SCHOOL OF BIOCHEMISTRY & IMMUNOLOGY

Trinity College

JUNIOR SOPHISTER BIOCHEMISTRY 2024

Welcome to the School of Biochemsitry and Immunology and specifically the discipline of Biochemistry which underpins many other disciplines in the biological and biomedical sciences.
The first two years in College are very different to the Sophister years you are now entering; they were preparatory years whereas what you do now counts towards your degree. The ethos is also different. During years 1 & 2 the class size can be large and the atmosphere impersonal. Despite this, you coped and obviously did reasonably well as you have succeeded in obtaining a place in a dynamic School. However, the smaller class size now means that teaching can be more interactive – feel free to ask questions and initiate discussions in lectures. If you have not understood, assume that the lecturer has not explained things properly. Above all, try to see lecturers in supportive as well as directive roles. In this School you are allocated a tutor whom you will meet regularly and who will teach you in a small group situation; see this as advantageous for you and not an imposition although it means more work.

The mini-review, the practical assessment, and small group tutorials, will help you develop the organisation and style in writing needed to get a good degree. In your future career you will need to present clear, well-structured reports. Discuss your work and take cognisance of the comments made by the staff member – they are as important as the mark. Poor exam technique, e.g. failure to use diagrams, lack of sub-headings, *etc.,* is a feature of early undergraduate years and we must take early steps to remedy this. Many exam answers read like summaries, not developed accounts of a topic. Do not assume that the reader has a good knowledge of the subject, explain details properly. "What is the use of a book", thought Alice, "without pictures or conversations" (Lewis Carroll). Keep this in mind when you organise your answers and essays.

THE EUROPEAN CREDIT TRANSFER SYSTEM (ECTS)

The European Credit Transfer and Accumulation System (ECTS) is an academic credit system based on the estimated student workload required to achieve the objectives of a module or programme of study. It is designed to enable academic recognition for periods of study, to facilitate student mobility and credit accumulation and transfer. The ECTS is the recommended credit system for higher education in Ireland and across the European Higher Education Area.
The ECTS weighting for a module is a measure of the student input or workload required for that module, based on factors such as the number of contact hours, the number and length of written or verbally presented assessment exercises, class preparation and private study time, laboratory classes, examinations,

training placements, and so on as appropriate. There is no intrinsic relationship between the credit volume of a module and its level of difficulty. The European norm for full-time study over one academic year is 60 credits. The Trinity academic year is 40 weeks from the start of Michaelmas Term to the end of the annual examination period. Each ECT credit represents 20-25 hours estimated student input, so a 10-credit module will be designed to require 200-250 hours of student input including class contact time and assessments.
ECTS credits are awarded to a student only upon successful completion of the course year. Progression from one year to the next is determined by the course regulations. Students who fail a year of their course will not obtain credit for that year even if they have passed certain component courses. Exceptions to this rule are one-year and part-year visiting students, who are awarded credit for individual modules successfully completed.

OVERVIEW OF JS COURSE STRUCTURE AND ASSESSMENT
A Junior Sophister student must complete 60 European Credit Transfer System credits (ECTS credits) in the year. The 60 ECTS credits translate into 600 marks for the entire year that are distributed across the course as follows:
The core modules represent 40 credits and consist of:

1. Three 10 credit core modules consisting of lectures and linked practicals. Each of these modules will be assessed by continuous assessment (30% weighting) and by an exam paper (70% weighting). There will be a separate exam paper for each module. Total marks for this component = 300 marks

2. A 10 credit research skills module covering literature skills (a minireview of a topic proposed by a member of staff), presentation skills (involving a short oral presentation of the minireview topic), a set of linked practical sessions that represent "mini-projects" and analysis of quantitative data (problem sessions and associated exams, in semester 2). This module will be assessed by continuous assessment throughout the year.
Total mark for this module = 100 marks.

As part of the TEP course structure all JS students are obliged to take 20 additional credits (200 marks) made up of open modules and electives; these are both 5 credit (50 marks) components and you take 10 credits in total each semester. All JS students are obliged to take at least one Trinity Elective option, you may take two (one in each semester if you wish). Note that not all elective options are available to JS Biochemistry students (www.tcd.ie/trinity-electives). To choose Trinity Electives, go to my.tcd.ie and select the menu option 'My Trinity Electives'.
Academic Registry will contact you directly with further details. There are several combinations of open/electives available.

Sem1
You must take GEU33045 Genomes and Systems Biology (5 credits) and either an Elective or PGU33014: Cell Physiology and Pharmacology. (5 Credits).

Sem2:
You must take BIU33140: Introduction to Immunology and Immunometabolism and an Elective (5 credits) or GEU33M15 Medical Genetics or BI33475 Basic Neurobiology (both 5 credits)

Module Structure (with Open module Options)

Biochemistry	
Semester 1 (S1)	**Semester 2 (S2)**
Core Modules	
BIU33110 Protein Structure and Function. (10 credits)	BIU33010 Nucleic acids. (10 credits)
BIU33120 Membranes and Cell Biology. (10 credits)	BIU33160 Research skills in Biochemistry. (10 credits)
Open Modules Scenario I	
GEU33045 Genomes and Systems Biology (5 Credits)	BIU33250: Introduction to Immunology and Immunometabolism (5 Credits)
Trinity Elective (5 Credits)	GEU33215 Medical Genetics (5 Credits) OR BIU33475 Basic Neurobiology (5 Credits)
Open Modules Scenario II	
GEU33045 Genomes and Systems Biology (5 Credits)	BIU33250: Introduction to Immunology and Immunometabolism (5 Credits)
PGU33905: Cell Physiology and Pharmacology (5 Credits)	Trinity Elective (5 Credits)
Open Modules Scenario III	
GEU33045 Genomes and Systems Biology (5 Credits)	BIU33250: Introduction to Immunology and Immunometabolism (5 Credits)
Trinity Elective (5 Credits)	Trinity Elective (5 Credits)

Assessment, Progression and Repetition of a year.

Assessment:

Assessment is semesterised. All modules completed in a given semester must be assessed within that semester. The results for semester 1 are only provisional.

Modules to be assessed: core modules plus any open modules/ electives selected for that semester

Courts of Examiners will convene after Semester 2 and consider the results from both semesters.

You should note that in-course assessment elements of these modules includes MCQs and problem exams, as well as home-work elements (laboratory assessments, minireview *etc*.).

Timetables for examinations are published in advance of the dates of the examinations, and available on-line. The onus lies on each student to find out the dates of examinations by consulting these timetables. No timetables or reminders will be sent to any individual student. It is your responsibility to present at the correct time and place for assessment.

Students who pass the Junior Sophister examination can have the Ordinary BA degree conferred if they do not choose to proceed to Moderatorship.

The Junior and Senior Sophister years are integrated and the Junior Sophister mark (including the mark for Broad Curriculum) will contribute 30% to your final degree mark.

A reminnder of progression rules

Reassessment (supplemental exams) will be available for all years (including sophister years).
Progression will be on an annual basis.
Students will be permitted to carry failed modules from from semester to semester but not from year to year.
The number of credits to pass a year will be 60.
10 ECTS may be accumulated at 'Qualified Pass' (i.e.marks between 35-39%).
That is an overall mark of 40% and 40% or greater in 50 credits.
If a student has achieved both Fail and Qualified Pass grades in modules completed in semester 1 and semester 2, they will be required to present for reassessment in all failed components in all modules for which they obtained either a fail grade or Qualified Pass.
The reassessment session (supplemental exams) usually occurs at the end of August (1 week) to coincide with the start of Semester 1 of the next academic year.

