricular sports activities
11. Court attendance or victim of crime	11. Driving test
12. Representing College/county/ country at significant or prestigious event or sport commitment or involvement in such an event	12. Lack of awareness of attendance requirements and University Regulations in this regard

## Multiple Choice Questionnaires and Notification of Absence

Throughout the year you will sit a number of Questionnaires, the majority of which are Multiple Choice Questionnaires (MCQs) which are generally comprised of questions that cover a significant proportion of the module.

It is important that you view the MCQs as official exams and are aware that different policies exist for missing an MCQ than for a practical. In addition, Maynooth University Exam policies and regulations will apply and be enforced during MCQs.

All MCQs are compulsory and failure to sit these exams will result in a **zero** grade.

If you foresee that you may not be able to sit an MCQ it is imperative that you contact the lecturer who is setting the exam **BEFORE** the MCQ.

Individuals who miss an MCQ may be permitted a resit if they have an acceptable reason and provide the appropriate evidence. Individuals who miss an MCQ without an acceptable reason and who did not contact the **lecturer who has set the exam** or **senior demonstrator** prior to the MCQ will not be offered a resit and will consequently be awarded a zero grade.

MCQs are exams and Maynooth University Exam policies and regulations apply during both. These can be viewed at the [Maynooth University Examinations Office](#) webpage.

## Connecting to Maynooth University wireless networks:

Maynooth University along with many other institutions broadcasts the eduroam wireless signal for students and staff. Use your wireless client to connect to eduroam and when prompted enter your Maynooth username and password.



You may need to enter your credentials twice when connecting for the first time. Some users will see prompts regarding certificates and should choose the “Accept \ Continue” option at this prompt.

*\*\*If you enter your username in the format of [username@mu.ie](mailto:username@mu.ie) (not an email address) your Maynooth account will allow you to connect to eduroam in other participating institutions for example in UCD, DCU, TCD and many others around the world.*

**Notices:** Information for students will be posted on MOODLE and can also be notified by e-mail to your mumail address. These will include information on courses, questionnaire results etc.

**E-mail:** You should check your Maynooth University e-mail account on a DAILY basis. Messages to individual students from Staff will normally be made via e-mail, using the student’s Maynooth University e-mail address. Delete messages regularly to ensure that your e-mail account is not over quota.

**Moodle** <https://moodle.maynoothuniversity.ie/>: This online learning environment is accessible both on and off campus. We use it for: (a) posting notices and announcements (b) to pass on information/ resources about individual modules and (c) recording absence. You will have access to all MOODLE areas relating to the modules for which you are registered as well as to general information areas entitled

- [All Biology Students 2025](#) a page for also recording absence and submitting supporting documentation. You should become familiar with the essentials of MOODLE as soon as possible.

## **Tips from the Biology department on getting better marks in your final year.**

Many students are using the same learning strategies that suited them in secondary school, without realizing that these work less well with each year at university.

### **How students fail or underperform in final year**

The responsibility is on you to use your time wisely and get the balance right between external work, commitments, socializing and getting, the best qualification you can. Every year some students dedicate too much time to part-time work (often in retail) and then fail or under-achieve in their exams in the summer. You need to be responsible and exercise good judgement in treating your studies seriously, and prioritizing your study. Here is some advice from past students who have failed or underperformed in fourth year - learn from their mistakes!!

1. **I missed too many lectures!** Our tip- If you do not attend lectures, you will miss a lot of information that is not possible to pick-up from somebody else's notes. The lecturer may emphasise a point or explain something in a particular way

that will stick in your mind. The lecturers often emphasize what is needed for an exam answer that moodle notes do not. There is a direct correlation between missing lectures and failing.

2. **I memorised essays but still got poor marks.** We are not examining for memory but for skills and competencies linked to higher order thinking. Your strategy for leaving cert will not work well. Memorising essays runs the risk of your guess being incorrect and failing to show you understand the question set. This is a common reason why students underperform.
3. **I failed on really simple stuff because I didn't submit it!** Our tip-Some compulsory modules (such as BI420 seminars) require continuous assessment (CA), these are very straightforward to do at the time, but if missed, you may discover you cannot pass the module or resit this in the autumn. DO the CA!
4. **I left things too late/ I didn't read my notes soon enough!** "I only downloaded the moodle extra reading and lecture notes in the week before the exams – but then I couldn't make any sense of it and I had too much to do." Our tip: engage early with your material.
5. **It took a long time to get a study routine.** "I wish I had got into the habit of trying to do a few hours of study each day in semester 1" Our tip- this is great advice and a habit developed by students who do well.
6. **I missed the general methodology practicals!** See point #3.
7. **I trusted ChatGPT.** "I didn't realise ChatGPT is a sentence generator, not a search engine. I had my marks reduced because I used AI poorly." Our tip- Trust yourself and your years of study- don't risk your degree or future career by using a poor tool.
8. **I never asked questions!** "I didn't like to be the centre of attention in years 1 to 3, but I started to ask questions in final year." Our tip- your lecturers can be really helpful. They love their subjects and are a resource to help you- use them.
9. **I didn't prepare enough for the exams!** In September, the exams look to be very far away but they will arrive sooner than you expect! Our tip- Every hour of work before study week, is worth three after Christmas! You need to start working towards the exams from the first week of the year. Prepare like someone training for a marathon - train (attend lectures and practicals), build up your distances (study, attempt sample exam questions) and finish the race (pass your exam successively).
10. **I Began to panic!** "Other students were saying to me they had the entire modules covered and all the possible exam answers prepared. It was starting to freak me out. But I spoke to friends, worked at my own pace and stuck to my plan. I did the work and passed well" Our tip- Don't let gossip freak you out.

