



Trinity College Dublin

Coláiste na Tríonóide, Baile Átha Cliath

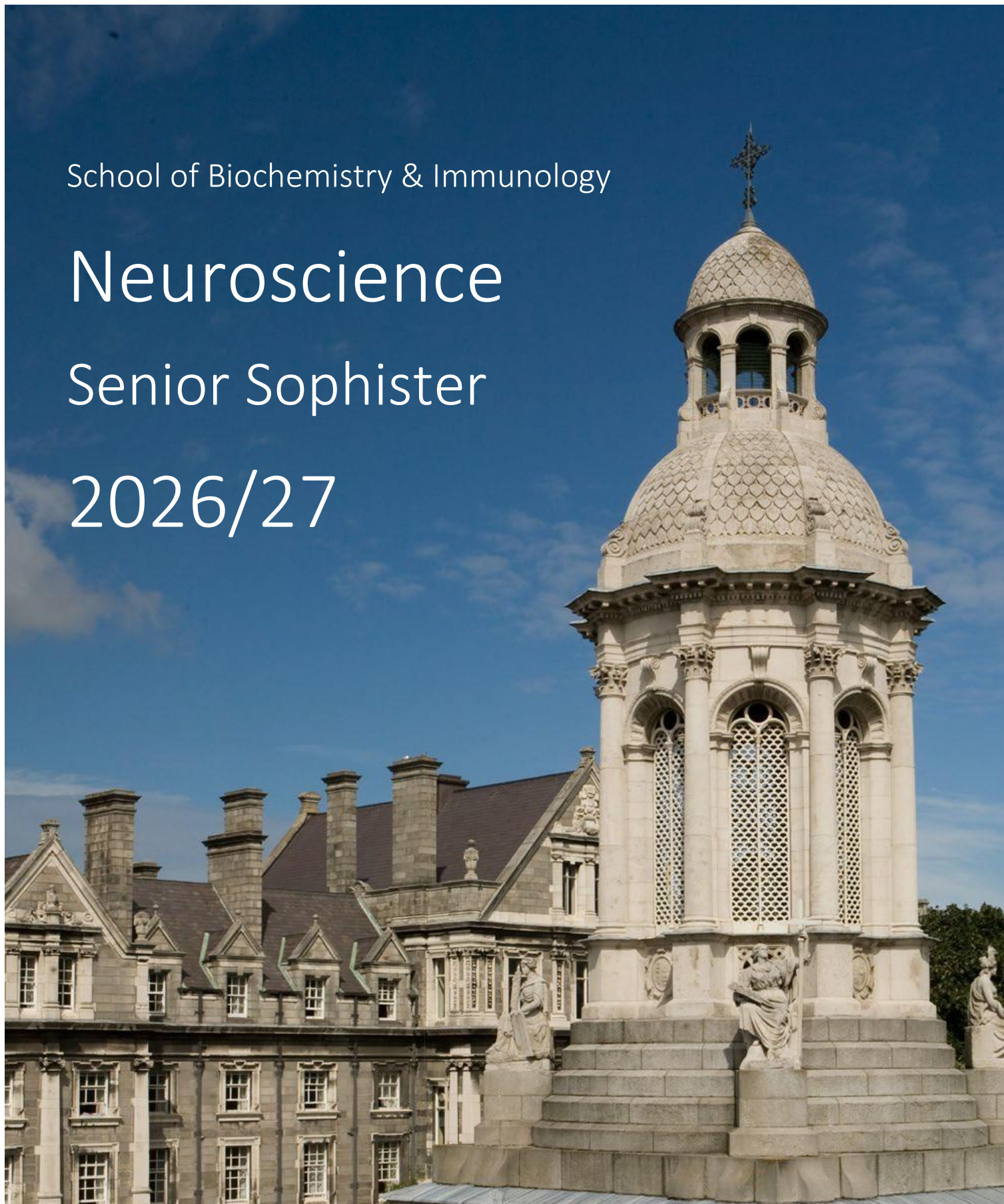
The University of Dublin

School of Biochemistry & Immunology

Neuroscience

Senior Sophister

2026/27



Contents

<i>Foreword</i>	3
-----------------	---

Section 1

<i>Timetable information & course coordinator contact details</i>	4
---	---

<i>Teaching Staff & Course structure</i>	5
--	---

<i>Important Dates</i>	6
------------------------	---

<i>Academic year calendar</i>	7
-------------------------------	---

<i>Module Summaries</i>	8-32
-------------------------	------

PGU44004	8
----------	---

NSU44PH2	11
----------	----

PSU34710	14
----------	----

BIU44415	16
----------	----

BIU44445	19
----------	----

BIU44455	21
----------	----

GEU44500	24
----------	----

NSU44490	27
----------	----

<i>Attendance & Submission deadlines for coursework</i>	33
---	----

<i>Plagiarism and academic integrity</i>	34
--	----

<i>Recommended Textbooks and Websites</i>	35
---	----

<i>Examinations, Viva Voce</i>	37
--------------------------------	----

<i>Structure of Marks for Moderatorship in Neuroscience</i>	39
---	----

<i>Class Descriptors</i>	40
--------------------------	----

<i>General statement on the course</i>	42
--	----

<i>Neurosoc</i>	43
-----------------	----

Section 2

<i>College policies, resources and general information</i>	44 onwards
--	------------

Foreword

This Handbook has been prepared as a guide to the Senior Sophister year, and contains information regarding the course content, course assessment, timetables, attendance, reading lists, guidance about conducting and writing up your final year project and also material on plagiarism and viva voce exams. It is essential that you read the information contained in this handbook and it is your responsibility to make yourself aware of your obligations on these modules and on the final year of the moderatorship as a whole.

Due to the multidisciplinary nature of Neuroscience, **the Senior Sophister year will be demanding and will require you to be committed to your course.** Students are expected to work hard and to take responsibility for their learning. However, you should always feel able to seek advice and guidance from members of teaching staff.

The Junior Sophister year laid solid foundations in various aspects of Neuroscience as well as conferring transferable skills in areas such as data handling, computing, and written and oral communication skills. Throughout the course of the Senior Sophister year you will gain a more broad-based and in-depth knowledge of Neuroscience from both theoretical and practical standpoints and will further develop your transferable skills. You are expected to supplement your lecture courses with additional reading – your lecturers will recommend key references but reading beyond these will allow you to push further into areas of particular interest to yourself. In addition, a major part of the Senior Sophister year is an individual research project, including a literature review, that counts for 33% of your Senior Sophister year marks. Research projects will be offered at the beginning of semester 1 and allocated within a few weeks. A major emphasis is placed on the research project and your time spent in the laboratory will help you decide if a career as a research scientist is one that interests you! It is a time to discover if you have a talent for scientific research and you will have ample opportunity to ask advice from your supervisors as well as your laboratory colleagues.

In addition to learning within the context of formal lecture and research sessions, we encourage you to engage with the wider neuroscience community in TCD, including research seminars and the activity of the Neuroscience society. Likewise co-operation with your fellow students will encourage learning from each other along the way. Peer-to-peer learning helps everyone involved and there are opportunities to do this in the context of the SS course. 'Being there' is essential for all of these experiences, so get involved and make the most of this experience.

We wish you every success over the next year.

Dr Colm Cunningham

SS Neuroscience Coordinator

September 2026



Ireland's EU Structural Funds
Programmes 2007 - 2013

Co-funded by the Irish Government
and the European Union

HEA

Higher Education Authority
An tÚdarás um Ard-Oideachas



The Neuroscience degree program was funded by the Irish government under the National Development Plan 2007-2013 and aided by the European Social Fund (ESF) under the Human Capital Investment Operational Programme 2007-2013.

Timetables

We will provide a timetable for Semester 1 in the first instance. However, this is subject to change as circumstances dictate. The module timetables are available through the TCD portal via **my.tcd.ie**. These can be searched for by module code and may be updated from time to time, so please monitor there for any changes.

The default position is that lectures will be in person and students should attend lectures. Lecture recordings will not be made available. PowerPoint slides will be available on the modules on blackboard as usual but it is the students' responsibility to attend lectures if they wish to engage with taught courses. Your choice not to attend does not place any responsibility on lecturers to provide you with recordings.

Please check with module coordinator if there are problems or some uncertainty about the arrival, on Blackboard, of course content.

NOTE: There is now also the “Trinity Live” app, which gives ready access to timetable information. You can download the Trinity Live app to access your timetable, digital ID, university wayfinding, library account and exam results. <https://trinitylive.tcd.ie>. While popular for obvious reasons, our experience of this so far has been that it is not updated in line with changes that staff may need to make to the timetable from time to time. The TCD portal **my.tcd.ie** remains the source of authoritative information. Changes required at short notice will be communicated to you directly by e-mail.

Direct queries should be made to the **course administrator** in the first instance or to **the SS Course coordinator** if necessary.

Please be advised that **e-mails sent outside working hours** are unlikely to be read before the following working day and lecturers will often not be in a position to act immediately on such e-mails. Therefore e-mails of this sort, sent out of hours or at short notice, should not be relied upon for asking questions pertinent to imminent submissions or as cause for **missing deadlines** etc.

Course administrator

Interim arrangements during staffing transitions

Gabrielle McCabe gamccabe@tcd.ie

Michael Slevin maslevin@tcd.ie

Room 3.07, Biochemistry School Office, TBSI, Pearse St.

+353-1-896 4195

Course Coordinator (Senior Sophister year)

Dr Colm Cunningham

Room 6.05, Trinity Biomedical Sciences Institute

Pearse Street

+353-1-896 3964

E-mail: colm.cunningham@tcd.ie

Degree Teaching Staff

Dr. Colm Cunningham, School of Biochemistry & Immunology (colm.cunningham@tcd.ie)

Prof. Gavin Davey, School of Biochemistry & Immunology (gdavey@tcd.ie)

Dr. Tomás Ryan, School of Biochemistry & Immunology (tomas.ryan@tcd.ie)

Dr. Andrew Harkin, School of Pharmacy and Pharmaceutical Sciences (aharkin@tcd.ie)

Dr. Pablo Labrador, School of Genetics and Microbiology (jp.labrador@tcd.ie)

Dr. Eva Jimenez, Dept. of Physiology, School of Medicine (jjimenez@tcd.ie)

Prof. Maeve Caldwell, Dept. of Physiology, School of Medicine (maeve.caldwell@tcd.ie)

Prof. Kevin Mitchell, School of Genetics and Microbiology (kevin.mitchell@tcd.ie)

Prof. Mark Cunningham, Dept. of Physiology, School of Medicine (mark.cunningham@tcd.ie)

Dr. David Loane, School of Biochemistry & Immunology (loaned@tcd.ie)

Dr. Paul Dockree, School of Psychology (dockreep@tcd.ie)

Dr. Jean Fletcher, School of Biochemistry & Immunology (FLETCHJ@tcd.ie)

Dr. Redmond O'Connell, School of Psychology (reoconne@tcd.ie)

Dr. Angela Sanches Inacio, Dept. of Physiology, School of Medicine (ASANCHES@tcd.ie)

Overview

Course structure

Module code	Module title	ECTS
BIU44415	Research Literature Skills (Neuroscience)	10
NSU44PH2	Neuropharmacology	5
PSU34710	Case studies in Neuropsychology	5
PGU44004	Neurophysiology II	5
BIU44455	Neuroimmunology & Neurodegeneration	5
GEU44500	Neurogenetics	5
BIU44445	Neurochemistry II	5
NSU44490	Capstone Project	20
Total		60

Important Dates *, **

Semester 1 (teaching)	Monday 14 th September 2026 – Friday 4 th December 2026
Project choices Due	Wednesday 30 th September
Project Design Seminars	Week beginning 19 th October
Reading Week	Week beginning 26 th October
Project Lab. Start	Monday 2 nd November
Literature Review Due	Friday 6 th November (12 noon)
Semester 1 Exams	Week beginning 14 th December (projected)

Christmas closure

Semester 2 (teaching)	Monday 18 th January 2027 – Friday 9 th April 2027
Project Lab. Finish	Friday 26 th February
Reading Week	Week beginning 1 st March
Project Submission	Monday 22 nd March
Poster Presentation	Week beginning 22 nd March
Semester 2 Exams ***	Week beginning 19 th April

* These dates are subject to change according to School/College/Examinations office constraints

** The full Academic Year structure is shown on the following page

*** A number of students will be selected for a **Viva Voce Exam** and these will take place approximately 3 weeks after the last written exam. This period allows marking of all semester 2 exams, confirmation of semester 1 marks and input of external examiner and cannot be shortened. Attending for *viva voce* is not obligatory but it is a useful opportunity to bring your mark up to the next division if you have a borderline mark (**within 1% of the next grade**). Your mark/grade cannot deteriorate as a result of the *viva voce* exam, but there is also no guarantee that you will receive the higher grade. These exams will take the form of an interview and will only take place **in person**. It is the student's responsibility to make themselves available if they wish to avail of this opportunity. The same situation applies to any potential viva arising in the supplemental examination session (August): the onus is on students to remain contactable after completing exams and to make themselves available for viva in a timely fashion.