Repetition of a year

Repetition of all years permitted
Students are not permitted to repeat any academic year more than once and may not repeat more than two academic years within a programme.
Repetition of a year is on a module by- module basis only.
A student's academic record on their transcript will show clearly the time lost through repetition of a year.

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Biochemistry Junior Sophister Year Core Lecture Module Structure 24/25: Semester 1 Provisional

	Internal Lecture code		Topic	Subject	Lecturer	Exam Format Essay Qs	Exam Paper
MODULE BIU33110 **Protein Structure** **Coordinator: Derek Nolan** 10 ECTS	BI3111		Protein Structure & Function	Alpha, beta, tertiary domain interactions	Amir Kahn	1 of 2 Qs	Paper 1 Sem 1
	BI3112			Active site architecture	Amir Kahn		
	BI3113		Protein Activity and Regulation	Functional group chemistry	Ken Mok	1 of 2 Qs	
	BI3114			Protein modifications	Jer Hayes		
	BI3115			Protein Analysis	Ken Mok		
	BI3116		Enzymology	Molecular enzymology	Jer Hayes	1 of 2 Qs	
	BI3117			Cofactors	Andrei Budanov		
	BI3118			Enzyme regulation	Derek Nolan		
MODULE BIU33120 **Membrane & Cell Biology** **Coordinator: Derek Nolan** 10 ECTS	BI3121		Membrane Structure	Lipid composition & organisation	Martin Caffrey	1 of 2 Qs	Paper2 Sem 1
	BI3122			Membrane proteins & transporters	Andrei Budanov		
	BI3123		Cytoskeleton and Vesicle Trafficing	Actin cytoskeleton	Derek Nolan	1 of 2 Qs	
	BI3124			Microtubules	Andrei Budanov		
	BI3125			Intermediate filaments	Emma Creagh		
	BI3127		Bioenergetics & Cell Signalling	Bioenergetics	Emma Creagh	1 of 2 Qs	
	BI3128			Cell signalling	Emma Creagh and Daneilla Zisterer		

Junior Sophister Year Core Lecture Module Structure 24/25: Semester 2 Provisional

	Internal code					Exam format Essay questions	
MODULE BIU33010 **Nucleic Acids**	BI3131		The Genome	Nucleic acid chemistry	TBC	1 of 2 Qs	Paper 1 Sem 2
	BI3132			DNA Structure	Andrew Bowie		
	BI3133			Replication	Daneilla Zisterer		
Coordinator: Derek Nolan	BI3134		Gene Expression	Transcription	Andrew Bowie	1 of 2 Qs	
	BI3135			Translation	Daniella Zisterer		
10 ECTS	BI3136		Molecular Genetic Mechanisms	Molecular biology techniques	Fred Sheedy	1 of 2 Qs	
	BI3138			Translation: a molecular perspective	TBC		
	BI3139			DNA repair mechanisms	David Finlay		

Provisional JS BIOCHEMISTRY — MICHAELMAS 2024

BIU33110: PROTEIN STRUCTURE
BIU33120: MEMBRANE & CELL BIOLOGY

BIOCHEMISTRY PRACTICALS TIMETABLE — ***JS Course Advisor: DEREK NOLAN***

VENUE: Teaching Lab (Rm 3.22), Level 3, Trinity Biomedical Sciences Institute, Pearse Street.

COLLEGE WEEK	DATES	TIME	MODULE	PRACTICAL	Location	PI
WEEK 3	Monday 09.09.24	10-11am	**BIU33110**	**Course Introduction – collect practical manuals, lab books**	**Lab 3.22**	**Derek Nolan**
	Monday 09.09.24	2-3pm	**BIU33110**	**Introduction to Practicals**	**LB11**	**Derek Nolan**
	Thursday 12.09.24	9-9.15am	**BIU33110**	**Lab Safety Talk**	**Lab 3.22**	**Joyce Rubotham**
	Thursday 12.09.24	9.15-10.15am	**BIU33110**	**Pipetting Exercise**	**Lab 3.22**	**Andrei Budanov**
	Friday 13.09.24	10-1pm	**BIU33120**	**pKa of *p*-Nitrophenol Practical**	**Lab 3.22**	**Derek Nolan**
WEEK 4	**Tuesday 17.09.24**	**10pm**	**BIU33110**	**Dilutions Assignment Due**	**Blackboard**	**Andrei Budanov**
	Thursday 19.09.24	3-4pm	**BIU33110**	**Protein Assay Pre-practical Tutorial**	**LB11**	**Andrei Budanov**
	Friday 20.09.24	10-1pm	**BIU33110**	**Protein (Bradford) Assay Practical**	**Lab 3.22**	**Andrei Budanov**
WEEK 5	Thursday 26.09.24	3-4pm	**BIU33110**	**Kinetic Pre-practical Tutorial**	**LB11**	**Jerrard Hayes**
	Friday 27.09.24	10-1pm	**BIU33110**	**Kinetics Practical**	**Lab 3.22**	**Jerrard Hayes**
WEEK 6	**Tuesday 01.10.24**	**10pm**	**BIU33120**	**pKa Assignment Due**	**Blackboard**	**Derek Nolan**
	Wednesday 02.10.24	4-5pm	**BIU33120**	**Tissue Culture Tutorial**	**L2.15**	**Danny Zisterer**
	Thursday 03.10.24	3-4pm	**BIU33110**	**RAS Expression Pre-practical Tutorial**	**Rm 5.16**	**Ken Mok**
	Friday 04.10.24	10-1pm & 2-5pm	**BIU33110**	**RAS Expression Practical Part 1**	**Lab 3.22**	**Andrei Budanov**
WEEK 7	Monday 07.10.24	10-1pm & 2-5pm	**BIU33110**	**RAS Expression Practical Part 2**	**Lab 3.22**	**Andrei Budanov**
	Tuesday 08.10.24	**10pm**	**BIU33110**	**Bradford Assay Assignment Due**	**Blackboard**	**Andrei Budanov**
WEEK 8	**Tuesday 15.10.24**	**10pm**	**BIU33110**	**Kinetics Assignment Due**	**Blackboard**	**Jer Hayes**
	Wednesday 16.10.24	2-3pm	**BIU33110**	**RAS Expression Post-practical Tutorial**	**Rm 5.16**	**Andrei Budanov**
WEEK 9	**READING WEEK**					
WEEK 10	**Tuesday 29.10.24**	**10pm**	**BIU33110**	**RAS Expression Assignment Due**	**Blackboard**	**Andrei Budanov**
	Friday 01.11.24	3-5pm	**BIU33120**	**c'AMP Binding Practical ONLINE**	**LB11**	**Danny Zisterer**
WEEK 11	Thursday 07.11.24	3-4pm	**BIU33120**	**Ion Transport Pre-practical Tutorial**	**Rm 5.16**	**Derek Nolan**
	Friday 08.11.24	10-1pm & 2-3pm	**BIU33120**	**Ion Transport Practical**	**Lab 3.22**	**Derek Nolan**
WEEK 12						
WEEK 13	**Tuesday 19.11.24**	**10pm**	**BIU33120**	**c'AMP Binding Assignment Due**	**Blackboard**	**Danny Zisterer**
WEEK 14	**Tuesday 26.11.24**	**10pm**	**BIU33120**	**Ion Transport Assignment Due**	**Blackboard**	**Derek Nolan**
	Thursday 28.11.24	12-2pm	**BIU33110/ BIU33120**	**Practical MCQ Exam**	**PAC ROOM**	**Derek Nolan**

Attendance at practicals is mandatory.