## Other University Supports and Services

**Academic Advisory Office:** The Academic Advisory Office offers a convenient first point of contact for students who wish to seek advice or assistance with their general experience of University life. The office provides an ombudsman-like role for students who may be encountering difficulties in their programme of study. [Academic Advisory Office](#)

**Examination Office:** The Examinations Office is part of the University Registry and administers the examination timetable. It is responsible for the central administration of the University written examinations. The academic year is semesterised with examinations held in Semester One (January) and Semester Two (May) with a Supplemental/Resit autumn session in August. [Examination Office](#)

**Student Health Centre:** The Student Health Centre is an acute care/advisory service. The service is envisaged as an addition to the student's own family doctor or specialist medical service. It operates within resource constraints so certain service limitations apply. Students should continue to attend their own general practitioner. [Student Health Centre](#)

**Student Services:** Student Services is an integral part of the University community, enabling the promotion and development of its educational mission. Using a holistic approach, we offer a range of clearly defined services to support and empower students to achieve their personal and academic potentials and so enhance their life's journey. We strive to create a community which is open and caring and where diversity is expected and respected. [Student Services](#)

**Maynooth Access Programme:** The Maynooth University Access Programme (MAP) encourages under-represented groups to enter third level and provides these groups with support through their time at Maynooth. These groups include [under-represented school leavers](#), [mature students](#), [students with disabilities](#) and members of the Irish Traveller community. [Maynooth University Access Programme](#)

### **FSE Equality, Diversity and Inclusion (Committee)**

The Faculty of Science and Engineering Equality, Diversity and Inclusion (EDI) Committee, are delighted to announce a series of EDI online training opportunities that are available to all students. EDI training is a potent tool for increasing awareness, enhancing comprehension, and equipping individuals with the skills required to both implement and advocate for fairness, respect, and the celebration of our differences.

#### **How to Get Involved:**

Participation in online EDI training initiatives is open to all students. The [Equality Office](#) has shared a helpful list of EDI-related online courses / training sessions at Maynooth University and highlighted who they are available to.

<b>Training</b>	<b>Location</b>	<b>Staff / Students?</b>
<a href="#">EDI in HE &amp; Let's Talk About Race</a>	Moodle	Available to staff and students at MU
<a href="#">Consent at MU – Preventing Sexual Violence &amp; Harassment</a>	Moodle	Available to staff and students at MU
<a href="#">Sexual Health   Maynooth University</a> (Student link)	Moodle	Available to staff and students at MU
<a href="#">Disability Awareness Training – National Disability Authority</a>	Online	Open access

If you have any questions or require additional information, please do not hesitate to contact the Universities EDI Committee at ([fse.admin@mu.ie](mailto:fse.admin@mu.ie)).