Academic Year Calendar
2026/27

Academic Semester Week	Week beginning	2026/27 Academic Year Calendar		Term / Semester
		UG continuing years / PG all years	UG new first years	
1	31-Aug-26	Marking/Results 2025/26		4-Michaelmas Term begins/Semester 1 begins
2	07-Sep-26	Marking/Results and Orientation (PG, Visiting, Erasmus)		
3	14-Sep-26	Teaching and Learning	Orientation (IF UG)	4-Michaelmas teaching term begins
4	21-Sep-26	Teaching and Learning	Teaching and Learning	
5	28-Sep-26	Teaching and Learning	Teaching and Learning	
6	05-Oct-26	Teaching and Learning	Teaching and Learning	
7	12-Oct-26	Teaching and Learning	Teaching and Learning	
8	19-Oct-26	Teaching and Learning	Teaching and Learning	
9	26-Oct-26	Study/Review (Monday, Public Holiday)	Study/Review (Monday, Public Holiday)	
10	02-Nov-26	Teaching and Learning	Teaching and Learning	
11	09-Nov-26	Teaching and Learning	Teaching and Learning	
12	16-Nov-26	Teaching and Learning	Teaching and Learning	
13	23-Nov-26	Teaching and Learning	Teaching and Learning	
14	30-Nov-26	Teaching and Learning	Teaching and Learning	
15	07-Dec-26	Revision / Assessment*	Revision / Assessment*	
16	14-Dec-26	Assessment*	Assessment*	4-Michaelmas Term ends Sunday 20 December 2026/Semester 1 ends
17	21-Dec-26	Assessment* / Christmas	Assessment* / Christmas	
18	28-Dec-26	Christmas Period - College closed 24 December 2026 to 5 January 2027 inclusive	Christmas Period - College closed 24 December 2026 to 5 January 2027 inclusive	
19	04-Jan-27	Foundation Scholarship Examinations	Foundation Scholarship Examinations	
20	11-Jan-27	Marking***	Marking***	
21	18-Jan-27	Teaching and Learning	Teaching and Learning	4-Hilary Term begins/Semester 2 begins, Hilary teaching term begins
22	25-Jan-27	Teaching and Learning	Teaching and Learning	
23	01-Feb-27	Teaching and Learning (Monday, Public Holiday)	Teaching and Learning (Monday, Public Holiday)	
24	08-Feb-27	Teaching and Learning	Teaching and Learning	
25	15-Feb-27	Teaching and Learning	Teaching and Learning	
26	22-Feb-27	Teaching and Learning	Teaching and Learning	
27	01-Mar-27	Study/Review	Study/Review	
28	08-Mar-27	Teaching and Learning	Teaching and Learning	
29	15-Mar-27	Teaching and Learning (Wednesday, Public Holiday)	Teaching and Learning (Wednesday, Public Holiday)	
30	22-Mar-27	Teaching and Learning (Friday, Good Friday)	Teaching and Learning (Friday, Good Friday)	
31	29-Mar-27	Teaching and Learning (Monday, Easter Monday)	Teaching and Learning (Monday, Easter Monday)	
32	05-Apr-27	Teaching and Learning	Teaching and Learning	
33	12-Apr-27	Revision	Revision	
34	19-Apr-27	Assessment**	Assessment**	4-Hilary Term ends Sunday 25 April 2027
35	26-Apr-27	Trinity Week (Monday, Trinity Monday) / Assessment**	Trinity Week (Monday, Trinity Monday) / Assessment**	4-Trinity Term begins
36	03-May-27	Marking/Results (Monday, Public Holiday)	Marking/Results (Monday, Public Holiday)	
37	10-May-27	Marking/Results	Marking/Results	
38	17-May-27	Marking/Results	Marking/Results	
39	24-May-27	Research	Research	4-Trinity Term ends Sunday 6 June 2027/Semester 2 ends
40	31-May-27	Research	Research	
41	07-Jun-27	Research (Monday, Public Holiday)	Research (Monday, Public Holiday)	
42	14-Jun-27	Research	Research	
43	21-Jun-27	Research	Research	
44	28-Jun-27	Research	Research	
45	05-Jul-27	Research	Research	
46	12-Jul-27	Research	Research	
47	19-Jul-27	Research	Research	
48	26-Jul-27	Research	Research	
49	02-Aug-27	Research (Monday, Public Holiday)	Research (Monday, Public Holiday)	
50	09-Aug-27	Research	Research	
51	16-Aug-27	Research	Research	
52	23-Aug-27	Reassessment 2026/27 - Semesters 1 & 2	Reassessment 2026/27 - Semesters 1 & 2	

* Semester 1 assessment session: December 11 to 22, 2026 inclusive (No assessment after Dec 22nd)

** Semester 2 assessment session: April 19 to 30, 2027 inclusive

*** Marking of Semester 1 assessments will continue into January and early February. Provisional Semester 1 results will be made available to students during the week commencing February 8, 2027

Programme Structure: Module Summaries

Module Descriptor - Neurophysiology II (5 ECTS)

Module Code	PGU44004
Module Name	Neurophysiology II
Semester taught	Michaelmas (semester 1)
Contact Hours	22 hours
Module Personnel	Profs Eva Jimenez, Maeve Caldwell, Aine Kelly, Colm Cunningham, Aisling Dunne and Angela Sanches Inacio

Module Learning Outcomes: On successful completion of this module, students should:

- LO1 Understand different types of stem cell and their functions.
- LO2 Describe the potential of stem cells to model disease.
- LO3 Describe the structure and function of the blood-brain barrier.
- LO4 Describe the mechanism associated with disruption of the blood flow and reduction of oxygen.
- LO5 Describe how exercise modulates the cell proliferation and survival in the brain that underpins adult hippocampal neurogenesis.
- LO6 Discuss how exercise exerts anti-inflammatory effects that may be neuroprotective.
- LO7 Appreciate some of the functions of astrocytes and the impact of astrocytes on neuronal function.
- LO8 Appreciate that microglia are highly responsive phagocytic cells and understand and be able to articulate mechanisms by which microglia sense and respond to disturbances in the tissue.
- LO9 Appreciate that the phenotype of microglia may vary according to the nature of the stimulus and that the nature and consequences of these different phenotypes constitutes a rapidly moving field that requires reading of current literature.
- LO10 Appreciate the cells, processes and molecular events involved in the detection of, and response to, endogenous and exogenous insults in the CNS.
- LO10 The anatomical and biophysical properties of neurons of the CNS.
- LO11 Ion fluxes that generate the resting membrane potential of a neuron.
- LO12 The electrical properties and passive membrane properties of neurons.
- LO13 Electrophysiological techniques for the recording of a variety of neurophysiological signals using both *ex vivo* and *in vivo* approaches in animals and humans.
- LO14 Properties of glutamate and GABA-evoked synaptic potentials/currents.
- LO15 Synaptic plasticity of glutamate transmission including the mechanisms underlying the induction and expression of long-term potentiation and depressions.
- LO16 Plasticity of the brain and of information storage in the brain.
- LO17 The origin of the EEG signal.

Module content

The module is designed to explore the neurophysiology of glia and neurons. The module will begin by providing an understanding of stem cells and their differentiation into neural subtypes including glia. The concept of adult neurogenesis and the effect of exercise will also be discussed. Thereafter we discuss astrocytes and microglia and appreciate their ability to adopt different phenotypes. The diverse roles of astrocytes and microglia will be considered. We will compile practical examples of how astrocytes and microglia help to maintain homeostasis and respond to injury. Astrocytes are the most prevalent glial cell in the brain and the module will continue by exploring the many functions of astrocytes from the very well-defined role in providing metabolic support to neurons to the finding that astrocytes, like microglia, are active players in cerebral innate immunity. The role of astrocytes in blood brain barrier function will be described and the impact of changes in blood brain barrier permeability will be considered. This part will also consider the changes that occur in disorders of the central nervous system with a focus on exploring the impact of neuroinflammation in disease pathologies.

The second part of the module concerns the physiology of neuronal activity. The brain is composed of billions of interconnected neurons. The key objective of the neurophysiology lectures is to understand how neurons are organised, function, and how they ultimately determine network function in the brain. Core material delivered in this module will aim to develop students' understanding of the key concepts that underlie cellular neurophysiology, synaptic communication/plasticity and neuronal network activity. In this context, several pathological conditions, such as epilepsy, schizophrenia and Alzheimer's disease will be explored.

Programme of lectures.

Week	Lecture Topic & Lecturer	Lecturer
3	Stem cells - types and functions	Maeve Caldwell
3	Stem Cells for disease modelling	Maeve Caldwell
3	Exercise and glia	Áine Kelly
3	The Blood brain barrier and CSF	Eva Jimenez
3	Cerebrovascular disorders: Hypoxia in neonates, stroke & vascular Dementia	Eva Jimenez
4	Astrocytes: functions	Maeve Caldwell
4	Astrocytes: In health and Disease	Maeve Caldwell
5	Pathogen detection in the CNS	Aisling Dunne
5	Sterile inflammation in the CNS	Aisling Dunne
6	Microglia: dynamic responders to tissue disruption	Colm Cunningham
6	Microglia phenotypes in homeostasis and disease	Colm Cunningham
6	Astrocytes and Epilepsy	Angela Sanches Inacio
6	Astrocytes and Epilepsy	Angela Sanches Inacio
11	The Membrane Potential	Angela Sanches Inacio
11	Ion channels and ionic currents	Angela Sanches Inacio
11	Cell to cell communication	Angela Sanches Inacio
12	Electrophysiological techniques	Angela Sanches Inacio
12	Electrical properties of neurons	Angela Sanches Inacio

12	Synaptic and intrinsic neuronal plasticity	Angela Sanches Inacio
12	Synaptic transmission	Angela Sanches Inacio
12	Synaptic transmission	Angela Sanches Inacio
13	Basic neuronal circuits in the CNS	Angela Sanches Inacio
13	Origin of brain rhythms	Angela Sanches Inacio
13	Cognitive functions of network rhythms	Angela Sanches Inacio

Recommended Reading List: Reading material to support learning will be recommended by each participating lecturer. Additionally, following books are recommended for lectures week 12-13:

- C. Hammond, Cellular and molecular neurophysiology, AP (ISBN: 9780123741271)
- G. Shepherd, The Synaptic Organisation of the Brain, OUP (ISBN: 9780195159561)
- B. Hille, Ion Channels of Excitable membranes, Sinauer (ISBN: 9780878933211)
- E. Kandel et al., Principles of Neural Science, Elsevier (ISBN: 978-0071390118)
- H. Sontheimer, Diseases of the Nervous system, Elsevier (ISBN: 9780128002445)

Assessment Details: Formal Exam worth 100% of module mark.

Module Coordinators

Eva Jimenez,	jimeneze@tcd.ie	01 896 2710
Maeve Caldwell,	maeve.caldwell@tcd.ie	01 896 4852
Mark Cunningham,	mark.cunningham@tcd.ie	01 896 8569
Angela Inacio,	asanches@tcd.ie	

Executive Officer: Danielle Fernandes
Email: FERNAND3@tcd.ie

Module Descriptor – Neuropharmacology (5 ECTS)

Module Code: NSU44PH2
Module Name: Neuropharmacology
Semester taught: Michaelmas (semester 1)
Contact Hours: 25
Module Personnel: Andrew Harkin

Module Learning Outcomes.

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

- LO1 Discuss the diagnostic criteria and symptom presentation, biological basis and drug treatment of affective and anxiety disorders, insomnia, schizophrenia, drug dependence, pain, epilepsy, Parkinson's and Alzheimer's disease and acute ischemic stroke.
- LO2 Describe the mechanisms of action and clinical uses of local and general anaesthetic drugs.
- LO3 Identify the pharmacokinetic characteristics and adverse effects associated with antidepressant, mood stabilising, anxiolytic, hypnotic, analgesic, anaesthetic, anticonvulsant, anti-Parkinsonian and cognitive enhancing drugs.
- LO4 Discuss the neurobiological theory of CNS disorders and neurobiological adaptation to psychotropic drugs.
- LO5 Assess and evaluate recent advances in the drug treatment of CNS disorders and provide an up-to-date insight into CNS drug development.

To learn the principles of neuropharmacology and drug therapies for disorders of the central nervous system.

Neuropharmacology covers drug-induced changes in functioning of the nervous system. The specific focus of this module is to provide a description of the cellular and molecular actions of drugs on synaptic transmission. This course refers to specific diseases of the nervous system and their treatment in addition to giving an overview of the techniques used for the study of neuropharmacology and provides up to date insights into current drug development efforts for central nervous system diseases.

Module content

Programme of lectures. All lectures are delivered by Andrew Harkin

Week	Lecture Topic
3	Introduction to Neuropharmacology
3	Depression
3	Antidepressants
4	Atypical antidepressants
4	Bipolar and mood stabilisers – lithium
4	Anxiety disorders

5	Anxiolytics
5	Hypnotics
5	Schizophrenia
6	Antipsychotics I
6	Antipsychotics II
6	Anti-parkinsonian drugs
7	Drug treatment of Alzheimer's disease
7	Brain ischemia and neuroprotection
7	Epilepsy
8	Anticonvulsant drugs
8	Anticonvulsants II
8	Drug dependence and addiction – reward circuitry, drugs of abuse.
9	Reading Week
10	Drug dependence and addiction – reward circuitry, drugs of abuse.
10	Anaesthetics (General)
10	Anaesthetics (Local)
11	Pain – nociception, spinal and supraspinal pain pathways
11	Narcotic analgesics and other CNS acting analgesics
11	Narcotic analgesics and other CNS acting analgesics II
12	Module review II
Dec 2025	Assessment Week

Description of each Lecture

1. Introduction to Neuropharmacology, Neurotransmission, key steps in synaptic transmission and targets for drug action.
2. Depression: Aetiology, symptoms, diagnostic criteria.
3. Antidepressants: Tricyclic antidepressants, monoamine oxidase inhibitors, Selective serotonin reuptake inhibitors; pharmacodynamic mechanisms, pharmacokinetics, adverse effects.
4. Atypical antidepressants: Dual acting agents; non-monoaminergic antidepressants, rapid acting antidepressants; Neurobiological adaptation.
5. Bipolar disorder: Aetiology, symptoms, diagnostic criteria.
6. Mood stabilisers: Lithium - pharmacodynamic mechanisms, pharmacokinetics, adverse effects and toxicity.
7. Anxiety disorders: Phobias, panic, stress related disorders, generalised anxiety, obsessive compulsive disorder. Aetiology, symptoms, diagnostic criteria.
8. Anxiolytics: Drugs for the treatment of anxiety; benzodiazepines and others. Pharmacodynamic mechanisms, pharmacokinetics, adverse effects.
9. Hypnotics: Z-drugs for insomnia and others. Pharmacodynamic mechanisms, pharmacokinetics, adverse effects.
10. Schizophrenia: Aetiology, symptoms, diagnostic criteria.
11. Antipsychotics: First generation, atypicals and others. Pharmacodynamic mechanisms, pharmacokinetics, adverse effects.