BIU33110 Protein structure

Module Code BIU33110

Module Name Protein structure

Semester taught Semester 1

Contact Hours Lectures: 28 hours, practicals: 24 contact hours including tutorials

Module Personnel Amir Khan(AK), Jer Hayes (JH), Ken Mok (KHM), Andrei Budanov (AB), Derek Nolan (DN)

Learning Aims

This module introduces the concept of proteins as molecular nanomachines that act as the workhorses in living cells. The relationship between protein structure and function and how drugs can be exploited to target proteins to treat diseases will also be covered. Topics covered in this module will include functional group chemistry and reaction mechanisms, protein structure and function as well as enzyme behaviour, enzyme kinetics, reaction mechanisms and regulation. The module includes laboratory sessions. Topics covered in the laboratory sessions are (i) protein determination & analysis, (ii) enzyme assay and kinetic analysis, (iii) expression and analysis of RAS recombinant protein. In addition there will be sessions on laboratory safety and pipetting exercises.

7. Module content: Programme of lectures and practicals –

Weeks are in blocks

Week	Lecture Topic & Lecturer	Practical
Semester 1		
Term week	**Protein Structure & Function** **10 lectures Amir Kahn**	
1	Amino acid chemistry	Lab safety
1	Conformation and dihedral angles	
1	Secondary structures and motifs	Pipette exercise
1	Tertiary and quaternary folding	
1	Universe of protein folds	
1	Principles of protein folding	
2	Chaperones and energetics of folding	Protein assay tutorial
2	Diseases of protein conformation	
2	Proteins and proteomics I	Protein assay
2	Proteins and proteomics II	
	Protein Activity and Regulation **9 lectures (KHM, JH)**	
2	Functional group chemistry I (KHM)	
2	Functional group chemistry II. (KHM)	
3	Functional group chemistry III (KHM)	
3	Principles of Spectrophotometry (KHM)	
3	Fluorescence of biomolecules (KHM)	Kinetics tutorial

3	Measurement of Protein Stability (KHM)	
3	High-Throughput Techniques and Lasers (KHM)	Kinetics
3	Post-Translational modifications I (JH)	
4	Post-Translational modifications II (JH)	
	Enzymology (9 Lectures) **(JH, AB, DN)**	
4	Enzyme reactions, reaction order, initial rate and linea (JH)	RAS tutorial
4	Enzyme kinetics, 2-substrate kinetics & topological rea (JH)	
4	Enzyme inhibition; reversible and irreversible. (JH)	
4	Temperature and pH effects on enzyme kinetics. (JH)	
4	Introduction to coenzymes, NAD(P)H and flavins (AB)	RAS part 1
5	Pyridoxal Phosphate (PLP) and PLP-dependent reactior	
5	Enzyme regulation by macromolecules and irreversible modifications DN	RAS part 2
5	Enzyme regulation by Reversible Modification DN	
5	Allosteric Regulation DN)	

Lecture Schedule (Note Week 1 of teaching term is week 3 of College timetable)

Practicals (weeks are term weeks)
Week 1: Introduction to Practicals, Lab Safety Talk , Pipetting Exercise
Week 2: Protein Assay Pre-practical Tutorial , Protein (Bradford) Assay Practical
Week 3: Enzyme Kinetics (General) Tutorial, Kinetic Pre-practical Tutorial, Kinetics Practical
Week 4-6: RAS Expression Pre-practical Tutorial,RAS Expression Practical Part 1 RAS Expression Practical Part 2, RAS Expression Post-practical Tutorial

Learning Outcomes

Recall and comprehend key knowledge and concepts of the hierarchy of polypeptide structure and the forces that stabilize the three-dimensional shape of proteins

Explain the link between a protein structure and its biological activity, and with appropriate examples, how human diseases arise from a deviation in structure

Organize enzymes into various classes and demonstrate the ability to critically develop an assay of biological activity

Recognize the functional group of biological molecules, such as lipids, DNA and proteins, and explain how the chemistry is linked to biological function

Define the mechanism of enzyme inhibitors and propose how this can be exploited for drug therapy

Describe the complex kinetics of multi-substrate catalytic reactions and identify and compare the assays utilized to study the mechanisms

Understand and explain the functional importance and structural properties of coenzymes such as pyridine nucleotides, flavins, and pyridoxal phosphates for enzyme catalysis.

Describe the various ways in which enzyme activity can be regulated and the significance these regulatory mechanisms for cellular and metabolic function.

Assessment BIU33110 Protein Structure 10 ECTS = 100

Assessment:
End of term exam: (70%): Exam Paper consisting of two parts.

Part A: Essay questions. Three sections each with 2 questions; answer one from each section: (Three questions, 60 marks in total; Paper weighting 85.7%).

Part B: Answer three short questions from six. Short questions may relate to lecture material, practicals or both (10 marks. Paper weighting 14.3%).

In course assessments, (total 30%): Pipetteing exercise (1%), Bradford (3%), Kinetics (5%), RAS: Recombinant Protein Expression Practical assignment (6 %), MCQ exam based on practicals (15%).

BIU33120 Membrane & Cell Biology

Module Name Membrane and Cell Biology

Semester taught Semester 1

Contact Hours 31 lecture hours; 12 hours practical/related tutorials

Module Personnel Martin Caffrey (MC)**,** Andrei Budanov (AB), Derek Nolan (DN), Emma Creagh (EC), Aisling Dunne (AD).

Learning Aims

This module covers the structure and function of biological membranes, the cytoskeleton, related signal transduction pathways and associated pathological conditions important in human health. The module is covers three central themes, membrane structure, the cytoskeleton, Bioenergetcis and Signalling. Topics will include: (i) the structure, function and organization of membranes & membrane proteins, (ii) the bioenergetic and transport processes that occur across membranes, (iii) an introduction to the tubulin, intermediate and actin-based cytoskeleton, (iv) a review of cell signalling pathways from a mechanistic and functional viewpoint.

The module will include the following laboratory sessions. (i) Use of spectrophotometry to determine an important physical constant of a buffer (pKa), (ii) An Introduction to cell culture, (iii) The use of radioisotopes in research, cAMP ligand binding studies, (iv) Mitochondrial swelling assays for transport across the mitochondrial inner membrane.

Module content: Programme of lectures and practicals – (provisional, confirm on MT.TCD)

Lecture content	
Membrane structure (11 lectures)	
Lipid composition & organisation - Lecturer: Martin Caffrey (5 lectures) Week	
6	An introduction to the functions of membranes and their lipid components. Lect 1
6	An detailed overview of the fatty acids found in the major membrane lipids including signalling fatty acids. Lect 2
6	An examination of the structure and function of glycerophospholipids, glycoglycerolipids, the lipids of archae, lipoproteins and lipopolysaccharide and the role of lipopolysaccharide LPS in innate immunity, phospholipases and their uses, glycerolipid biosynthesis, Lect 3
6	An examination of the structure and function of sphingolipids, GPI- anchored proteins, sterols (cholesterol, Lipitor, rubber). Immunologically relevant lipids and lipoproteins, and lipids in disease. Lect 4
6	Spontaneous self-assembly of lipids, the hydrophobic effect, membrane formation and stability, mesophase formation, detergency, model membrane systems, how lipid chemical structure relates to function, the fluid mosaic model, rafts, and lipidomics. Lect 5
Membrane proteins & Transporters - Lecturer: Andrei Budanov & Derek Nolan (5 lectures)	
6	Introduction to membrane protein structure & function: experimental techniques for study. L6 AB
8	Types and functions of the movement of membrane proteins, including endo-exocytosis. L7 AB
8	Mechanism of the assembly of membrane proteins into specific sides of the membrane. L8 AB
8	Synthesis of membrane glycoproteins and their roles within the membrane. L9 AB
8	Generation and use of membrane potentials, Membrane transport and energy coupling L10 DN