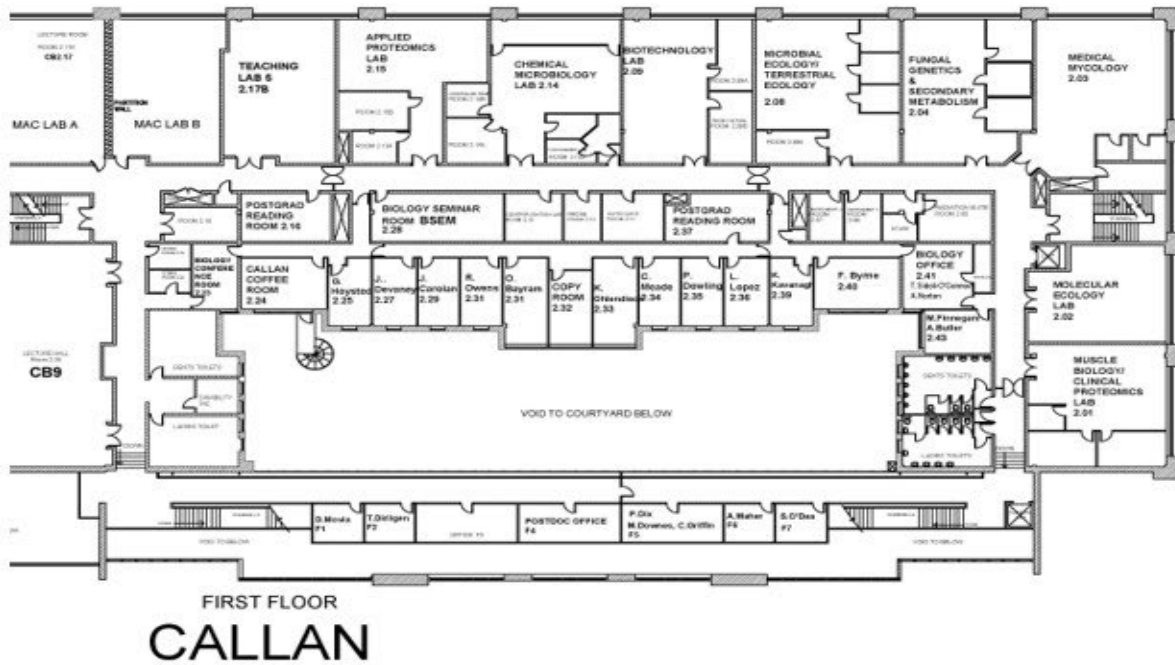
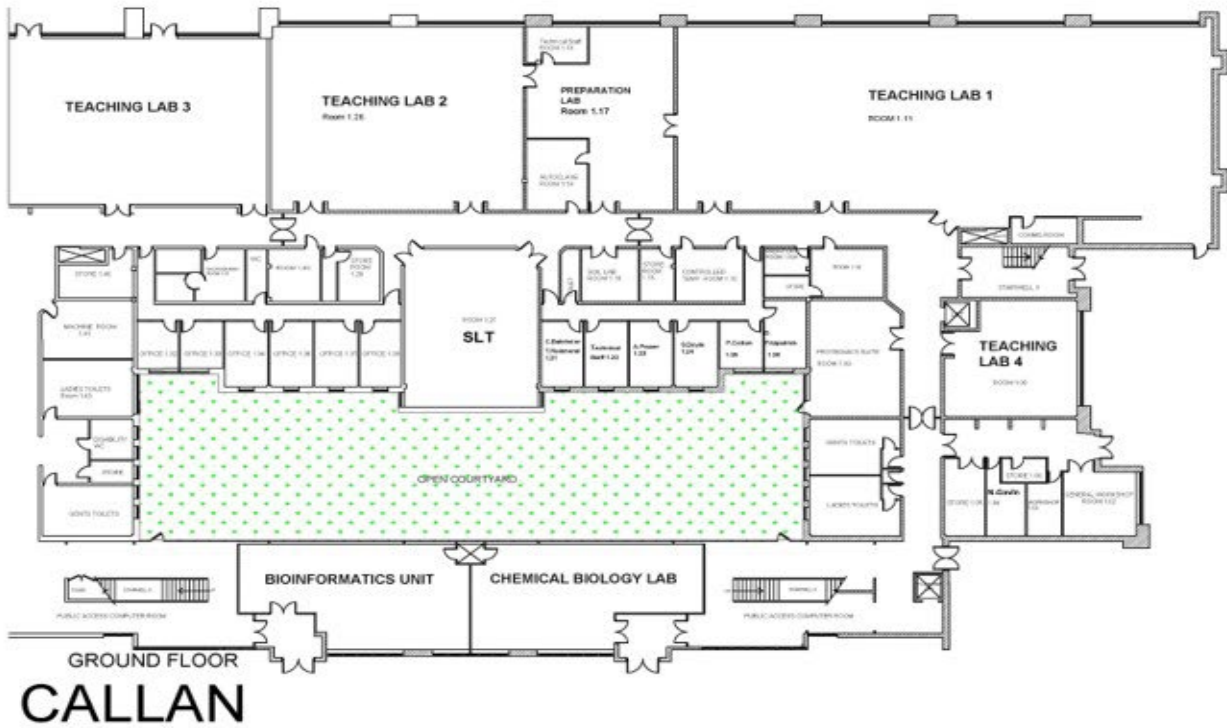
Timetables 2024/25: See link [Timetables | Maynooth University](#)