12. Neurodegeneration: Acute and chronic mechanisms of neurodegeneration.
13. Anti-parkinsonian drugs: Drug treatment for Parkinson's disease. Pharmacodynamic mechanisms, pharmacokinetics, adverse effects.
14. Drug treatment of Alzheimer's disease: Cholinesterase inhibitors and others. Pharmacodynamic mechanisms, pharmacokinetics, adverse effects.
15. Brain ischemia and neuroprotection: Antiplatelet drugs, anti-coagulant drugs, thrombolytics. Neuroprotective drugs.
16. Epilepsy: Classifications, aetiology, symptoms, diagnostic criteria
17. Anticonvulsant drugs.
18. Drug dependence and addiction: The reward circuit and role of dopamine in mediating the reinforcing effects of drugs of abuse.
19. Drugs of abuse: Psychostimulants, depressants, psychedelics and hallucinogens. Pharmacodynamic mechanisms, pharmacokinetics, adverse effects.
20. Anaesthetics (General): Pharmacodynamic mechanisms, pharmacokinetics, adverse effects.
21. Anaesthetics (Local): Clinical applications, pharmacodynamic mechanisms, pharmacokinetics, adverse effects.
22. Pain processing: Nociception, spinal and supra spinal pain pathways.
23. Narcotic analgesics: Opiates. Pharmacodynamic mechanisms, pharmacokinetics, adverse effects. Special considerations in clinical use.
24. Narcotic and other CNS acting analgesics: Pharmacodynamic mechanisms, pharmacokinetics, adverse effects. Factors guiding choice of analgesic in clinic.
25. Module review.

Recommended Reading List:

Rang and Dale's Pharmacology (10th Ed.) by James Ritter, Rod Flower, Graeme Henderson, Yoon Kong Loke, David MacEwan, Emma Robinson, James Fullerton. Elsevier (2023)

Brody's Human Pharmacology. Mechanism-Based Therapeutics (7th Ed) Lynn Wecker, Susan Ingram, Elsevier (2024)

Fundamentals of Psychopharmacology (3rd Ed.) by B. Leonard

Goodman and Gilman's The Pharmacological Basis of Therapeutics (14th Ed.) 2022

Nestler, Hyman and Malenka's Molecular Neuropharmacology: A Foundation for Clinical Neuroscience (4th Ed.) 2020.

The Biochemical Basis of Neuropharmacology (8th Ed.) by J.R. Cooper, F.E. Bloom, R.H. Roth

Assessment Details: Written examination 100%

Module Coordinator: Andrew Harkin
Email: aharkin@tcd.ie
Phone: 01-896 8575

Executive Officer: Gabrielle McCabe / Michael Slevin
Email: gamccabe@tcd.ie / maslevin@tcd.ie
Phone: 01-896 4195

Module Descriptor – Research Literature Skills (10 ECTS)

Module Code: BIU44415

Module Name: Research Literature Skills

Semester taught: Michaelmas (semester 1)

Contact Hours: 20 hours

Module Personnel: Coordinator Colm Cunningham, Gavin Davey, David Loane, Tomas Ryan, Mark Cunningham, Eva Jimenez, Kevin Mitchell, Kate Connor, Roisin McMackin, Jean Fletcher, Angela Sanches Inacio.

Module Learning outcomes

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

- LO1 Perform detailed dissection of research papers, with attention to the details of the methods used, the results presented, the analysis performed and the conclusions/interpretations drawn. This will allow the student to develop their skills in analysis, synthesis and integration of information from a widely used format in the field of neuroscience.
- LO2 Demonstrate their ability to think independently and critically with respect to data and other information sources.
- LO3 Demonstrate comprehension of experimental methods particular to the area of research of the selected papers.
- LO4 Develop peer to peer discussion and constructive debate skills.
- LO5 Demonstrate their ability to communicate effectively in oral and written formats.

This module is designed to develop critical thinking with respect to the Neuroscience literature and to train students in identification and synthesis of key information. Students should be able to dissect and critique original research papers, **thinking independently** as well as working in small groups. Through presentation of research works using different approaches (written and oral presentation, comprehension exercises) the student will learn how to **communicate effectively** and through sequential analysis and with formative and summative assessment the student should **develop continuously** in their ability to interact with a rapidly evolving field.

Module content:

- Oral presentation of a published original research paper (chosen by lecturers).
- Oral presentation of a second original research paper (chosen by the student).
- Tutorials on analysis and synthesis of research papers.
- Journal article comprehension examination

Week	Topic & Staff	Practical
Semester 1		
3	Tutorial on analysis and synthesis of research papers (CC)	
3	Tutorials on reproducibility, peer review, preprint archives (CC, KJM)	
3	Provision of articles for ' Journal club ' presentation 1 (CC)	

4	Presentation of papers (1) by each individual student	Oral presentation 1
4-6	Performance/submission of ' <i>peer review</i> '	Written assignment
6	Peer to peer 'reviewers meeting' (facilitated discussion)	Discussion/tutorial
6	Submission of consensus review	Written assignment
6	Submission of proposal for further experiments	Written assignment
12*	Students to choose own article for second ' <i>Journal club</i> ' Presentation (approval by capstone project PI is necessary) Presentation of paper by each individual student	Oral presentation 2
13	Tutorial on 'Journal comprehension' examination paper	
14	Journal comprehension Examination	Written assessment

* The week of those exercises after reading week are estimates at the current time.

Assessment details

Component	Weighting (ECTs)
Journal club Presentation 1	2
Peer Review exercise	3
Journal club Presentation 2	2
Examination	3

Plagiarism and Academic Integrity in BIU44415

Students are permitted to use GenAI in searching the literature and identifying sources of interest during this module, but where the output of GenAI is used to inform a student's document or work output, this usage must be acknowledged and appropriately cited, as per [Library guidelines on acknowledging and reference GenAI](#). A student who generates content from a GenAI tool and submits it as his/her/their own work will be considered to have committed plagiarism, which is defined as academic misconduct in accordance with College Academic Integrity Policy.

Module Coordinator: Colm Cunningham
colm.cunningham@tcd.ie
01-896 3964

Executive Officer: Gabrielle McCabe
Email: gammccabe@tcd.ie

Interim arrangements during staff transition
Michael Slevin maslevin@tcd.ie

Biochemistry & Immunology school office, TBSI
Phone: 01-896 4195

Module Descriptor - Case Studies in Neuropsychology (5 ECTS)

Module Code: PSU34710

Module Name: Case Studies in Neuropsychology

Semester taught: Michaelmas (Semester 1)

Contact Hours: 11 lectures (1 lecture in each week of the semester); 103 hours of independent study

Module Personnel: Paul Dockree

Module Learning Outcomes (with embedded graduate attributes):

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

- LO1 - Analyse and evaluate the different types of behaviours and symptoms expressed by neuropsychological syndromes.
- LO2 - Describe and explain the dysfunctional brain regions and networks underlying different neuropsychological impairments.
- LO3 - Understand and critique the different case- and group- study methods for assessment of brain damage.
- LO4 - Critically discuss the relationship between case studies in neuropsychology and techniques in cognitive neuroscience (e.g. imaging and electrophysiological methods)
- LO5 - Critically evaluate the mechanisms and methods of recovery and rehabilitation following brain damage.

This module primarily develops the Trinity Graduate Attribute "**To Think Independently**" through critical analysis of neuropsychological theory, methodology, and evidence. It also supports "**To Act Responsibly**" through engagement with ethical and clinical issues in brain injury assessment and rehabilitation, "**To Communicate Effectively**" through critical discussion and evaluation of evidence, and "**To Develop Continuously**" through engagement with contemporary research and evolving scientific understanding of brain-behaviour relationships.

Module Content

Case studies of patients with brain damage remain a critical part of cognitive neuropsychology's methods for understanding the organisation of cognitive systems and devising principled approaches to rehabilitation. In this topic, there is great scope for clinicians and researchers to inform and learn from one another with respect to the manifestation of clinical disorders, their potential causes, and paths to rehabilitation. Students are aware of famous patients with brain damage (e.g. Phineas Gage and patient H.M.) but this module will address lesser-known cases, who have nevertheless provided important insights into contemporary research problems across several domains including attention, memory, dysexecutive syndrome and disorders of meta-cognition and social-cognitive processing.

The format of lectures is conventional with face-to-face weekly lectures. Students are encouraged attend in person and to ask questions and to engage the lecturer in discussion where possible. The teaching will be research-led and based on up-to-date journal articles provided through Blackboard but student will be encouraged to engage in independent research. Where relevant podcasts and videos will be provided to complement reading materials.

The following topics will be covered:

Introduction to concepts and methods in neuropsychology

Perceptual Disorders: Visual agnosia, Art and brain injury, Synaesthesia

Memory Disorders: Remembering and forgetting our autobiographical pasts, Confabulation

Executive function Disorders: Breakdown of executive functions, Dysexecutive Syndrome

Motivational Disorders: Apathy, Impulsivity and disinhibition

Metacognitive Disorders: Anosognosia, Impaired self-awareness

Connectomics and neuropsychology: Diaschisis: remote effects of brain lesion, Maladaptive and compensatory brain changes, Guided recovery and rehabilitation

Teaching and Learning Method

The module is delivered through weekly in-person lectures, with recorded lectures also provided after each lecture; however, in-person attendance is required. Students are encouraged to participate actively through questions and discussion. Teaching is research-led and informed by current journal articles available on Blackboard, while students are also expected to engage in independent research. Relevant podcasts and videos may be provided to complement the reading materials.

Assessment details

Case Studies Analysis Assignment, to be submitted after semester 1 examination period (exact date subject to confirmation).

Assessment Description	LO Addressed	% of total	Week due
Case Studies Analysis Assignment. Four case histories are presented, which each describe a patient's symptoms in daily life and neuropsychological impairments identified at assessment. Students are required to choose <u>two</u> out of the four case histories and produce two 1,500-word reports organised into 4 sections that: 1/ Analyse and evaluate the behaviour and symptoms expressed by the patient and provide a well-reasoned and logical account of what neuropsychological condition or co-morbid conditions the patient may be exhibiting. Please focus on the conditions covered in the lectures. 2/ Critically examine what perceptual, cognitive and/or emotional domains are affected in this condition(s) and what likely brain mechanisms or networks have been damaged. 3/ Critically evaluate the additional neuropsychological tests, and/or neuroimaging investigations that would be most useful in further characterising the patient's condition and increasing confidence in the diagnosis (including any potential co-morbid diagnoses). Based on the available evidence, recommend and justify appropriate rehabilitation approaches, evaluating their effectiveness. Support your recommendations throughout with evidence from published research. 4/ Reflective component of your assignment research	LO1-LO5	100%	End of semester. Date TBA.

Contact Hours and Indicative Student workload

11 Scheduled lectures and 110 hours of independent study (comprising review and study of topics and

preparation and planning of continuous assessment).

Inclusive Curriculum

	PLEASE TICK
1. Have you reviewed the teaching / assessment methods and materials for possible barriers to learning, e.g. students with English as a second language, disabilities, significant external responsibilities, students with IT issues / requiring specific accessibility software etc.?	☒
2. Have you adapted your resources and teaching materials taking into account Trinity's Accessible Information Guidelines (https://www.tcd.ie/disability/teaching-info/TIC/materials.php)?	☒
3. Does the content of your module address diversity? For example, including a diverse demographic profile of authors, diversity of ideas and perspectives, or representation (e.g. pictures of conditions on different skin tones), or by acknowledgement of the homogenous context of the discipline/topic?	☒
4. Highlight at least two ways which your course/module incorporates principles of inclusivity and accessibility into the curriculum design 1. By providing a range of teaching approaches that incorporate traditional lecture-based teaching combined with opportunities for group discussions, Q&A and multimedia presentations for effective learning. 2. Providing additional sessions on assessment, with opportunity for Q&A and Blackboard Discussion Board exchange. <i>(i.e. supports engagement and representation of all Trinity students, presents information and content in a variety of ways, and offers variety and options of assessment type. See: Universal Design for Learning - AHEAD for more information and guidance, and Inclusive Curriculum - Equality - Trinity College Dublin (tcd.ie) for insights from Trinity students)</i>	

Recommended reading List

There is no core textbook for this module.

Journal articles: Articles from journals including *Brain*, *Neuropsychologia*, *NeuroCase*, *Cognitive Neuropsychology* and *Neuropsychological Rehabilitation* will be uploaded to Blackboard on a weekly basis together with each lecture.

Books for orientation to Neuropsychology:

Introduction to Neuropsychology. 2nd Ed. J. Graham Beaumont.

Into the Silent Land: Travels in Neuropsychology. Paul Broks

Module prerequisite

It is recommended that students have completed a cognitive neuroscience module or equivalent in year 3

Module website

All teaching materials will be presented via TCD Blackboard

Module Coordinator

Paul Dockree

dockreep@tcd.ie

Phone: 01-896 3910

Module Descriptor – Neurochemistry II (5 ECTS)

Module Code: BIU44445
Module Name: Neurochemistry II
Semester taught: Hilary (Semester 2)
Contact Hours: 16
Module Personnel: Profs Gavin Davey & David Loane

Module Learning Outcomes:

The aims of this module are to understand how neurochemical mechanisms in brain cells interact and control neurotransmission and emergent cognitive behaviour, to understand how structure and function of neurotransmitters and receptors are critical to normal and abnormal brain function and to understand the neurochemical mechanisms by which brain activity is matched by energy provision and how this changes in various situations.