Cytoskeleton (11 Lectures)	
The actin cytoskeleton - Lecturer: Derek Nolan (4 lectures)	
8	Introduction to actin, structure, assembly and polarity of actin filaments L11
9	Structure of filamentous actin. Analysis of F- and G-actin in cells. L12
9	Actin binding, regulatory proteins. L13
9	Actin nucleation machinery and Wiskott Aldrich syndrome. Hijacking the actin cytoskeleton. Dendritic model for actin assembly and movement at the leading edge. L14
The Tubulin Cytoskeleton - Lecturer: Andrei Budanov (5 lectures)	
9	Structure of tubulin and microtubules, tubulin gene families and tubulin expression. L15
9	Assays of microtubular assembly, disassembly and polarity, drugs affecting microtubules. L16
9	Mechanism of microtubular assembly, dynamic instability and spindle synthesis. L17
10	Microtubular motors, types, mechanism of movement, regulation, physiological roles. L18
10	Tau protein, gene organization, expression, tubulin binding, function, dementias. L19
Intermediate filaments - Lecturer: Emma Creagh (2 lecture)	
10	Structure and polymerisation of intermediate filaments (IFs) and their classification into 6 major types plus their regulation, function and biomedical relevance L20 Intermediate filaments II L21
Bioenergetics and Signalling 10 lectures	
Bioenergetics - Lecturer: Emma Creagh (5 lectures)	
10	Introduction to Energy Transduction, Bioenergetics & Transport. L22
10	Mitochondrial Electron Transport Chain Complexes, Composition and Function. L23
10	The Chemiosmotic Theory and the Efficieny of Oxidative Phosphorylation. L24
11	Identifying membrane transporters families and their function.L25
11	Rotary Catalysis and the ATPsynthase. L26
Cell Signalling - Lecturers: Aisling Dunne/ Daniela Zisterer and Emma Creagh (5 lectures)	
11	Introduction to cell signalling and GPCRs (EC). GPCR signalling: evidence for extracellular localisation of receptor, discovery of G-proteins linked to cyclase, metabolic and transcriptional effects of cAMP. L27
11	GPCR signalling (continued) (EC). GPCR-linked signal-activated phospholipases, PLC as a paradigm with brief coverage of PLD and PLA2. L28
11	Receptor tyrosine kinases (RTKs) (AD/DZ). PDGF and EGF as examples of RTKs. Recruitment of SH2-domain containing modules focussing on PI3 Kinase. Overview of GAP, SOS and Grb2 proteins. Details of Map kinases cascades. L29
11	RTK signalling (continued) (AD/DZ). RTKs and PI3K. PKB (Akt) and PDK1 signalling. Pleckstrin homology domains. Insulin signalling and IRS1/2 activation. Overview of JAK/STAT signalling. L30
12	Steroid hormone signalling (EC). Steroid hormones and paradigms for transcriptional regulation. L31

Lecture Schedule

There will be approximately six lectures per week (where possible, check timetable for details) until the module is completed. The lectures will start on week six of teaching term before reading week and continue after reading week as indicated.

Practicals

Week 1: Use of spectrophotometry to determine an important physical constant of a buffer (pKa).
Week 4: An Introduction to cell culture.
WeeK 8: The use of radioisotopes in research, cAMP ligand binding studies.
Week 9: Mitochondrial swelling assays for transport across the mitochondrial inner membrane.

Week 12: MCQs

Learning Outcomes:

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

*Describe the chemistry and biochemistry of the major lipid classes.
*Demonstrate an understanding of lipid metabolism and how it relates to human diseases
*Recall and integrate key knowledge and concepts concerning the role of lipids in membrane structure and function.
*Demonstrate how physical chemical principles contribute to our understanding of how lipid structure relates to lipid function.
*Describe how model membranes are formed and their applications
*Explain what lipidomics is all about.
Describe the structure of monomeric actin and its assembly into filaments in non-muscle cells.
Explain how the assembly and disassembly of actin filaments is regulated

Assessment: BIU33120 Membrane & Cell Biology 10 ECTS = 100 %

Assessment

End of term exam: (70%): Paper consisting of two parts.
Part A: Essay questions. Three sections each with 2 questions; answer one from each section: (Three questions, 60 marks in total; Paper weighting 85.7%).
Part B: Answer three short questions from six. Short questions may relate to lecture material, practicals or both (10 marks. Paper weighting 14.3%).

In course assessment (total 30%): In course assessment: 3 home-work assignments (pKa practical 4%, cAMP Binding Assay = 5%, Ion Transport = 6%, (home work assessment: 15 marks total) and end of module MCQ (15 %).

BIU33010 Nucleic Acids

Module Name Nucleic Acids
Semester taught Semester 2
Contact Hours 43 hours; 28 lectures, 15 h practicals (provisional)

Module Personnel Daniela Zisterer**,** Andrew Bowie, Fred Sheedy, David Finlay,

Learning Aims

This module covers the structure and function of nucleic acids in a eukaryotic context. The basis of gene transcriptional regulation and mRNA translation are

described at a mechanistic and structural level in addition to the processes involved in DNA replication and repair. The lectures of this module are accompanied by a set of practical sessions (15 contact hours) that include (i) analysis of plasmid DNA, digestion and cloning, transformation and selection of bacteria; laboratory and tutorial sessions (ii) PCR and qRT-PCR, analysis and tutorial.

Module content: Programme of lectures and practicals (**provisional**)

week	Lecture Topic & Lecturer	Practical
Semester 2		
1	Nucleic acid chemistry I (TBC)	
1	Nucleic acid chemistry I (TBC)	
2	Molecular cloning I (F Sheedy)	
2	Molecular cloning II (F Sheedy)	
2	Molecular cloning III (F Sheedy)	
2	Genome structure I (M Baran)	
3	Genome structure II (M Baran)	
3	Genome structure III (M Baran)	
4	DNA replication I (D Zisterer)	
4	DNA replication II (D Zisterer)	
4	DNA replication III (D Zisterer)	
4	Eukaryotic transcription-an overview (A Bowie)	
5	Classes & properties of transcription factors (A Bowie)	
5	Eukaryotic transcription-initiation (A Bowie)	
5	Eukaryotic transcription-elongation and termination (A Bowie)	
6	Regulation of transcription apparatus (A Bowie)	
6	Signalling pathways & transcription (A Bowie)	
6		PCR data handling (TBC)
8	Eukaryotic translation I (D Zisterer)	
8	Eukaryotic translation II (D Zisterer)	
8		Molecular Biology Lab (D Nolan)
9	Transcription: a molecular perspective (TBC)	
9	Eukaryotic translation III (D Zisterer)	
9		Molecular Biology Lab
10	DNA damage-an overview (D Finlay)	
10	Translation: a molecular perspective I (TBC)	
10	DNA damage & excision repair pathways (D Finlay)	
10		RT-PCR (F Sheedy)
11	DNA strand break repair pathways I (D Finlay)	
11	Translation: a molecular perspective II (V Kelly)	
11	DNA strand break repair pathways II (D Finlay)	

11	Global DNA damage response (D Finlay)	

Lecture Schedule
Times and locations of Lectures and practical schedule will be confirmed before the start of semester 2.