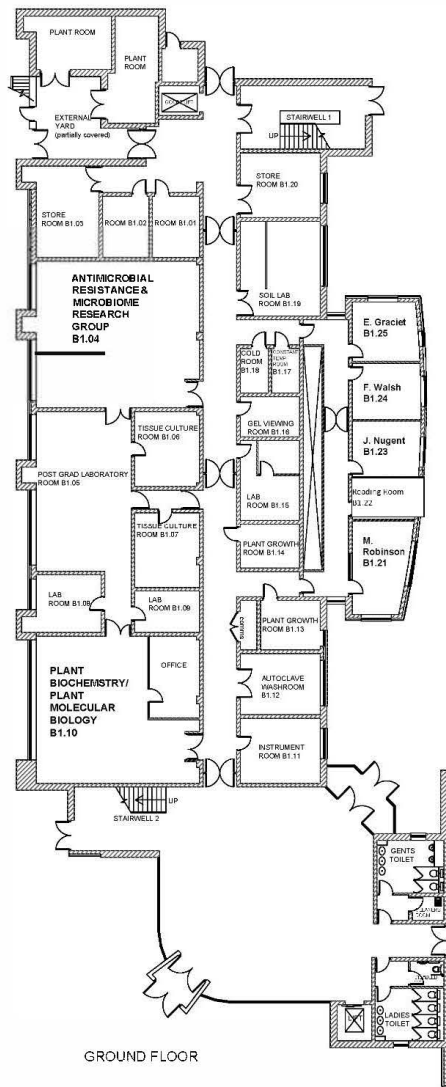
**Map of Campus:**

[Campus Maps](#)



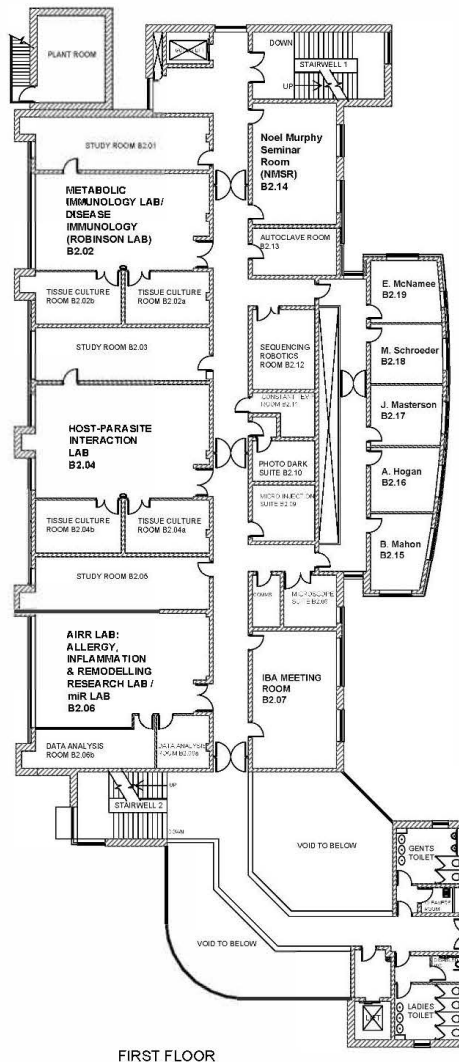
# MAPS OF THE DEPARTMENT





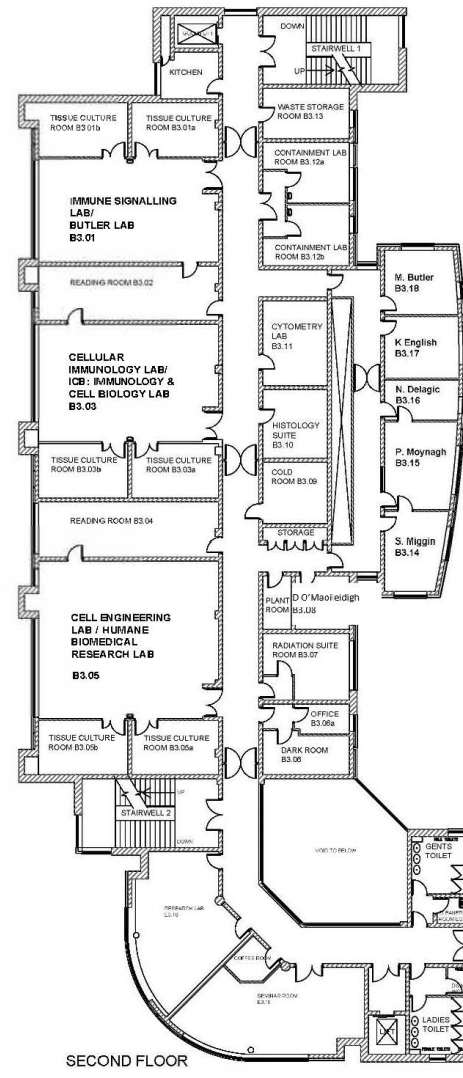
GROUND FLOOR

BIOSCIENCE BUILDING



FIRST FLOOR

BIOSCIENCE BUILDING



SECOND FLOOR

BIOSCIENCE BUILDING