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

- LO1 Explain the molecular and cellular mechanisms of chemical signalling in the brain,** including neurotransmitter synthesis, storage, release, receptor activation and signal termination, and the roles of ion channels, transporters, SNARE proteins and intracellular signalling pathways.
- LO2 Compare the molecular mechanisms of major neurotransmitter and neuromodulatory systems,** including excitatory, inhibitory, monoaminergic and atypical signalling, with particular emphasis on transmitter synthesis and metabolism, receptor structure and function, and mechanisms of signal transduction.
- LO3 Explain how cellular and brain energy metabolism supports neurotransmission and neuronal function,** integrating neurovascular coupling, blood brain barrier nutrient transport, neuron-glia metabolic interactions, glucose and alternative fuel metabolism, mitochondrial oxidative phosphorylation and mitochondrial dynamics.
- LO4 Analyse the functional interdependence of metabolism and neuronal signalling,** including how mitochondrial function, cellular energy thresholds and metabolic adaptation regulate neurotransmitter release, synaptic function and plasticity, and how disruption of oxygen or energy substrate availability contributes to brain dysfunction and injury.
- LO5 Apply and evaluate neurochemical principles in brain health and disease,** including the molecular basis of neurological and psychiatric disorders, neuroinflammation and neurodegeneration, and the effects of drugs, toxins, exercise, fasting and alternative fuels on brain function.

Programme of lectures

Week	Topic & Lecturer
22*	<i>Neurotransmitters and brain biochemistry (Gavin Davey)</i>
	Neurotransmission & Molecular mechanisms of exocytosis
	Cholinergic signaling & neurotoxins
	Molecular mechanisms in excitatory neurotransmission
	Molecular mechanisms in inhibitory neurotransmission

	Dopamine and noradrenaline molecular neurobiology
	Serotonin and molecular neurobiology underlying depression
	Atypical neurotransmitters 1
	Atypical neurotransmitters 2
	Atypical neurotransmitters 3
	Energy thresholds and mitochondrial dynamics
	Energy producing systems in the brain
29*	<i>Success & Failure in brain energy metabolism (David Loane)</i>
	Neurovascular coupling and energy substrate usage by neurons and astrocytes
	Catastrophic disruption: bioenergetic mechanisms in stroke pathophysiology
	Oxygen deprivation (hypoxia) in the brain.
	Hypoglycemia and brain energy metabolism
	Healthy habits for a metabolically fit brain
	Microglial metabolism regulates inflammation in brain disease

**Timing is provisional at time of distribution*

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>)

Scientific publications provided at time of lectures

Assessment Details: Written examination 100%

Module Coordinator: Gavin Davey
Email: gdavey@tcd.ie
Phone: 01-896 8408

Executive Officer: Gabrielle McCabe
Email: gamccabe@tcd.ie

Interim arrangements during staff transition

Michael Slevin maslevin@tcd.ie

Biochemistry & Immunology school office, TBSI
Phone: 01-896 4195

Module Descriptor - Neuroimmunology & Neurodegeneration (5 ECTS)

Module Code: BIU44455

Module Name: Neuroimmunology & Neurodegeneration

Semester taught: Hilary (Semester 2)

Contact Hours: 20

Module Personnel: Profs Colm Cunningham and David Loane

Module Learning outcomes

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

- LO1 Describe how hormones and neurotransmitters impact upon immune system functioning, and how psychological stress can alter immune function via hormone/neurotransmitter release.
- LO2 Describe the way in which different innate and adaptive immune responses occur in the brain with respect to other organs and to discuss multiple sclerosis and EAE with respect to immune responses to CNS antigens.
- LO3 Describe CNS response to bacterial endotoxin: toll-like receptor activation, inflammatory cytokine and chemokine production, endothelial activation and cell infiltration.
- LO4 Describe and discuss innate immune activation in infectious and sterile inflammation including stroke, TBI, spinal cord injury; encompassing microglial activation, cellular infiltration (cytokine production, phagocytosis, oxidative burst and ligand receptor interactions that limit microglial activation).
- LO5 Recall and integrate knowledge of the role of microglia and peripheral immune cells in acute and chronic neurodegeneration.
- LO6 Discuss and criticise animal models of Alzheimer's disease and the investigation of amyloid vaccination strategies in humans.
- LO7 Describe how systemic inflammation signals to the healthy brain (detailing sickness behaviour with respect to 1) symptomology and brain areas involved in expression of same 2) routes of activation 3) the role of cytokines and prostaglandins in sickness behavior. Extend this information to the impact of similar insults on the vulnerable/degenerating brain.
- LO8 Discuss common themes in neurodegeneration including protein aggregation, dysfunction of the ubiquitin proteasome pathway and autophagy and inflammation.
- LO9 Describe the basic neuroanatomy of common neurodegenerative diseases including Prion diseases, Tauopathies (AD, FTD), ALS (Motor Neuron disease), Huntington's disease, Parkinson's disease and Alzheimer's disease and draw on the 'common themes' above to explain mechanisms of degeneration.
- L10 Describe key animal model approaches to studying these neurodegenerative diseases and discuss current and emerging therapeutic approaches.

Module content

The module will provide an introduction to the basic principles of neuroimmunology: brain influences on the immune system and immune system activation influences on brain function. The course will also interrogate the role of the immune system in neurodegenerative diseases and injuries including stroke, spinal cord and traumatic brain injury. Thereafter the course will deal with chronic neurodegenerative diseases, the mechanisms common to these diseases and the animal model systems used to study these diseases.

Programme of lectures with tutorial/discussion sessions.

Week	Lecture Topic	Lecturer
Semester 2		
24*	Introduction to the immune system and neuroimmunomodulation	Colm Cunningham
24	Neurotransmitter (ACh, NA, GC) effects on immune system	Colm Cunningham
25	Brain as an immune privileged organ	Colm Cunningham
25	Multiple sclerosis	Colm Cunningham
25	Innate immunity inflammation in CNS with acute insults.	Colm Cunningham
25	Stroke, TBI & spinal injury. Contribution of immune system	David Loane
25	Spinal cord regeneration	David Loane
25	Contribution of TBI to development of dementia	David Loane
26	Alzheimer's disease (pathology, genetics & development of Models)	Colm Cunningham
26	AD: status of therapeutic efforts, inflammation	Colm Cunningham
26	Systemic inflammation: Sickness Behaviour and impact on vulnerable states (delirium/dementia)	Colm Cunningham
26	Common themes in neurodegeneration: prion disease	Colm Cunningham
26	The prion concept & protein aggregation	Colm Cunningham
26	Parkinson's, inflammation, α -synuclein, ubiquitin proteasome system	Colm Cunningham
27	Autophagy	Colm Cunningham
27	Prion disease, endoplasmic reticulum stress/unfolded protein response	Colm Cunningham
27	Compartmentalised Neurodegeneration, synaptic loss	Colm Cunningham
27	Axonal Degeneration/Tau, Huntington's, MND, Stress granules, RNA-BPs	Colm Cunningham
27	Discussion/Revision session	Colm Cunningham

** Schedule is approximate at the time of distribution.*

Recommended reading

There is no recommended textbook for this module

Journal articles (*these are some suggestions; others are cited during the lectures*)

Neurotransmitter and stress effects on immune function

- **Sternberg EM.** (2006) Neural regulation of innate immunity: a coordinated nonspecific host response to pathogens. *Nat Rev Immunol.* 6: 318-28.
- Chavan SS, Pavlov VA, **Tracey KJ.** Mechanisms and Therapeutic relevance of Neuroimmune communication. *Immunity.* 2017 Jun 20;46(6):927-942.

Immune Privilege and Neuroimmunology of EAE and multiple sclerosis

- **Engelhardt et al.**, (2017) The movers and shapers in immune privilege of the CNS. *Nat Immunol.* 2017 Feb;18(2):123-131. doi: 10.1038/ni.3666.
- **Galea I**, Bechmann I, Perry VH. (2006) *What is immune privilege (not)*, *TRENDS in Immunology* 28(1)
- **Sospedra M**, Martin R. (2005) Immunology of multiple sclerosis. *Annu Rev Immunol.* 2005;23:683-747.

Microglial activation states, DAMPs, PAMPS etc.

- **Ransohoff, R.M** How Neuroinflammation contributes to neurodegeneration (2016) 353(6301):777-83. doi: 10.1126/science.aag2590
- **Lucin and Wyss-Coray** (2009) Immune activation in brain aging and neurodegeneration: too much or too little? *Neuron* 64(1):110-22.
- **Mancuso (2025)** Microglia heterogeneity, modeling and cell-state annotation in development and neurodegeneration. *Nature Neuroscience* 28:1381-1392
<https://doi.org/10.1038/s41593-025-01931-4>

Alzheimer's disease and Immunotherapy

- Heneka et al., (2024) Passive anti-Amyloid- β immunotherapy in Alzheimer's Disease – opportunities and challenges. *Lancet* 404: 2198–208 [doi.org/10.1016/S0140-6736\(24\)01883-X](https://doi.org/10.1016/S0140-6736(24)01883-X)
- **Karran & De Strooper** (2016) The amyloid cascade hypothesis: are we poised for success or failure. *J. Neurochem.* Oct;139 Suppl 2:237-252. doi: 10.1111/jnc.13632.

Systemic inflammation impact on the brain/sickness behavior, depression, delirium

- Konsman JP, Parnet P, **Dantzer R.** (2002) Cytokine-induced sickness behaviour: mechanisms and implications. *Trends Neurosci.* **25**: 154-159.
- **Saper CB**, Romanovsky AA, Scammell TE. (2012). Neural circuitry engaged by prostaglandins during the sickness syndrome. *Nature Neuroscience* 15; 1088-1095
- **Sullivan & Dulac (2025)** Sickness and the Brain. *Current Biology* 35, R963–R1015,

Neurodegenerative disease (General: more specific & recent articles are cited in lectures)

- **Jellinger KA.** (2009) Recent advances in our understanding of neurodegeneration. *J Neural Transm.* 2009 Sep;116(9)

10. Assessment details 100% Written exam. Semester 2

11. Module Coordinator Colm Cunningham
colm.cunningham@tcd.ie
01-896 3964

Executive Officer: Gabrielle McCabe
Email: gamccabe@tcd.ie

Interim arrangements during staff transition
Michael Slevin maslevin@tcd.ie

Biochemistry & Immunology school office, TBSI
Phone: 01-896 4195

Module descriptor – Neurogenetics (5 ECTS)

Module Code	GEU44500
Module Name	Neurogenetics
Semester taught	2
Contact Hours	20
Module Personnel	Profs. Juan Pablo Labrador, Kevin Mitchell

Module Learning Outcomes:

The goal of this course is to provide a concise and stimulating investigation of the field of Developmental Neurogenetics. Course lectures will explain different developmental processes of the nervous system, discuss the current issues and questions, and provide a framework for reading scientific literature.

Upon completion of this course, students will not only understand the basic concepts in genetics of neural development and behavioural genetics but will understand the current challenges within each field of study. Students will gain an appreciation for the complexity of neural development at the cellular, molecular and genetic level and behavior. Upon completion, students should also be able to approach any scientific literature related to this course.

Module Content:

This course has two components: Genetics of Neural Development and Behavioural Genetics. Within Genetics of Neural Development will examine how a developmental program encoded in the genome directs the assembly of the nervous system, creating a remarkably stereotyped but highly plastic and responsive structure. It will address how nervous tissue is set aside in the early embryo, how it becomes patterned, how individual cell types differentiate through the expression of different combinations of genes, and how these genes specify various properties that define each cell type: cell migration to the correct position, establishment of appropriate connections, electrical properties, neurotransmitter expression, etc. covers different aspects of nervous system development from neural induction to early steps of circuitry assembly. There is a focus on different genetic experimental methods employed to identify central mechanisms of nervous system development. We will use different models to explain processes and provide examples of networks and concepts. The emphasis will be on the conservation of signaling pathways in development of very diverse organisms. This will include *Drosophila melanogaster*, mouse as well as embryological studies in frogs and chick. It will also cover a number of human genetic disorders associated with defects in these processes.

The Behavioral Genetics section will examine how genes influence behavior through effects on cellular physiology and neuroanatomy. More specifically, it will look at how *variation* in genes can cause *variation* in behavior. It will encompass the use of genetic approaches to dissect the cellular and biochemical components of complex behaviors in model organisms (worms, flies, mice) as well as the heredity of behavioral characteristics and psychiatric disorders in humans.

Major topics (examples of relevant psychiatric disorders are shown in parentheses): 1. Circadian rhythms and Sleep, 2. Addiction and Appetite, 3. Aggression, Social behavior (Schizophrenia), 4. Sexual behavior, 5. Anxiety (Depression), 6. Learning and Memory, 7. Language, Handedness and Cerebral Asymmetry (Autism, Dyslexia), 8. Personality and Intelligence (Lack of).

Each topic will be covered by one or more reviews and its study will be required for a successful completion of the course.

Programme of lectures

Week	Lecture Topic	Lecturer
22	Genetics of Neural Development –Neural Induction	JP Labrador
22	Genetics of Neural Development – Nervous System Patterning in Drosophila	JP Labrador
22	Behavioral Genetics – Introduction to Behavioral Genetics	JP Labrador
22	Behavioral Genetics – Circadian rhythms and Sleep,	JP Labrador
23	Genetics of Neural Development - Neural Induction in Drosophila	JP Labrador
23	Genetics of Neural Development - Spatiotemporal information in neuronal fate specification Drosophila	JP Labrador
23	Behavioral Genetics – Addiction and Appetite,	JP Labrador
23	Behavioral Genetics – Aggression	JP Labrador
24	Genetics of Neural Development – Asymmetric division and neuronal fate specification Drosophila	JP Labrador
24	Genetics of Neural Development – Patterning in the vertebrate nervous system	JP Labrador
24	Behavioral Genetics – Social behavior (Schizophrenia)	KJ Mitchell
24	Behavioral Genetics – Sexual behavior	KJ Mitchell
25	Genetics of Neural Development – Neuronal specification in vertebrates.	KJ Mitchell
25	Genetics of Neural Development – Axon guidance in invertebrates and the labeled pathways hypothesis.	KJ Mitchell
25	Behavioral Genetics – Anxiety (Depression)	KJ Mitchell
25	Behavioral Genetics – Learning and Memory	KJ Mitchell
26	Genetics of Neural Development – Axon guidance, screens and midline guidance in Drosophila	KJ Mitchell
26	Genetics of Neural Development – Midline guidance in vertebrates	KJ Mitchell
26	Behavioral Genetics – Language, Handedness and Cerebral Asymmetry (Autism, Dyslexia)	KJ Mitchell
26	Behavioral Genetics – Personality and Intelligence (Lack of).	KJ Mitchell
28	Reading Week	

Recommended Reading List:

As a very basic introductory literature for the course any Developmental Biology book such as Developmental Biology by Scott F. Gilbert and Introduction to Genetic Analysis by Anthony J.F. Griffiths can be used.