Learning Outcomes:

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

- Recognize the functional groups of nucleic acids and relate how the chemistry is linked to biological function.
- Recall and integrate key knowledge and concepts about DNA structure, function and process and assess the importance of DNA replication and DNA repair.
- Describe the molecular and structural features of transcription initiation, transfer RNA charging and ribosomal translation.
- Recall and integrate key knowledge and concepts about how gene expression is regulated and demonstrate an understanding of the processes and importance of transcription and translation.
- Relate the theory behind techniques used in recombinant DNA technology and evaluate how these techniques can be applied to biological problems.
- Understand the different types of DNA damage, how they occur and the implications for genome stability.
- Exhibit knowledge of the different repair pathways that exist to deal with the range of types of DNA damage.
- Appreciate the signal transduction pathways that sense DNA damage and coordinate the cells response.

Assessment: BIU33010 Nucleic Acids 10 ECTS = 100 %.
70% End of term examination, 30 % in course assessed

End of term exam: (70%): 70 % End of year exam Paper consisting of two parts.

Part A: Essay questions. Three sections each with 2 questions; answer one from each section: (Three questions, 60 marks in total; Paper weighting 85.7%).

Part B: Answer three short questions from six. Short questions may relate to lecture material, practicals or both (10 marks. Paper weighting 14.3%).

In course assessment (30%): Lab assignments (15% of course) plus MCQ exam of practicals/techniques (15% of course).

Module Coordinator: Dr Daniela Zisterer
Email: dzistrer@tcd.ie, Phone: 018961628

BIU33160 Research Skills Biochemistry

Module Code BIU33160

Module Name Research Skills (Biochemistry)

Semester taught Semester 2

Contact Hours 45 (various components)

Module Personnel Biochemistry and Immunology Staff

Learning Aims

This aim of this module is to develop research, critical analysis and communication skills that are essential for a graduate biochemist. Students will undertake a major written review of a subject area of biochemical relevance under the supervision of a member of staff of the School of Biochemistry and Immunology. This will involve preparation of a written review and an oral presentation on the topic.

Critical analysis of primary data is another key skill and this will be addressed through quantitative analysis of three data sets (2 sessions/set). The first seesion will cover an introduction to the probelm, students will be given a problem for home work which will then be subject to a worked analysis is session 2. The module also includes a set of linked practical sessions covering: (i) Cancer metabolism (7) and (ii) culture and differentiation of a medically important protozoan parasite (20 h). These practicals involve multiple sessions and represent "mini-projects" to prepare students for the final year research project. Finally the module includes a series of four workshops given by experienced staff members on useful career skills.

Module content: (6 h QP sessions and tutorials, 27h Practicals, 4h Workshops, plus minireview presentations, Lab based MCQ)

Provisional outline of term (to be confirmed before semester 2)

Week	**Lecture Topic & Lecturer**	**Practical/Note Time TBC**
1		
1	Quantitative Problem Session 1 (tbc)	
2		Cancer Metabolism (KHM)
2	Quantitative Problem Session 2 (tbc)	
3		
3	Quantitative Problem Session 3 (tbc)	
4		Trypanosomes (DN

4	Quantitative Problem Session 4 (tbc)	
5	Quantitative Problem Session 5 (tbc)	Trypanosomes (DN
6	Quantitative Problem Session 6 (tbc)	
6	Mini-Review Presentations Tutorial (DN)	
7	**Reading Week**	
8	Research Careers Session 1 – Applications & CV (TBC)	
9	Research Careers Session 2 – Grants & Proposals (TBC)	
10	Research Careers Session 3 – Publishing & Peer Review (TBC)	
11	Research Careers Session 4 – Outside Academia (TBC)	
12	***Lab-based MCQ***	
12	***Quantitative Problem Exam***	

Lecture Schedule
Lecture, tutorial and practical schedule will be confirmed before the start of semester 2.

Learning Outcomes:

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

- Carry out a systematic literature review in a given area using databases, bibliography and review articles to source the relevant and important studies.
- Critically analyse research findings in terms of experimental design and outcomes.
- Write a clear, accurate and thorough scientific essay giving perspective and opinion.
- Present and discuss findings in a small group format.
- Apply data analysis and statistical techniques to scientific and experimental problems.
- Increase knowledge of the range of cutting-edge molecular techniques employed in immunological and biochemical research.
- Compose a targeted and specific academic CV clearly demonstrating key skills acquired and experience.

Assessment: This module is 100% in-course assessed.

Summary of Component credits
Minireview (written and oral presentation) 5 credits (50% of module marks)

Practicals (lab assigments and MCQ) 3 credits (30% of module mark)
Qunatitative problem sessions 2 credits (20% of module marks).

Breakdown

40 % of the module marks go toward the mini-review which will be corrected by experienced academic staff member.
10 % of the module marks is for the in-class presentation based on the findings of the mini-review.
15 % of the marks go towards 2 assignments based on the associated Practicals'.
15 % of the marks will be assessed by an in-class MCQ based upon the Practical material at the end of term
20% will be based on the quantitative problem sessions which will be examined by an in class exam at the end of the module.
IMPORTANT: You will be notified of the times and locations of these exams at the beginning of semester 2. It is your resonsibility to be present for this exam. Be advised that these dates cannot be changed nor can alternative times be provided.

Module Coordinator Derek Nolan
Email: denolan@tcd.ie
Phone 01-8962455

Open Modules

3.5 GEU33045 Genomics & Systems Biology

1. Module Code GEU33045 (Open Module)
2. Module Name Genomics & Systems Biology
3. Semester taught 1
4. Contact Hours 24
5. Module Personnel Mike Dolan, Adrian Bracken, Carsten Kröger, Kenneth Mok
6. Learning Aims The aim of this module is to equip students with a comprehensive understanding of the methods used in the fields of genomics, proteomics and metabolomics and how these methods are used for basic research, biotechnology, agriculture and medicine. To this end, several applications from work in diverse organisms (bacteria, fungi, plants, animals including humans) in addition to specific diseases and disorders (Schizophrenia and Cancer) will be presented. The module further introduces students to the field of systems biology and outlines how systems biology differs from the classic reductionist approach used in biology.

7. Module content:

Week	Day & Time	Lecture Topic & Lecturer
3	Tue 10th Sept 17:00-18:00	Introduction to Genomics and Systems Biology (Dolan)
3	Wed 11th Sept 17:00-18:00	History of DNA Sequencing I (Dolan)
4	Mon 16th Sept 17:00-18:00	History of DNA Sequencing II: The Human Genome Project (Dolan)
4	Tue 17th Sept 17:00-18:00	Modern Day DNA sequencing I: 2nd Generation Sequencing Technologies (Dolan)
5	Mon 23rd Sept 17:00-18:00	Modern Day DNA sequencing II: 3rd Generation Sequencing Technologies (Dolan)
5	Tue 24th Sept 17:00-18:00	Structural and Comparative Genomics (Dolan)
6	Mon 30th Sept 17:00-18:00	Genomic Architecture of Schizophrenia (Dolan)
6	Tue 1st Oct 17:00-18:00	Transcriptomics: Revealing Gene Expression (Dolan)
7	Mon 7th Oct 17:00-18:00	Profiling RNA expression in the Schizophrenic Brain (Dolan)
7	Tue 8th Oct 17:00-18:00	Regulation of Gene Expression (Dolan)
7	Wed 9th Oct 17:00-18:00	Single-cell and spatial Transcriptomics (Dolan)
8	Mon 14th Oct 17:00-18:00	Single-cell dissection of the human brain in health and disease (Dolan)
8	Tue 15th Oct 17:00-18:00	*Revision of material, discussion and answering student questions (Dolan) - tutorial*
9		**Study/Review week**
10	Tue 29th Oct 17:00-18:00	Bacterial genomes and comparative genomics (Kröger)
11	Mon 4th Nov 17:00-18:00	Functional genomics in bacteria (Kröger)
11	Tue 5th Nov 16:00-17:00	Introduction into the epigenome: histone and DNA modifications (Bracken)
11	Tue 5th Nov 17:00-18:00	Methods to analyse the epigenome; the ENCODE project (Bracken)
12	Mon 11th Nov 17:00-18:00	Cancer profiling and classification of tumour types (Bracken)
12	Tue 12th Nov 17:00-18:00	Using genomic information for the development of cancer therapies (Bracken)
13	Mon 18th Nov 17:00-18:00	Proteomics: Identify/characterise/quantify; Mass Spec and other technologies (Mok)
13	Tue 19th Nov 17:00-18:00	Quantitative proteomics; clinical proteomics (Mok)
14	Mon 25th Nov 17:00-18:00	Interaction/affinity proteomics; metabolomics introduction (Mok)
14	Tue 26th Nov 16:00-17:00	Metabolomics technologies (Mok)
14	Tue 26th Nov 17:00-18:00	*Revision of material, discussion and answering student questions (all lecturing)*
15		**Revision Week**
16		**Assessment Week**