However, this literature should be used as a starting point for this course since the material covered in the lectures needs to be studied in more specific and advanced reviews on each topic that will be provided with each lecture.

Assessment Details: Final exam 100%.

Module Coordinator Juan Pablo Labrador
Email: labradoj@tcd.ie
Phone 01-896 1966

Executive Officer: Alicia Vega
Email: genetics@tcd.ie
Phone 01-896 1140

Module Descriptor - Capstone Project (20 ECTS)

Module Code: NSU44490

Module Name: Capstone Research Project

Semester taught: 1 & 2

Contact Hours: Collaborative throughout

Module Personnel: Coordinator Colm Cunningham & individual lab Principal Investigators

Module Learning outcomes

The capstone project is a common element across all degrees in TCD and is weighted at 20 ECTS. This project requires a significant level of independent research by the student. It will be an integrative exercise that requires students to demonstrate skills and knowledge developed across a range of activities over your four years of study. The goal is the production of a significant piece of original work that will provide you with the opportunity to demonstrate your attainment of the graduate attributes (to think independently, to communicate effectively, to develop continuously and to act responsibly).

The module will provides students with a rich experience of independent research and will train them in laboratory, analytical and presentation skills that will be useful in academic, research, regulatory or industrial settings.

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

- LO1 Perform a detailed and up to date literature review on the topic of the project. Modelled on published scientific reviews, this will allow the student to develop their skills in literature research, synthesis and integration of information from multiple sources and scientific writing.
- LO2 Demonstrate their ability to think independently and critically with respect to data and other information sources.
- LO3 Demonstrate competence in a range of skills particular to the laboratory/setting in which the capstone project is performed.
- LO4 Demonstrate their ability to present information in multiple oral and written formats, significantly developing their ability to communicate effectively.

Module content: Performance of a literature review (25%)
Oral presentation of project introduction & experimental design (10%)
Performance of research, production of dissertation (60%)
Presentation of data in conference-style poster format (5%)

Week	Topic & Staff	Practical
Semester 1 *		
3	Introduction to the capstone project & provision of selection of projects (Cunningham)	
4	Deadline for submission of project choices	
9	Project design seminar (Cunningham & other PIs)	Oral presentation

11	Laboratory project begins ** (individual PI labs)	Laboratory work
11	Submission of literature review	Assignment
11-15	Lab work continues**	Laboratory work
Semester 2 *		
22-27	Lab work continues **	Laboratory work
28-30	Dissertation writing & submission	
31	Poster presentation (Cunningham & other PIs)	Poster presentation

**** Students *should not* be expected or asked to skip lectures in order to perform lab work. If this occurs it should be entirely self-motivated and should be done mindful of the importance of lectures. If you are being asked to skip lectures *and do not wish to do so*, please inform me as soon as this occurs (colm.cunningham@tcd.ie).**

You have agency to direct your efforts into whatever you prefer, but management of time and how you prioritise it, is your own responsibility. If you choose to prioritise project work over lectures, accommodations should not be sought from module or course coordinators at a later time.

Senior Sophister Neuroscience project deadlines

<i>Project design seminar</i>	<i>Week Beginning 19th October 2026</i>
<i>Laboratory start</i>	<i>Monday 2nd November 2026</i>
<i>Literature review submission</i>	<i>Friday 6th November 2026</i>
<i>Practical work ends</i>	<i>February 26th 2027</i>
<i>Project report submitted</i>	<i>March 22nd 2027</i>

Assessment details

Component	Weighting in ECTs	(% of module)
Literature review	5	25%
Project Design Seminar	2	10%
Lab Conduct & competence	2	10%
Dissertation	10	50%
Poster presentation	1	5%

Plagiarism and Academic Integrity in NSU44490

Students are permitted to use GenAI in searching the literature, identifying sources of interest during this module, but where the output of GenAI is used to inform a student's document or work output, this usage must be explicitly acknowledged and appropriately cited, as per [Library guidelines on acknowledging and reference GenAI](#). A student who generates content from a GenAI tool and submits it as his/her/their own work will be considered to have committed plagiarism, which is defined as academic misconduct in accordance with College Academic Integrity Policy. Academic misconduct processes have and will be pursued in those instances.

11. Module Coordinator

Executive Officer:

Colm Cunningham
colm.cunningham@tcd.ie
Gabrielle McCabe
Email: gamccabe@tcd.ie
Phone: 01-896 4195

Stages involved in the research project

Literature Review:

Your research project will be preceded by a review of the literature pertaining to your project. The review should be concise and incisive, and must not exceed 5000 words, exclusive of references. *Students are required to write the number of words on the front page of their literature review. Students may exceed the word limit only by 10% e.g. if the word limit is 5,000 words, a word count of 5,500 will be accepted. Following discussions with the external examiner in 2016, penalties will be considered for failure to adhere to these guidelines.*

- It is critically important that work is correctly cited — it is plagiarism to use the work of others without proper acknowledgement. See later sections of this handbook (*Plagiarism and Instructions for Writing Reports*) for guidelines on citation and form of references.
- The number of references quoted should not exceed 50 (again $\pm 10\%$). If at all possible, review articles should mostly be used to refer to earlier work and most references should then be those reporting recent work and developments more closely related to your topic. One assessment criterion is how you exercise critical judgement in choosing the references that you draw on.
- Please seek advice from your supervisor as to sources of historic reviews and pertinent current journal papers. Also, seek your supervisor's advice in writing the review. Each supervisor will expect to see a complete draft at some stage and in offering a project has also agreed to offer feedback on one complete draft.

Input from the project supervisor

The project supervisor will read one complete draft of the literature review prior to submission. Do not expect your supervisor to read incomplete or multiple drafts of your work. You should provide your supervisor with a draft of your literature review at least one week before the submission date, in order to leave time for them to read it, and for you to take on board any suggestions that they may have for improvements. It is your responsibility to take the lead in this. However, if you find your supervisor unresponsive to phone, e-mail or in-person requests for feedback please bring the matter to the attention of your year coordinator (colm.cunningham@tcd.ie)

An electronic (pdf) copy of the literature review should be submitted to Blackboard, using the submission link in module NSU44490 by 12 noon on Friday November 6th.

Your submitted work must begin with a coversheet which should contain the following declaration:

"I have read and understood the academic integrity provisions in the General Regulations of the University Calendar for the current year, found at <http://www.tcd.ie/calendar>.

I have also read and understood (i) the programme-level permissions regarding the use of GenAI in this assessment task, outlined in the programme handbook that relates to this assessment.

Where I have used the output of GenAI in my work, I have acknowledged its use in my work and understood the guidance, located at: <https://libguides.tcd.ie/gen-ai>.

I have also read and understood the Academic Integrity guide located at <https://libguides.tcd.ie/academic-integrity> and completed the 'Ready Steady Write' Tutorial on avoiding plagiarism, located at <https://libguides.tcd.ie/academic-integrity/ready-steady-write>."

Project Design Seminar: Each student will have a 15-minute time slot in which to give a 10-12 minute presentation of the background to the project, the question to be investigated and the material/subjects and methods to be used. Up to five minutes will be available for questions. *These times must not be exceeded and the chair will stop you if you do run over this time (and you may be penalized). Similarly, planning a talk that does not use the time available and presents a very superficial background will not attract good marks. These presentations will happen in person, in the week beginning 19th of October.*

The presentation will enable the teaching staff to satisfy themselves that students have a reasonable understanding of the *underlying theoretical basis* for the investigations proposed and that the *methods* and *design* are appropriate. Staff will also judge whether the project is practicable in the time available. It is therefore important that students emphasise these points in their talks. It is not possible to summarise all the literature in the time available — students must make critical judgements. See *Instructions for Writing Reports* for some guidelines on oral presentations. It is not possible to properly show and discuss more than 10-12 slides. Keep them simple and populate slides with images or concepts around which to build discussion (rather than filling with text, which can only be read and which does not tend to produce compelling presentations).

Students should consult with their supervisors when preparing presentations. They should rehearse presentations several times and preferably have at least one 'dress-rehearsal' with the other members of the class.

Assessment Criteria: The following criteria will be used to assess presentations.

- Content
- Ability to convey key concepts
- Appropriate use of the available time
- Quality of slides
- Style/fluency of delivery
- Ability to answer reasonable questions about the study (*NB it is your responsibility to equip yourself for presenting the project and preparing for relevant questions. You might ask your supervisor to discuss questions that are relevant to the study design or you may generate such questions in your own reading*)

Dissertation: Dissertations should be written according to the style outlined here and in *Appendix I: Instructions for Writing Reports*. Dissertations are assessed by the supervisor but also by one other staff member, who may not be expert in the precise field of study. The style of the dissertation should be designed to be read by a neuroscientist, but one not necessarily expert in the field of the specific project.

Although there is some overlap, the literature review (which will have been submitted around the time of starting in the laboratory) is not the same thing as the introduction of the dissertation. Therefore, the literature review must not simply be repurposed as the *Introduction* to your Dissertation. Instead, the introduction to the project thesis will be considerably shorter and focused explicitly on introducing the experiments to be conducted, providing essential information to place the work in context. Any recent

literature that comes to your attention between November and February should of course be included. Changes in emphasis, as a consequence of the practicalities/pitfalls of your research, as it actually occurs in the laboratory, should also be made. Many journals allow introductions of less than 1000 words. **For the purposes of this thesis, the introduction should be a maximum of 1500 words.**

Overall, the Dissertation should be a maximum length of 40 A4 pages (excluding title pages, contents, plagiarism declaration, abstract, references and any appendices) with 1.5 spacing and font no smaller than 11 point. Therefore, it means 40 pages of text (introduction, methods, results, discussion) and all pages with graphs counting towards the 40-page total.

It is not necessary to limit yourself to 1 graph per page. You should arrange your data in a way that best suits the data: both from the point of view of aesthetics or just for organising related things together - 4 genes on a certain pathway or 3 outputs from a certain cell type etc. Where you have a lot of figures, take your lead from scientific papers where there are sometimes several panels within 1 figure. One rule that should be observed, however, is that the figure and figure legend remain together, either on the same page or on 2 pages facing each other. Having a figure legend that is not available to look at in the same place as the figure is very inconvenient for the reader and will irritate markers.

It is not essential to have an ONLY figure and a legend on one page, but it does look smarter if you avoid mixing main text with a figure and legend on the same page. Try to intersperse the figures among the results text in a way that is sensible – i.e. the figure should come very soon after you have written about it, but it also does not make sense to have a paragraph of text and then to leave most of the page empty just so that you can put the figure on the next page. Try to exercise some common sense about how best to organise the layout. Putting all the figures at the end is very unhelpful.

At the present time, the default position is that the student will submit an electronic copy of the thesis on the advised deadline (to BOTH myself and to the Executive officer of the School of Biochemistry & immunology). Any change to this will be clearly communicated to the class.

Important notes regarding penalties.

Following recommendations by the Neuroscience external examiner in 2016, penalties will be considered for failure to adhere to these page/word count guidelines.

*Excessive description of and presentation of results from **experiments not actually carried out by the student will attract penalties.***

*It is important that, in discussions with your supervisor, you are clear about what you will actually carry out (as opposed to only describing the aspirations of some larger project in which the sophister project is embedded). In simple terms, if you did not do it yourself, it should not be given prominence in your results section. **A declaration must appear, at the beginning of your thesis, in which you verify that the work is entirely your own. Work contributed by members of the host laboratory is NOT entirely your own and therefore must be acknowledged here since inclusion of work, without acknowledgement, performed in part by others constitutes plagiarism.***

Scheduling:

Methods can be written quite early in the project and 'polished' later.

It is possible, and advisable, to prepare results/figure and to perform statistical analysis as you complete individual parts of the project (i.e. during the practical part of the project and not necessarily waiting until you have finished in the lab).

The *Introduction* will normally be finalised last and will use some material from your Literature Review, but should not be a re-tread of the literature review and must be more focused on introducing the work that was *actually carried out* during the project and brought up to date with new, more relevant papers not available at the time of the literature review. The introduction should also still provide sufficient explanation of the key methodological approaches to allow any neuroscientist to understand the techniques that underpin the research (while full details of those methodological approaches will be contained in the methods section).

Assessment of the dissertation: The dissertation will be double marked by two members of the academic staff. The following will be among the criteria used (see also: Descriptors pg40).

- Overall presentation (layout, accuracy, literacy)
- Use of literature, including grasp of different lines of evidence
- Clarity of statement of aims, results
- Clarity of explanation of methodological approaches
- Graphical representation of data (selection and value of the choice, clarity, integration into text, clarity of legends)
- Use and interpretation of statistics (over-interpretation is a serious fault)

Input from the project supervisor: You should try to discuss progress with your supervisor on a reasonably frequent basis, even if you are supervised day-to-day by a member of the laboratory. The supervisor may have intentions or ideas that are not apparent to all lab members.

In addition, the project supervisor will read **one** complete draft of the project report prior to submission. Do not expect your supervisor to read incomplete or multiple drafts of your work. You should provide your supervisor with a draft of your project report one week before the submission date, in order to leave time for them to read it, and for you to take on board any suggestions that they may have for improvements.

PLEASE DISCUSS YOUR TIMELINE FOR SUBMISSION OF DRAFTS/RECEIPT OF FEEDBACK WITH YOUR PI TO ENSURE THAT THEY CAN MAKE TIME TO READ AND PROVIDE THIS FEEDBACK IN TIME FOR YOU TO MAKE USE OF IT !

Conduct of the Student throughout Project: Supervisors are asked to allocate a mark to the conduct of the student during project work. Some indication of the criteria to be used is below.