NOTE: Venue LTEE3

8. Learning Outcomes: Upon successful completion of this module, students will be able to describe experimental approaches used in the fields of genomics, proteomics and metabolomics. They will understand how to leverage these methods to analyze complex biological systems and questions. Students will be able to evaluate the applications of these techniques in biological sciences and discuss case studies involving specific diseases and disorders. Finally, they will be able to differentiate between systems biology and traditional reductionist approaches in biology.

9. Recommended Reading List: none

10. Assessment Details: One 1.5-hour exam paper at the end of semester 1

11. Module Coordinator Mike Dolan MJDOLAN@tcd.ie

Executive Officer: Genetics

Email: genetics@tcd.i, Phone x1140

PGU33905: Cell Physiology and Pharmacology

Module Code: **PGU33950**

Module Name: **Cell Physiology and Pharmacology**

Semester taught: **Semester 1**

Contact Hours: **25**

Module Coordinator:

Dr Róisín McMackin

Learning Aims:

This module has two sections. The first half of the module covers lectures focused on (i) membrane structure, proteins and properties; (ii) receptors and neurotransmitters, (iii) the principles of drug action, drug development and drug targets. These lectures are designed to consider the structure of the membrane, the changes that occur in the membrane under different biological circumstances using age as an example, and role of membrane proteins. Cell functions, for example, the control of intracellular calcium by cells and transmitter release will be considered in the context of the membrane proteins that impact on these functions. The second half of the module covers lectures focused on (i) a general introduction to pharmacokinetics and pharmacodynamics, (ii) pharmacology of the autonomic nervous system, (iii) therapeutic targets in neurodegenerative and affective disorders and (iv) drug treatments for cardiovascular disease.

Delivery: The module will be delivered face for core and open module students. However, it is important to note that it may not be possible to timetable for all open module students and where clashes arise these sessions will provided online in the form of recorded lectures (on blackboard).

Learning Outcomes:

- Appreciate the role lipids play in the composition and function of plasma membranes.
- Be aware of the role that fatty acids and lipids in cell function, and the impact of ageing on membrane lipids and consequently on cell function.
- Be in a position to describe how accumulation of reactive oxygen species impacts on membrane lipids and to appreciate how these changes contribute to diseases.
- Appreciate the importance of controlling intracellular calcium concentration.
- Be able to characterize the steps leading to transmitter release.
- Be in a position to describe the techniques used to analyse lipids, intracellular calcium concentration and neurotransmitter release.
- Demonstrate an understaning of the physiology and associated pathophysiology of the key systems discussed.
- Describe how drugs produce their theurapeutic and side effects on the body.

- Be able to describe the mechanism(s) of action of selected drugs (giving examples) for a given ailment and be aware of the indications and contraindications of drugs.

Note College Week is term week 1, starting Monday 9th sept

Provisional outline:

Module content: **Lectures (Venue: TBSI)**

Week	Lecture Topics	Lecturer
3	Introduction (B2.72/3/4)	Dr Tamara Boto
3	Lipid Membrane I (B2.36/7/8)	Dr Tamara Boto
3	Lipid Membrane II (LB11)	Dr Tamara Boto
4	ROS, Age & Lipid Membrane I	Dr Tamara Boto
4	ROS, Age & Lipid Membrane II	Dr Tamara Boto
4	Calcium I (B2.72/3/4)	Dr Tamara Boto
4	Calcium II (B2.36/7/8)	Dr Tamara Boto
4	Plasm Memb Prot I (LB11)	Dr Tamara Boto
5	Plasm Memb Prot II (B2.72/3/4)	Dr Tamara Boto
5	Membrane recep (B2.36/7/8)	Dr Tamara Boto
5	Neurotransmitter I (LB11)	Dr Tamara Boto
6	Neurotransmitter II	Dr Tamara Boto
6	Neurotransmitter III (B2.72/3/4)	Dr Tamara Boto
6	Introduction to Physiological Pharmacology: Pharmacokinetics & Pharmacodynamics I	Dr Eva Jimenez
6	Introduction to Physiological Pharmacology: Pharmacokinetics & Pharmacodynamics II	Dr Eva Jimenez
7	Autonomic Nervous System: Cholinergic system I	Prof Mark Cunningham
7	Autonomic Nervous System: Cholinergic system II	Prof Mark Cunningham
7	Autonomic Nervous System: Adrenergic system I	Prof Mark Cunningham
7	Autonomic Nervous System: Adrenergic system II	Prof Mark Cunningham

7	Neuropharmacology: Affective Disorders (2 Hours)	Prof Mark Cunningham		
7	Cardiovascular Pharmacology I	Dr Wilby Williamson		
8	Cardiovascular Pharmacology I	Dr Wilby Williamson	Tue 18th Oct	16:00-17:00

Recommended Reading List:

Alberts, Bruce, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. Molecular Biology of the Cell. 5th Edition. New York: Garland Science. ISBN 978-0-8153-4111-6

Rang and Dale's Pharmacology, Elsevier, ISBN: 9780702053634. – Medical Pharmacology at a Glance, 8th Edition, Michael J. Neal, John Wiley & Sons, ISBN: 9781118902400

Assessment Details:

- Continuous Assessment: MCQ 30%
- End of year exam question 70% - 35% Cell Physiology; 35% Pharmacology

SEO: Christine Monahan
Email: Physiology@tcd.ie
Phone: 01-8962

BIU33250 Introduction to Immunology & Immunometabolism

Module Code BIU33250
Module Name Introduction to Immunology & Immunometabolism
Semester taught Semester 2 (Lectures)
Contact Hours 22
Module Personnel Cliona O'Farrelly (COF), Frederick Sheedy (FS), Jean Fletcher (JF), Richard Porter (RP), Luke O'Neill (LON),

Learning Aims This module introduces to the basic components and function of the immune system – the molecules, cells, tissues and organs that make up the immune system. It will illustrate the immune responses to infection. Additionally, it will introduce students to the importance of central energy and intermediary metabolic pathways before considering how they are dysregulated in diseases like cancer and also how we can harness this knowledge for new immunotherapies

Module content: Provisional for semester 2

Week	Lecture Topic & Lecturer	Practical/Note
23	Introduction – The Immune System (COF)	
23	Innate Immunity 1 – Innate Defences (FS)	
23	Innate Immunity 2 – Cellular Response to infection (FS)	
23	Innate Immunity 3 – PRR Signalling (FS)	
24	Innate Immunity 4 – Cytokines (FS)	
24	T-cells 1 – DCs & Antigen Presentation (JF)	
24	T-cells 2 – T-cell Receptor (JF)	
24	T-cells 3 – T-cell Signalling (JF)	
24	T-cells 4 – Effector T-cells (JF)	
25	B-cells 1 – B-lymphocytes & Plasma Cells (COF)	
25	B-cells 2 – Antibodies (COF)	
25	B-cells 3 – Disorders of the immune system (COF)	
26	Advanced Metabolism 1 – Central Energy Metabolism (RKP)	
26	Advanced Metabolism 2 – Intermediary Metabolism (RKP)	
26	Advanced Metabolism 3 – PPARs (RKP)	
26	Advanced Metabolism 4 – Nucleotide Metabolism (RKP)	
27	Advanced Metabolism 5 – Cancer Cell Metabolism (RKP)	
27	Advanced Metabolism 6 – Immune Cell Metabolism (RKP)	

27	Immunometabolism 1 (LON)	
27	Immunometabolism 2 (LON)	
28	***In-class MCQ***	
29	**Reading Week**	
35	**Trinity Week**	
36	**Revision Week**	
37/3	**Assessment**	

Lecture schedule will be confirmed before start of semester 2.