- Application and commitment: reliability, punctuality and responsibility in the laboratory
- Proficiency and competence in the laboratory
- Literature: creativity in finding material and comprehension of that material
- Intellectual input and initiative
- Data analysis: understanding the bases of statistical tests and using them appropriately

END of capstone section

There are further notes on project writing in the appendices to this handbook.

Attendance and submission deadlines for coursework

Attendance

All students are expected to attend lectures, workshops and practical classes. **Lectures recordings will not be provided.** Scheduled classes play an important role in supporting progress through the academic year, in particular course assignment work. Students are therefore expected to keep up a consistent rate of good attendance so that performance later in the year will not be adversely affected.

In the event of not being able to attend classes due to illness, **please inform the Course coordinator and the course administrator.**

Attendance at Journal club sessions is mandatory. Reading and critically evaluating research papers is a key skill and this module accounts for 10 ECTS. Time spent in these sessions will benefit those who attend and engage with the material, as well as those actually performing talks.

If students wish to skip lectures in order to spend more time in the lab during capstone project, please be aware that this is entirely the choice of the student. We recommend attendance at lectures and appropriate planning of laboratory research hours. The duration of the project has already been extended to reflect that there are some periods of the project where there is also a significant lecture load. The course comprises 60 ECTS and there is no way to achieve this in 22 weeks without some periods of intense activity.

NOTE: Students should not be compelled by project supervisors or by PhD/post-doc advisors to skip lectures. If this occurs, please notify me as soon any such pattern arises.

Students who miss classes are responsible for updating themselves on any information provided during those classes. Recordings will not be provided.

Submission deadlines

For each item of course work (Literature review and project dissertation) there will be a submission deadline. Apart from maintaining equity between students, deadlines enable students to demonstrate the ability to schedule their work properly. Students are expected to meet all deadlines.

A case for special circumstances may be made to the Course Coordinator directly, or via the College Tutor. Extensions will only be given in exceptional circumstances.

Plagiarism

Plagiarism is the act of presenting the work or ideas of others as one's own, without due acknowledgement. The University considers plagiarism to be a major offence, and subject to the disciplinary procedures of the University. The School has a zero tolerance policy in relation to plagiarism. All students submitting assignments to the School are REQUIRED to be familiar with the plagiarism provisions in the General Regulations of the University Calendar <http://www.tcd.ie/calendar>.

All students must read and understand this guide <https://libguides.tcd.ie/academic-integrity>, and complete the [Ready Steady Write tutorial](#).

All students must complete a signed declaration to be submitted with all assessed coursework, declaring that they have read and understood the Library guide on Academic Integrity and Generative AI. Please refer to the Blackboard module for specific instructions.

GenAI: Aligned with the College Statement on Artificial Intelligence and Generative AI in Teaching, Learning, Assessment & Research (2024), the use of GenAI is permitted unless otherwise stated. Where the output of GenAI is used to inform a student's document or work output, this usage should be acknowledged and appropriately cited, as per [Library guidelines on acknowledging and reference GenAI](#). From an academic integrity perspective, if a student generates content from a GenAI tool and submits it as his/her/their own work, it is considered plagiarism, which is defined as academic misconduct in accordance with the College Academic Integrity Policy. If individual modules have further restrictions or permit greater allowances in the use of GenAI, those restrictions or allowances must be stated in the module descriptions in the Blackboard VLE. In such circumstances, it is the module permissions regarding the use of GenAI which are deemed to be definitive for use in that module.

[College Statement on Artificial Intelligence and Generative AI in Teaching, Learning, Assessment and Research](#)

Breaching academic integrity: Refer to <https://libguides.tcd.ie/academic-integrity/consequences> to see the penalties for breaching academic integrity.

Depending on the severity of the case, in addition to marks penalties the student may have the misconduct noted on their SITS record and the case may be referred to the Junior Dean.

You will see on the flow chart in the link that even the lowest level case should be noted on the SITS record by the module coordinator!

Recommended textbooks and websites

Recommended General Neuroscience textbook

Principles of Neural Science (5th Ed.) by Kandel, Schwartz, Jessell, Hudspeth and Siegelbaum (2012)
McGraw Hill

Excellent comprehensive text

Basic Neurochemistry; Principles of molecular, cellular and medical neurobiology (8th Ed) by Brady, Albers, Siegel & Price. Academic Press
ISBN 978-0-12-374947-5

Excellent text on Neurochemistry and Molecular Neurobiology

Principles of Neurobiology (2ND Ed) by Liqun Luo (2020) Taylor & Francis
ISBN: 9780815346050

Good on circuit and behavioral neuroscience and on modern methodological approaches

Fundamental Neuroscience (4th Ed) by L.R. Squire, F.E. Bloom, N.C. Spitzer, S. Du Lac, A. Ghosh, D. Berg (2008) Academic Press; ISBN: 9780123858702

A comprehensive reference text

Neuroscience: Exploring the Brain 5th Edition) by M.F. Bear, B.W. Connors, M.A. Paradiso (2006) Lippincott Williams and Wilkins; ISBN:9781284286878

A good basic text

Useful Web Sites

Reference databases:

Pubmed

Pubmed is a database of journals kept in the National Library of Medicine in the USA. It contains journals from the 1960's up to the present day. It gives abstracts for almost all articles, and it also contains links to many full text articles. This is the standard method used by researchers to search for neuroscientific research papers.

<https://pubmed.ncbi.nlm.nih.gov/>

Science Direct

Science direct is a web-based database of Elsevier Science journals. It contains 1200 scientific journals and access to full-text articles. You can download full text articles from 1995 onwards within TCD.

<http://sciencedirect.com>

Neuroscience Web Sites

'The brain from top to bottom'

<http://www.thebrain.mcgill.ca>

The Allen brain atlas: A large data portal on brain connectivity and gene expression

www.brain-map.org

Brain model tutorial – Useful for Neuroanatomy

<http://pegasus.cc.ucf.edu/~Brainmd1/brain.html>

Basic Biochemistry of neurotransmitters

<http://web.indstate.edu/thcme/mwking/nerves.html>

A useful tour of the brain, and a description of brain disorders

<http://www.brainexplorer.org>

The whole brain atlas

<http://www.med.harvard.edu/AANLIB/home.html>

Senior Sophister Neuroscience examinations

You will be examined on taught material at the end of the semester in which it was delivered. The exact scheduling of examinations has not yet been finalised, therefore, the order of list below is subject to change.

Module Assessments & Examination papers

Semester 1 *In-course assessed:*

BIU44415 (100% assessed in course, 16.66% of year)

Journal club presentations (2 x 20%)

Peer review exercise (30%)

Journal article comprehension open book timed assignment

(*end of Semester 1*, answer all questions: 30% of module BIU44415)

PSU34710: Case Studies in Neuropsychology

Assignment (100%; 8.33% of year).

Semester 1 *Examinations (December 2026)*

NSU44PH2: Neuropharmacology

100% assessed by exam; 8.33% of year:

(Answer 2 questions out of the 4 provided)

PGU44004: Neurophysiology II

100% assessed by exam; 8.33% of year:

(Answer 2 Questions: 1 from each section: either/or format)

Section 1: Glial Physiology

Section 2: Neurophysiology

Semester 2 *Examinations (April/May 2027)*

BIU44445: Neurochemistry II

100% assessed by exam; 8.33% of year:

(Answer 2 questions out of the 4 provided)

BIU44455: Neuroimmunology and Neurodegeneration

100% assessed by exam; 8.33% of year:

(Answer 2 questions out of the 4 provided)

GEU44500 (100% assessed by exam; 8.33% of year):

Neurogenetics (2 Questions: Either/or format: answer 1 from each from each section)

Viva Voce Examinations

Students may be requested to present for a *viva voce* (oral) examination by the External Examiner who has access to all examination answers and project reports, as well as a copy of this *Handbook*. This process has two functions. Firstly, to provide an opportunity to compare our course with other courses throughout the world. This ensures the quality and validity of the course. Secondly to assess whether our students have been marked fairly.

No mark is allocated to the *viva voce* examination. Candidates' marks cannot be reduced as the result of a *viva voce* examination, but the ranking of students within the class and the class of degree may be adjusted upwards on the basis of sufficiently good performance.

Typically, students will not get more than a few days' notice of being called for *viva* given that selection for *viva* is dependent on the final marks received and processed, which do not become available until the end of the marking period.

Although it is not mandatory to take the *viva* (i.e. your mark cannot be downgraded), it is up to individual students to ensure that they remain available to take this examination if they wish to take this opportunity to improve their grade.

Each *viva voce* examination will last approximately 20 minutes.

The final degree marks will typically be available within days of the *viva voce* examinations.

There will be an opportunity to attend a practice viva in semester 2 according to your preference.

External Examiner (2026-2029)

Prof Karen Horsburgh

University of Edinburgh

Structure of marks for the Moderatorship in Neuroscience

The final Senior Sophister mark is comprised of a number of different components as follows.

60 ECTS = 100 % of SS mark

5 ECTS = 8.33%

Senior Sophister marks

58.33 % In-course assessments (30 ECTS)

PSU34710: Case Studies in Neuropsychology (5 ECTS, 8.33%)

-Assignment (100%; 8.33% of year).

Research Literature skills (BIU44415, 10 ECTS, 16.67%)

- Journal Club presentations x2 (6.67 %),
- Peer review exercise (5%),
- Journal comprehension exam (5%)

Capstone Research project (NSU44490, 20 ECTS, 33.33 %)

- Literature review: 8.25 %
- Project design seminar: 3.33 %
- Supervisors conduct mark: 3.33 %
- Poster presentation: 1.65 %
- Project report: 16.65 %
33.33%

41.66 % Examinations (30 ECTS)

5 x single module exam papers @ 8.33% each = 50%)

Overall degree mark

70 %: Senior Sophister marks

30 %: Junior Sophister Neuroscience

Class Descriptors

The following Descriptors are given as a guide to the qualities that assessors are seeking in relation to the grades usually awarded. A grade is the anticipated degree class based on consistent performance at the level indicated by an individual answer. In addition to the criteria listed examiners will give credit for evidence of critical discussion of facts or evidence.

Guidelines on Grades for Sophisters' Essays and Examination Answers

<i>Class</i>	<i>Mark Range</i>	<i>Criteria</i>
<i>I</i>	<i>90-100</i>	IDEAL ANSWER: showing insight and originality and wide knowledge. Logical, accurate and concise presentation. Evidence of reading and thought beyond course content. Contains particularly apt examples. Links materials from lectures, practicals and seminars where appropriate.
	<i>80-89</i>	OUTSTANDING ANSWER: falls short of the 'ideal' answer either on aspects of presentation or on evidence of reading and thought beyond the course. Examples, layout and details are all sound.
	<i>70-79</i>	MAINLY OUTSTANDING ANSWER: falls short on presentation and reading or thought beyond the course but retains insight and originality typical of first- class work.
<i>II-1</i>	<i>65-69</i>	VERY COMPREHENSIVE ANSWER: good understanding of concepts supported by broad knowledge of subject. Notable for synthesis of information rather than originality. Sometimes with evidence of outside reading. Mostly accurate and logical with appropriate examples. Occasionally a lapse in detail.
	<i>60-64</i>	LESS COMPREHENSIVE ANSWER: mostly confined to good recall of coursework. Some synthesis of information or ideas. Accurate and logical within a limited scope. Some lapses in detail tolerated.
<i>II-2</i>	<i>55-59</i>	SOUND BUT INCOMPLETE ANSWER: based on coursework alone but suffers from a significant omission, error or misunderstanding. Usually lacks synthesis of information or ideas. Mainly logical and accurate within its limited scope and with lapses in detail.
	<i>50-54</i>	INCOMPLETE ANSWER: suffers from significant omissions, errors and misunderstandings, but still with understanding of main concepts and showing sound knowledge. Several lapses in detail.
<i>III</i>	<i>45-49</i>	WEAK ANSWER: limited understanding and knowledge of subject. Serious omissions, errors and misunderstandings, so that answer is no more than adequate.
	<i>40-44</i>	VERY WEAK ANSWER: a poor answer, lacking substance but giving some relevant information. Information given may not be in context or well explained, but will contain passages and words, which indicate a marginally adequate understanding.
<i>Fail</i>	<i>35-39</i>	MARGINAL FAIL: inadequate answer, with no substance or understanding, but with a vague knowledge relevant to the question.
	<i>30-34</i>	CLEAR FAILURE: some attempt made to write something relevant to the question. Errors serious but not absurd. Could also be a sound answer to the misinterpretation of a question.
	<i>0-29</i>	UTTER FAILURE: with little hint of knowledge. Errors serious and absurd. Could also be a trivial response to the misinterpretation of a question.

Guidelines on Marking for Project/Dissertation Assessment

Class	Mark Range	Criteria
<i>I</i>	<i>85-100</i>	Exceptional project report showing broad understanding of the project area and excellent knowledge of the relevant literature. Exemplary presentation and analysis of results, logical organisation and ability to critically evaluate and discuss results coupled with insight and originality.
	<i>70-84</i>	A very good project report showing evidence of wide reading, with clear presentation and thorough analysis of results and an ability to critically evaluate and discuss research findings. Clear indication of some insight and originality. A very competent and well-presented report overall but falling short of excellence in each and every aspect.
<i>II-1</i>	<i>60-69</i>	A good project report, which shows a reasonably good understanding of the problem and some knowledge of the relevant literature. Mostly sound presentation and analysis of results but with occasional lapses. Some relevant interpretation and critical evaluation of results, though somewhat limited in scope. General standard of presentation and organisation adequate to good.
<i>II-2</i>	<i>50-59</i>	A moderately good project report, which shows some understanding of the problem but limited knowledge and appreciation of the relevant literature. Presentation, analysis and interpretation of the results at a basic level and showing little or no originality or critical evaluation. Insufficient attention to organisation and presentation of the report.
<i>III</i>	<i>40-49</i>	A weak project report showing only limited understanding of the problem and superficial knowledge of the relevant literature. Results presented in a confused or inappropriate manner and incomplete or erroneous analysis. Discussion and interpretation of result severely limited, including some basic misapprehensions, and lacking any originality or critical evaluation. General standard of presentation poor.
<i>Fail</i>	<i>20-39</i>	An unsatisfactory project containing substantial errors and omissions. Very limited understanding, or in some cases misunderstanding of the problem and very restricted and superficial appreciation of the relevant literature. Very poor, confused and, in some cases, incomplete presentation of the results and limited analysis of the results including some serious errors. Severely limited discussion and interpretation of the results revealing little or no ability to relate experimental results to the existing literature. Very poor overall standard of presentation.
<i>Fail</i>	<i>0-19</i>	A very poor project report containing every conceivable error and fault. Showing virtually no understanding or appreciation of the problem and of the literature pertaining to it. Chaotic presentation of results, and in some cases incompletely presented and virtually non-existent or inappropriate or plainly wrong analysis. Discussion and interpretation seriously confused or wholly erroneous revealing basic misapprehensions.

General Statement of Course

This statement is designed to be helpful to employers and others by giving an idea of the skills acquired and tested during the Moderatorship programme in Neuroscience. It also gives an outline of the range of skills that students can demonstrate by the end of their degree and may be useful in compiling CVs.

The Neuroscience degree class is comprised of 20-23 Science students in their third and fourth years in College. They are treated as one group for the two years (although they share a number of courses with other groups). The course fosters students' responsibility for their own learning; good interpersonal skills; teamwork and supporting others; giving and taking appropriate criticism.

Extraction of information from primary written sources

(This skill is repeatedly used and repeatedly tested throughout the two years.)

- charts and graphs
- constructing and following an argument
- summarising key elements orally and in writing
- criticising evidence, methods, arguments, presentation (including statistics)

Presentation skills

A high standard of presentation is required with strict adherence to deadlines. PowerPoint presentation software is used for all oral presentations.

- reports of laboratory work
- literature reviews
- reports to a specified format using word-processing, spreadsheets and data analysis applications.

Information Skills

Searching for primary and other sources of information using Internet and other electronic resources as well as other means.

Project work

Group projects foster teamwork skills (in which specific instruction is given).

Individual projects develop initiative, persistence, responsibility and coping skills; further develop skills in the following areas:

- reviewing
- analysis
- numeracy
- literacy

Do you want to learn about cutting-edge neuroscience research and still have a brilliant social life ?!!

JOIN NEUROSOC !!!

Our weekly seminar series provides the student body with a chance to learn about the exciting cutting-edge neuroscience research carried out by academics from within Trinity as well as other Irish and foreign universities. It provides a truly unique opportunity for our members to chat to leaders in the field of neuroscience in an informal setting and gain valuable insights and ideas for future career paths.

As well as the exciting SCIENCE aspect to our society....

We also host a number of SOCIAL EVENTS throughout the year. Past events have included movie screenings, BBQ's, 12 bars of Christmas, table quizzes, lots of wine receptions and not forgetting the glitz and glamour of our annual Neurosoc Ball.

These social events are guaranteed nights to be remembered, as well as giving the new students a chance to make strong friendships with the current post-graduate and undergraduate members of the society.

For more information find us at <https://www.trinitysocieties.ie/societies/neuroscience>

OR contact us at: neuroscience@csc.tcd.ie

We'll be looking forward to seeing you soon,

The Neurosoc. Team



SECTION 2

TABLE OF CONTENTS *(pagination begins from 1 again)*

1. General Regulations	1
2. Student Services	1
2.1 Academic Support	7
2.2 Health and Wellbeing Support	7
2.3 Getting Involved	7
2.4 Financial Support.....	8
2.5 Administrative Support	8
2.6 Your Tutor.....	8
2.7 Postgraduate Advisory Service.....	9
2.8 The Academic Registry	10
2.9 Information on key campus locations	10
2.10 Student Representation and Governance.....	11
2.11 Careers Information	11
3. Academic Writing	11
3.1 The Use and Referencing of Generative AI	11
3.2 Academic Integrity and Referencing Guide.....	11
3.3 Research Ethics.....	12
4. General Information	13
4.1 Emergency Procedure	13
4.2 Health and Safety Statements.....	13
4.3 Data Protection	13
4.4 Explanation of ECTS Weighting	13
4.5 Links to Further University Policies and Procedures	14

1. GENERAL REGULATIONS

Standard Text: In the event of any conflict or inconsistency between the General Regulations published in the University Calendar and information contained in programme or local handbooks, the provisions of the General Regulations in the Calendar will prevail.

Reference/Source

[Calendar](#)

Calendar, undergraduate studies, Part II

Part A – General information

<https://www.tcd.ie/calendar/undergraduate-studies/>

Part B – General Academic Regulations

<https://www.tcd.ie/media/tcd/calendar/undergraduate-studies/general-regulations-and-information.pdf>

2. STUDENT SERVICES

[Student Services](#) has developed the handbook (embedded below) outlining the support services provided to undergraduate and postgraduate students. The handbook and further information is available from their website and in the [Student Services Handbook](#). School/Department Handbooks can provide a link to the PDF or embed the PDF within the Handbook itself.

Reference/Source: [Student Supports & Services](#)

Want to make
the most of your
student
experience?

[WWW.TCD.IE/
STUDENTS/
SUPPORTS-
SERVICES](http://WWW.TCD.IE/STUDENTS/SUPPORTS-SERVICES)

**Administrative
Support**

**Health and
Wellbeing
Support**

**Academic
Support**

Here to
help!

**Getting
Involved**

**Financial
Support**



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Supporting your student experience

Want to do
better in your
assignments?

[WWW.TCD.IE/
STUDENTS/
SUPPORTS-
SERVICES](http://WWW.TCD.IE/STUDENTS/SUPPORTS-SERVICES)



Supporting your student experience

Want to keep
yourself well while
you're studying?

[WWW.TCD.IE/
STUDENTS/
SUPPORTS-
SERVICES](http://WWW.TCD.IE/STUDENTS/SUPPORTS-SERVICES)

Student Counselling

Mindfulness Monday
Wellbeing Wednesday
Support Groups
Counselling

Health Centre

GP service
Nurses
Physiotherapist
Emergency Clinics

Sport

Gym
Fitness Classes
Personal Trainers
Swimming Pool

Here to
help!

Healthy Trinity

Healthy Eating
Smarter Travel
Sexual Health
Healthy habits

Chaplaincy

Christian Services
Prayer Rooms
Free lunch!

Student2 Student

Peer mentoring
Peer support

Supporting your student experience



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Want to get
involved outside
the classroom?

[WWW.TCD.IE/
STUDENTS/
SUPPORTS-
SERVICES](http://WWW.TCD.IE/STUDENTS/SUPPORTS-SERVICES)

**Students'
Union**

Sabbatical Officers
Class Reps
Campaigns

Societies

120 Societies

Clubs

50 Sports Clubs

Here to
help!

Volunteering

Entrepreneurship

Global Room

Supporting your student experience



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Having cashflow problems?

[WWW.TCD.IE/
STUDENTS/
SUPPORTS-
SERVICES](http://WWW.TCD.IE/STUDENTS/SUPPORT-SERVICES)



Supporting your student experience

2.1 Academic Support

Student Learning Development	http://student-learning.tcd.ie/
The Library	http://www.tcd.ie/library/
Maths Help Room	http://maths.tcd.ie/outreach/helproom/
Undergraduate Programming Centre	https://teaching.scss.tcd.ie/general-information/ugpc/
Language Learning Centre	http://www.tcd.ie/slscs/clcs/lhc/
Centre for English Language Learning and Teaching	https://www.tcd.ie/slscs/english/
Disability Service	http://www.tcd.ie/disability/
Careers Service	http://www.tcd.ie/Careers/

2.2 Health and Wellbeing Support

Student Counselling	http://www.tcd.ie/Student_Counselling/
Health Centre	http://www.tcd.ie/collegehealth/
Sport	http://www.tcd.ie/Sport/
Healthy Trinity	http://www.tcd.ie/healthytrinity/
Student2Student	http://student2student.tcd.ie/
Chaplaincy	http://www.tcd.ie/Chaplaincy/

2.3 Getting Involved

Students' Union	http://www.tcdsu.org/
Clubs	http://www.tcd.ie/Sport/student-sport/
Societies	http://trinitysocieties.ie/
Volunteering	http://www.tcd.ie/civicengagement/
Entrepreneurship/Portal	https://www.tcd.ie/portal/
Global Room	http://www.tcd.ie/study/international/trinity-life/global-room/

2.4 Financial support

Senior Tutor's Office*	http://www.tcd.ie/seniortutor/students/undergraduate/financial-assistance/
Students' Union Welfare Loans	https://www.tcdsu.org/welfare-equality
Bursaries/Prizes (Undergraduate)	http://www.tcd.ie/calendar/undergraduate-studies/ (Part D: 11 - Prizes and other awards)
Bursaries/Prizes (Postgraduate)	https://www.tcd.ie/calendar/graduate-studies-higher-degrees/ (Section XI: Postgraduate Awards and Travel Funds)
Exhibitions	http://www.tcd.ie/calendar/undergraduate-studies/ (Part D: 8 - Entrance Awards)
Scholarships	http://www.tcd.ie/study/undergraduate/scholarships-funding/

*Remember, you can ask your Tutor for advice and guidance about anything and they will point you in the right direction

2.5 Administrative Support

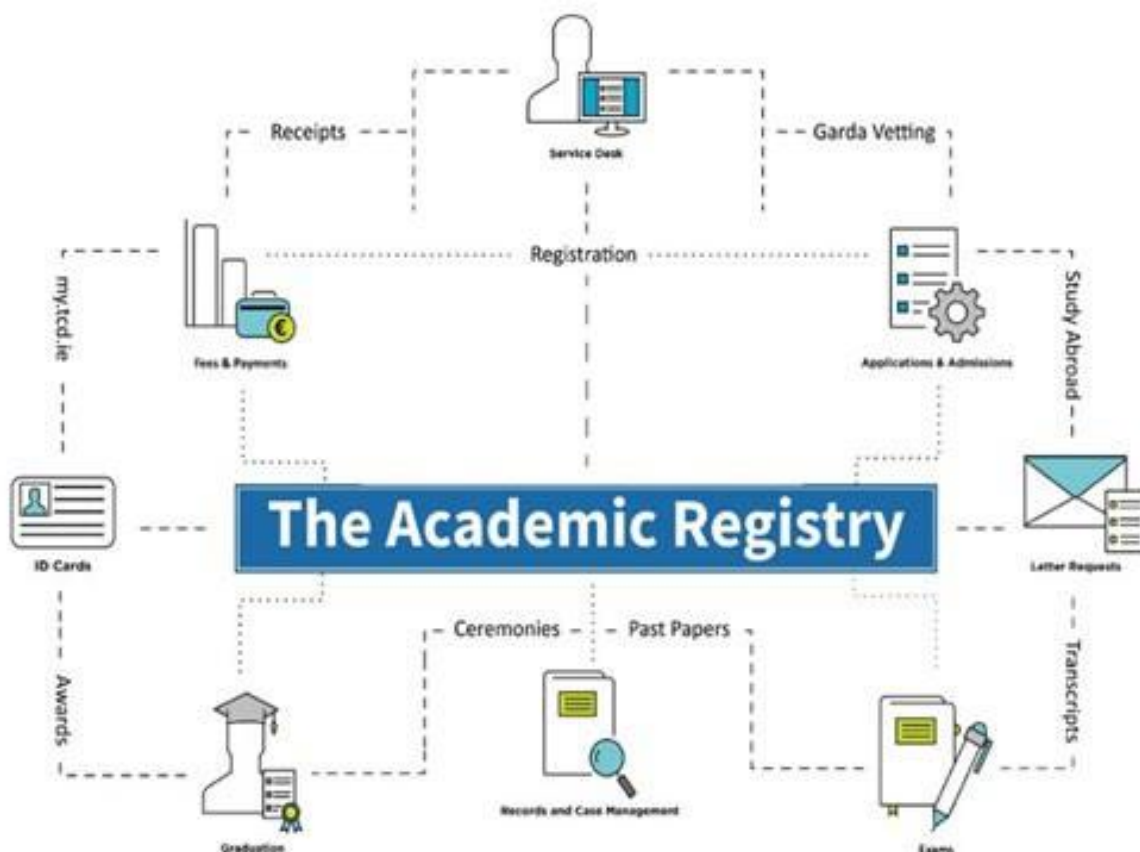
Your Tutor	http://www.tcd.ie/seniortutor/
Postgraduate Advisory Service	http://www.tcd.ie/seniortutor/students/postgraduate
Academic Registry	http://www.tcd.ie/academicregistry/

2.6 Your Tutor

All registered full-degree undergraduate students are allocated a [Tutor](#) when starting in College. Your Tutor is a member of academic staff who is appointed to look after the general welfare and development of all students in their care. You should see your Tutor whenever you have a question or are worried or concerned about any aspect of College life or your personal life, in particular if it is affecting your academic work. Everything you say to your Tutor is in strict confidence. Unless you give them permission to do so, they will not give any information to anybody else, whether inside College or outside (not to your parents/family for example). Your

Tutor can help you only if they know you are facing difficulties, so if you are worried about anything go and see your Tutor before things get out of hand. Whilst your Tutor may not be able to solve the underlying problem, they can help you find the best way to limit the impact of your situation on your College work. Tutors can help with academic advice, changing course, withdrawing from College, exam regulations, financial assistance and personal advice

2.7 Academic Registry



Information on key campus locations

The main locations that are pertinent to you in your SS year are

TBSI <https://www.tcd.ie/biosciences/visiting/>

School of Biochemistry & Immunology Office: Room 3.07, Biochemistry School Office, TBSI, Pearse St.
+353-1-896 4195 gamccabe@tcd.ie

TCIN/Lloyd Institute <https://www.tcd.ie/Neuroscience/contact/>

Schools/Departments in which you will perform your capstone projects

Reference/Source

[Student Supports & Services](#)

[Interactive College Map](#)

2.8 Student Representation and Governance

Information on the TCDSU student representation structures are available at the following links:

[TCDSU](#)

[TCDSU Student Representation Overview](#)

2.9 Careers Information

References/Sources:

[Trinity Careers Service](#)

[Careers - PG Focus](#)

3. ACADEMIC WRITING

3.1 The Use and Referencing of Generative AI

Aligned with the College Statement on Artificial Intelligence and Generative AI in Teaching, Learning, Assessment & Research (2024), the use of GenAI is permitted unless otherwise stated.