Learning Outcomes:

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

- Identify cells, receptors and soluble component of the innate immune system and how they function to eliminate pathogen.
- Define how an adaptive immune response is initiated and how different types of adaptive immune responses are used to eliminate particular pathogens.
- Identify how the immune system can cause disease and how it can be exploited therapeutically
- Recall key central energy and intermediary metabolic pathways and appreciate their importance in cellular function
- Apply knowledge on cellular metabolism to diseases including cancer and inflammation

Recommended Reading List:

The recommended text for this module is Janeway's Immunobiology published by Norton's Books, currently in its 10th Edition.
Further reading will be given out by lecturers during the module.

Assessment Details:

60% End of year examination, 40% in course assessed.

In course assessment: In-class end of module MCQ exam covering lecture material

Module Coordinator Aisling Dunne
Email: AIDUNNE@tcd.ie

BASICS OF NEUROBIOLOGY

1. Module Code BI33475
2. Module Name BASICS OF NEUROBIOLOGY
3. Semester taught Semester 2
4. Contact Hours 16 hours (16 Lectures)
5. Module Personnel Drs Gavin Davey & David Loane
6. Learning Aims: This module focuses on chemical transmission between neurons, how neurotransmitters are classified and identified and describes typical and atypical neurotransmitters and their functions in the brain. It considers mechanisms in which abnormal neurotransmission gives rise to common neurological & psychiatric disorders.

7. Module content: Provisional Programme of lectures and practicals – (Please Complete the Table in the format shown)

Week	Lecture Topic & Lecturer
Semester	
22	Intro: cell types in the brain and their functions; NT typ criteria (GD)
22	Techniques for studying neurotransmission (GD)
22	Acetylcholine release & exocytosis (GD)
23	Biogenic Amines I (GD)
23	Biogenic Amines II & brain disorders (GD)
23	Glutamatergic neurotransmission systems
24	GABAergic neurotransmission systems (GD)
24	Atypical Neurotransmitters I (GD)
24	Atypical Neurotransmitters II (GD)
25	Brain lipids, gangliosides & lipid mediators (DL)
25	Intracellular trafficking & signalling (DL)
25	Inborn metabolic diseases of the brain (DL)
26	Inborn metabolic diseases of the brain (DL)
26	Neurobiology of schizophrenia & autism (DL)
27	Neurobiology of mood and anxiety disorders (DL)
27	Neurobiology of addiction (DL)

8. Learning Outcomes:

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

- Describe the cell types in the brain and common techniques that enable chemicals with neurotransmitter-like properties to be identified
- Understand the criteria that need to be satisfied in order for a chemical to be classified as a neurotransmitter
- Develop a knowledge of the biogenic amines (acetylcholine, dopamine, noradrenaline, adrenaline, serotonin) and the properties that allow them to be classified as neurotransmitters

- Develop a knowledge of glutamate and GABA and the properties that allow them to be classified as neurotransmitters
- Develop a knowledge of atypical neurotransmitters (NO, CO, D-serine, neuropeptides, purines) and the properties that allow them to be classified as neurotransmitters
- Develop a knowledge of how dysfunctional neurotransmitter systems give rise to common neurological & psychiatric disorders

9. Recommended Reading List:
Basic Neurochemistry (Siegal, Albers, Brady, Price) Academic Press, 7th Edition. (6th Edition is online free at https://www.ncbi.nlm.nih.gov/books/NBK20385/?term=basic%20neurochemistry)
Principles of Neural Science by Eric Kandel , James Schwartz , Thomas Jessell , Steven Siegelbaum , A.J. Hudspeth

10. Assessment Details: Examination (70% written examinations; 30% continual assessment involving a 2500 word literature review on a neuroscience topic allocated to each student).

11. Module Coordinator: Dr Gavin Davey
Email: gdavey@tcd.ie
Phone: 018968408

Executive Officer: Gabrielle Mc Cabe
Email: GAMCCABE@tcd.ie
Phone: 018964195

12. Module Website NA

Trinity Elective **5 ECTS = 50 marks**

100% in course assessed

Note that this module may be in either of two semesters depending on the choice.

LECTURE TIMETABLES Practical times will be confirmed before hand.
Lecture timetables are published in My.TCD.ie. Hard copies are not provided.
Timetables listed in this booklet are for reference only, check your timetable on MY.TCD portal.
We will endevour to notify you by email if there are 'last minute' changes.

RULES REGARDING ATTENDANCE AT LECTURES
Attendance: The college regulations regarding attendance, as laid out in 'General regulations and information' in Part 1 of the College Calendar (http://www.tcd.ie/about/calendar/ part1/index.php), will apply. For your information relevant extracts are reprinted here.

'All students should enter into residence in or near Dublin and must begin attendance at the College not later than the first day of teaching term, and may not go out of residence before the last day of teaching term, unless they have previously obtained permission from the Senior Lecturer through their tutor.
Students must attend College during the teaching term. They must take part fully in the academic work of their class throughout the period of their course. Lecture timetables are published on College and school or department notice-boards before the beginning of Michaelmas lecture term. The onus lies on students to inform themselves of the dates, times and venues of their lectures and other forms of teaching by consulting these timetables.'

'*In special circumstances exemption from attendance at lectures for one or more terms may be granted by the Senior Lecturer; application for such exemption must be made in advance through the tutor. Students thus exempted must perform such exercises as the Senior Lecturer may require.*'

'*Students who in any term have been unable, through illness or other unavoidable cause, to attend the prescribed lectures satisfactorily, may be granted credit for the term by the Senior Lecturer but must perform such supplementary exercises as the Senior Lecturer may require. The onus for informing the Senior Lecturer of illness rests with individual students* ***who should make themselves familiar with the general and more detailed school or course regulations regarding absence from lectures or examinations through illness.*** *In addition, issues with students may arise from time to time, which in the opinion of the Senior Lecturer affect a student's ability or suitability to participatein his or her course. If requested by the Senior Lecturer, students will be required to undergo a medical examination or assessment by a doctor or specialist nominated by the Senior Lecturer at the expense of the College for the purpose of obtaining an opinion as to the student's medical fitness to continue with his/her studies or as to his/her ability or suitability to participate in his/her course to the standards required by the College.'*

'Students who find themselves incapacitated by illness from attending lectures (or other forms of teaching) should immediately see their medical adviser and request a medical certificate for an appropriate period. Such medical certificates should be copied to the faculty, school or department office, as appropriate, by the student's tutor.'

Additional requirements of the School of Biochemistry and Immunology with regard to attendance at lectures are:
Students are required to attend and participate in all lectures, pre-practical talks, small group tutorials and problem sessions that have been organized for them. Students must sit all of the annual examination papers.

RULES REGARDING ATTENDANCE AT PRACTICALS & SUBMISSION OF COURSE WORK
The requirements of the School of Biochemistry and Immunology with regard to the satisfactory attendance at practicals, completion of course work, late submissions and release of marks are laid out in the introduction to the laboratory manual. Practicals cannot be re-run to facilate any absence. You must notify the School/course co-ordinator if you cannot attend a practical. You must have a valid reason to justify your absence from a practical class.

If you have permission to be absent from a practical an alternative form of assessment will be made available in lieu of a practical submission, you cannot simply use sample data.

STUDENTS WITH DISABILITIES / LONG TERM HEALTH ISSUES
The School's Academic Liaison Officer is Ms Martha Motherway-Gildea (motherm@tcd.ie), based in the Preparation Room, Biochemistry Teaching Laboratory.
Please notify Ms Motherway in confidence if you have any disabilities or health issues that might affect your ability to participate in lectures, complete your practicals or the associated assignments. Large print manuals can be provided to students with a visual impairment. Students are encouraged to register with the disability officer, Mr Declan Reilly - reillyde@tcd.ie. It is particularly important to do this well before the examination period. Please note it is the student's responsibility (not the liason officer's or your college tutor's) to reigister with the disability office.

PROVISION OF COURSE MATERIAL IN BLACKBOARD
Practical assignments, lecture resource materials, and end-of-module practical MCQ exams are supplied through the relevant module in Blackboard (mymodule.tcd.ie). If a module is not visible to you send an email to bblearn@tcd.ie giving the module code and your college user name. If the issue is not resolved contact denolan@tcd.ie.

SUBMISSION OF COURSE WORK The submission process will be via Blackboard. The process and due date will be specified on the assignment. The penalites relating to late / non submission are given in the Practical Manual.

LITERATURE SKILLS/MINI-REVIEW Students will be required to carry out a literature search and write an extended essay consisting of diagrams plus 6,000-8,000 words in the text. The ability of a student to survey and evaluate the

literature and produce an organised, cogent synthesis will be taken into account. Guidelines on writing a review and a sample review are posted in Blackboard. Minireviews have been assigned randomly and you will be given your topic in the first week of term. In preparation for the review you could look at some review articles in *Current Opinion in Cell Biology* or *Current Opinion in Immunology.* All reviews must be typed in 12 point font and spacing must be at least 1.5. Students are required to sign a declaration to the effect that the mini-review is entirely their work and to submit their review to Turnitin.

SMALL GROUP TUTORIALS

Each student meets regularly with a tutor, in groups of 2-3 students. Tutors have been assigned and will stay with you through-out the year. **Please contact your tutor during the first week of the Michaelmas Semester to arrange the first meeting.** Tutorials (3-4 per term) will include exercises covering core concepts in biochemistry, training in getting the most out of research papers, and giving presentations on topics chosen by the tutor. Tutorials are useful times to discuss lecture material and practicals, the various exercises should help in your development as a scientist, and in examinations.

JUNIOR SOPHISTER SUMMER AWARD (Provisional)

The School usually awards an internship to the JS student in the Biochemistry programme who obtains the highest total mark in the Practical assignments/laboratory work/in course component of the core modules. The award will take the form of salary for six weeks to work in one of the research laboratories in the School. Details of how to apply will be circulated in the Hilary Semester. Please note that students who spend any time in a research lab during the summer (whether paid or unpaid) cannot do their SS project in that lab.

ELI LILLY INTERNSHIP

In the past Eli Lilly, a pharmaceutical company based in Cork, have sponsored a summer internship for one of our JS students, although this has yet to be confirmed for 21/22. The process involved a presentation in sem 1 to give an overview of the company and to provide information on C.V. preparation and interview skills. Students interested in applying for the internship will submit formal applications and a short-list of candidates will be interviewed. The process usually concluded by December. In the past the internship started on the Tuesday after the June bank holiday weekend and will run for approximately 12 weeks.

For the past number of years, a number of JS Summer Internships have been available in the University of Massachusetts Medical School, Worcester, MA. Details of these internships for summer 25 and how to apply will be circulated during the year, usually at the start of semester 2.

PLAGIARISM

The College Calendar defines plagiarism, describes the levels of plagiarism and the sanctions. All students are required to complete the online tutorial 'Ready, Steady, Write'. It is located at http://tcd-ie.libguides.com/plagiarism.

When you submit coursework you will have signed a declaration to the effect that you have read and understood the plagiarism provisions of the College. Therefore all cases of matching text will be treated as Level 3 offences, see http://tcd-ie.libguides.com/plagiarism/levels-and-consequences, zero marks will be assigned to all plagiarised text and there will be no option to resubmit.
Where an assignment (or part assignment) cross matches with text in the assignment of another student both students and their tutors will be notified by email and invited to explain the match. As both students will have signed a declaration that they have read and understood the plagiarism provisions of the College all cases of matching text will be treated as Level 3 offences by both students, zero marks will be assigned to the two texts and there will be no option to resubmit. Level 3 applies even if a student was given permission to use another student's work.

USEFUL INFORMATION

Erasmus/International Student Coordinator:

Dr Andrei Budanov, budanova@tcd.ie

Director of Teaching and Learning:

Dr Jean Fletcher

School Office: biochem@tcd.ie

Executive Officer: Úna Murphy

Email: MURPHYU1@tcd.ie

Phone: 018961608

Locations/Venues Guideline

TBSI = Trinity Biomedical Sciences Institute

B2.50 = Seminar Room, Level -2, TBSI

B2.72-2.74 = Combined Tutorial Room, Level -2 TBSI

CHLLT = Chemistry Large Lecture Theatre, located in the Chemistry Building on campus

FRED = Room 5.16, Level 5, TBSI

JOLY 4 = Lecture Theatre located in the Hamilton Building on main campus

LB11 = Lecture theatre (Lloyd Building) situated in Trinity Centre for Neuroscience, Lloyd Building,(enter building and take staircase downwards on your left).

LTEE1 EE4-5 = Lecture Theatre 1, Basement, East End

LTEE2 = Lecture Theatre 2, Basement, East End

LTEE3 = Lecture Theatre 3, Basement, East End

MacNeill 3 = lecture in the Hamilton Buyilding

Maxwell 5 = lecture theatre in the Hamilton Building

MOYN LT = Moyne Lecture theatre, located in the Moyne Building (Microbiology)

Rm 3.22 = the main Biochemistry Teaching Lab on Level 3 in TBSI

Room 6.07 = Seminar Room, Level 6, TBSI

SALMON 1 = Salmon Lecture Theatre, Ground Floor, Hamilton Building, East End

TCJ1 = will refer to locations in St. James (for Mol. Meds)

TERCENTENARY = L2.15 = Tercentenary Hall, Level 2, TBSI

QUEK = B1.15 = Stanley Quek Lecture Theatre, level -1, TBSI

ACADEMIC REFERENCES

Students applying for Summer Internships abroad require an academic reference. To assist us in processing the <u>many</u> requests that we receive please follow the guidelines below:

Two weeks is an appropriate time for the processing of a reference.

It is not a good idea for three people who are going to the same institution to each get their reference from the same, one, member of staff.

In order to facilitate your referee it would be a good idea to provide the following:

- Title of project, Nature of project / Internship, max two lines.
- Where you are going, why are you going there, what do you hope to achieve?
- How will this internship / summer project *etc* contribute to your professional development
- Transcript from Science Course Office with JF and SF results.
- If appropriate, a copy of breakdown of JS course works marks to date: Obtainable from the office, must be stamped with office stamp and provided to staff as a hard copy.