Where the output of GenAI is used to inform a student's document or work output, this usage should be acknowledged and appropriately cited, as per [Library guidelines on acknowledging and reference GenAI](#).

From an academic integrity perspective, if a student generates content from a GenAI tool and submits it as his/her/their own work, it is considered plagiarism, which is defined as academic misconduct in accordance with College Academic Integrity Policy.

Specific restrictions concerning the use of GenAI are stated in module descriptions in the Programme Handbook (see page 34 and modules BIU44415 and NSU44490).

Reference/Source

[College Statement on Artificial Intelligence and Generative AI in Teaching, Learning, Assessment and Research](#)

[Library guidelines on acknowledging and reference GenAI](#).

3.2 Academic Integrity and Referencing Guide

Reference/Source

[Calendar Part II, B: General Regulations & Information, 'Academic Integrity'](#)

[Statement of Principles on Integrity](#)

[Academic Integrity Policy](#)

[Library Guides - Academic Integrity](#)

[Coversheet Declaration](#)

3.3 Research Ethics

[Research Ethics](#)

[Policy on Good Research Practice](#)

[Ethics Policy](#)

4 GENERAL INFORMATION

4.1 Emergency Procedure

In the event of an emergency, **dial Security Services on Extension 1999**

Security Services provide a 24-hour service to the College community, 365 days a year. They are the liaison to the Fire, Garda and Ambulance services and all staff and students are advised to always telephone Extension 1999 (+353 1 896 1999) in case of an emergency.

Should you require any emergency or rescue services on campus, you must contact Security Services. This includes chemical spills, personal injury or first aid assistance.

It is recommended that all students save at least one emergency contact in their phone under ICE (In Case of Emergency).

It is also recommended that students download the SafeZone app to access alerts for closures in inclement weather, etc.

4.2 Health and Safety Statements

Applicable information relating to health and safety in the classroom and laboratories will be provided individually in those specific settings

4.3 Data Protection

Information on Data Protection regarding your student data is available from:

[Data Protection for Student Data](#)

4.4 Explanation of ECTS Weighting

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, clinical attendance, professional 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. Within Undergraduate courses 1 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, assessments and examinations. Within Postgraduate courses, 1 credit represents 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, assessments and examinations.

ECTS credits are awarded to a student only upon successful completion of the programme year. Progression from one year to the next is determined by the programme regulations. Students who fail a year of their programme will not obtain credit for that year even if they have passed certain component. Exceptions to this rule are one-year and part-year visiting students, who are awarded credit for individual modules successfully completed.

Reference/Source:

<https://www.tcd.ie/academic-affairs/academic-regulations/ug-module-sizes-and-capstone/>

4.5 Links to Further University Policies and Procedures

The following are links of where to find further information on University regulations, policies, and procedures that you may find useful as a student:

[All Academic Policies](#)

[Student Complaints Procedure](#)

[Dignity & Respect Policy](#)

[Equality Policy](#)

APPENDIX 1

Further guidelines on Writing Reports

This is a rather long section with a lot of detail in it. This is because the department (and employers) regard the acquisition of communication skills as very valuable. I hope that these notes will help you to develop those skills and that you will take pride and pleasure in that development. You will find that you will not absorb all this information at a single reading. You should refer to these notes whenever you are doing a significant piece of writing and especially when you are writing your Project Report/Dissertation.

These instructions have been prepared to indicate to both staff and students the expected standard of report writing and they apply to all reports and the Senior Sophister Project. It is probably not an exaggeration to say that up to 20% of marks are lost by poor presentation of work. These notes are designed to help students to avoid the most common faults and to improve the presentation of work. While directed towards the writing-up of a major project report, almost all the advice can be applied to short reports and essays, which form the bulk of the in-course assessments during the Sophister years.

Preparing a Synopsis

It is essential to prepare a detailed synopsis of any piece of written work, which is likely to be more than one page long. A synopsis helps the writer to clarify what the main points are and to arrange the material so as to bring the important points out. For a Project Report, the synopsis would show the order in which the material is to be presented, some idea of the length of each section, what is to be included in each section and an indication of the location of Figures, Tables and Plates.

There are two main objectives in preparing a synopsis:-

- a) To help the writer to plan the work to the maximum effect.
- b) To produce a written document which can be discussed with the supervisor before a great deal of writing is done. This is essential for large reports and is strongly recommended as a general practice.

A carefully produced synopsis can save many hours of writing time and will allow alterations and additions. Work that is not well-planned/well structured from the outset is likely to ramble and the main points will be lost.

The dissertation should be divided into the following standard sections:

Title

Abstract (Summary)

Acknowledgements

Introduction

Methods

Results

Discussion

References

Appendices

Very occasionally, the nature of the material may require a different format.

Students should consult supervisors before deviating from the standard arrangement.

Now follows a short discussion of the headings listed above.

Title

This should be informative without being too long. Abbreviations should be avoided.

Abstract

The abstract (not to exceed 250 words) should be clearly written and readily comprehensible to a broad readership. The abstract should provide a concise summary of the objectives, methodology, key results, and major conclusions of the study. It should be written in complete sentences, without explicit subheadings.

Acknowledgements

The Acknowledgements should be placed at the beginning of the Capstone Project dissertation, when they should immediately follow the Title and Summary.

As a matter of courtesy, *all* staff mentioned should be given a title (Prof., Dr, Mr, Ms) and both forename and surname. Only intimates should be referred to by first name only.

Work contributed by others to your project **must be** acknowledged. Such a situation would arise if, for example, stored samples generated by another researcher were used in the project or if the nature of specific experiments to be included in the project dictated that they must be carried out by an experienced researcher. The titles and names of such contributors and the precise nature of their contribution must be included in this section in a clear statement of acknowledgement.

An omission of such an acknowledgement where required is plagiarism which, as outlined elsewhere in this Handbook (pages 15, 28, 34 and page 11 of section 2) is regarded by College as a serious offence, and the student concerned will be penalised.

All the foregoing are 'preliminaries' and should not be numbered with the main body of the text. Instead, give preliminaries Roman numerals (i, ii etc.). The pages of the main text should be numbered using Arabic numerals (1, 2, etc).

Introduction

On the whole, short introductions are preferred. A long summary of the literature is not necessary and is better placed in the relevant sections of the Discussion. A clear statement of the problem and the immediate background as well as the aims of the project and its relevance should be given.

Methods

A clear account of all the animals, materials, methods (including statistical analyses) and experimental designs used must be given so that others can repeat the experiments. (The anonymity of human subjects must be preserved, by using code numbers or letters.) In particular, it should always be clear to the reader exactly what is being measured, and how many measurements (or animals or subjects) there are in each value. Failure to do this will result in loss of marks. It may be useful to clarify here the contribution of others to the practical work (see *Acknowledgements*).

Results

This is usually the most badly-presented section of reports and yet it is the most important. The reader must be led carefully through the results step by step. The main observations must be brought out; it is **NOT** sufficient to present figures or tables and then leave the reader to work out the meaning (see later sections: *Figures* and *Tables*).

Second-order variables. If you are using some transformation (e.g. percentages) of the raw data, you should explain why you are doing so and, if possible, what, if any, difference the transform makes. When results are presented as % control, the absolute value of the control should be given in the Figure/Table legend.

Presentation of Statistics. This requires particular attention and is a skill that must be acquired. Always state clearly what measure (mean, etc.) and what measure of variation (SD, SEM, etc.) is being used. The number of observations (n) must be clearly stated and specifically given if SEM's are used. Do not give excessive numbers of decimal places; measures of variation should have one more significant figure than the mean. It is important to clearly state the **direction** and **magnitude** of the change observed. That is, first state the finding in plain English and then give the statistical support for that statement (i.e detail the results of any statistical tests used to determine significance).

Example: Pre-treatment with dexamethasone induced a decrease of approximately 80% in TNF- α production from glial cells ($P < 0.01$ versus vehicle-treated control by Student's t-test).

Significance Testing. Express significant differences by probability values or conventional symbols: * = $P < 0.05$, ** = $P < 0.01$, *** = $P < 0.001$.

Over-interpretation of results is a serious error. You must demonstrate that you understand the significance of statistical testing. If a difference (or other statistical result, e.g. correlation) is not statistically significant, you should not treat it as if it is. If you want to discuss a non-significant 'trend' in your results, make it clear that you know the difference. (You should also have a sound biological reason for doing so.)

Discussion

This section often presents the most problems. In particular, it is often difficult to decide what should go in the Discussion and what should go in the Results (see *Preparation of a Synopsis*, below). A good guideline is to state the finding in the results section but do not consider its meaning or interpretation until you write the discussion. When in doubt, put it in the Discussion and leave the presentation of results as uncluttered as possible.

The Discussion will typically include the following.

- a) A brief summary of the main results (single paragraph): this should always be the opening of your discussion.
- b) Interpretation of the significance of your results.
- c) A comparison of the results (not forgetting the control values) with those in the literature.
- d) A discussion of the relevant literature.
- e) A critical discussion of possible sources of error in the results. *Critical* means not only listing the sources of error but also saying how important they are likely to be.

- f) An identification of future work or confirmatory work. This is especially important with smaller pieces of research like the capstone project because elements will undoubtedly be unfinished in some respect.

This list is not exhaustive and categories will often overlap, but it should help at the planning stage.

References

Note that **all** references cited in the text must appear in the list of references — and **only** those references. General reading such as textbooks should not be cited, unless you are using a figure or referring to a very specific point.

In the text...

- When you make a scientific statement of fact, you must reference an original article with data to support this fact (Smith *et al.*, 1999).
- If there is only one author, quote the name only followed by the year the paper was published (Jones, 2000).
- If there are two authors, use both names followed by the year the paper was published (Murphy & Quinn, 2001).
- If there are more than two authors, use *et al.* (always in italics with a full stop afterwards), which is the Latin term for 'and others' (Smith *et al.*, 1999).
- If you want to reinforce the point and use several articles, they should be listed from the earliest to latest, and separated by a semicolon (Smith *et al.*, 1999; Jones, 2000; Murphy & Quinn, 2001).
- If you are quoting two articles by the same person in the same year, denote one as 'a' and one as 'b'. This is done alphabetically according to the second author on the paper (Smith *et al.*, 1999a; Smith *et al.*, 1999b).
- When including the reference in the text, follow the following formats. 'Smith *et al.* (1999) have shown that...', 'It was shown by Smith *et al.* (1999) that...'.

Style of References

These days most journals use an abbreviated format for Journal titles.

When abbreviating Journal titles make sure to use the correct abbreviation. You can find the correct abbreviation of any journal on PUBMED (<http://www.ncbi.nlm.nih.gov/entrez/>)

Some examples are as follows:

Journals with a single word in the title are not abbreviated (eg) Neuropharmacology = Neuropharmacology
Journal of Neuroscience = "J Neurosci"

Behavioural Brain Research = "Behav Brain Res"

There are different styles for journal articles, books, and book chapters as illustrated below.

Journal article

Cited in text as: (Wang *et al.*, 2004)

Cited in reference list as:

Wang Q, Rowan MJ, Anwyl R (2004) β -amyloid-mediated inhibition of NMDA receptor-dependent long-term potentiation induction involves activation of microglia and stimulation of inducible nitric oxide synthase and superoxide. J Neurosci 24: 6049-6056.

Book

Cited in text as: (Hille, 1974).

Cited in reference list as:

Hille B (1984) Ionic channels of excitable membranes. Sunderland, MA: Sinauer.

Chapter in a book

Cited in text as: (Stent, 1981)

Cited in reference list as:

Stent GS (1981) Strength and weakness of the genetic approach to the development of the nervous system. In: Studies in developmental neurobiology: essays in honor of Viktor Hamburger (Cowan WM, ed), pp288-321. New York: Oxford UP.

The most important thing to remember when citing references is to be consistent.

Appendix

This should contain raw data that may be essential but impractical to provide within the results or may be methodological details including programming code. Note that all entries in the Appendix must be properly described in suitable legends. It is not inappropriate to repeat relevant statistical summaries in the Appendix. All Tables in the Appendix must have fully descriptive titles so that they can be understood without reference to the main text.

Figures and Tables

These are a great deal of trouble to prepare and it is a pity to waste them for the sake of a little attention to detail. All Figures and Tables must be numbered and have a descriptive legend, so that each can be understood without reference to the text. Legends precede Tables and follow Figures. It may be desirable to include the important observation or conclusion in the legend, especially in histological figures. All units of measurement and statistical parameters must be identified. Axes on graphs and columns in tables must be labelled so that it is clear what each point or value represents. Try to keep graphs uncluttered — three lines are plenty. Use the conventional symbols of open and filled squares, triangles or circles. Shading will aid clarity in histograms. Tables should be as simple as possible. Try not to put all your results in one huge Table because the effect is too daunting for the reader.

The commonest fault is the failure to integrate Figures and Tables with the text. It is no use saying: 'The results of this experiment are summarised in Table 3.' and then proceeding to the next item. The reader must be guided and the main points clearly brought out — even at the cost of some repetition of material between legend and text. If Figures or Tables are large, it may not be possible to include the legend on the same page. In such cases, put the legend on the facing page. If Figures, Tables or Plates (mounted groups of photographs) are brought together, rather than being interspersed with the text, say so and tell the reader where they are. Note that if it is necessary to put a figure or table sideways in the text, it should be arranged so that it is viewed from the right. *If you have copied a figure from somewhere else, or modified it only a little, the original figure must be acknowledged (with reference in the legend and in the list) (see Plagiarism).*

Grades of Heading

Careful attention should be given to this point at the planning stage. Examples of the usual grades of heading are given below with a short description of each in brackets). Use bold or italic type as

shown.

Heading

RESULTS

[capitals in bold print, usually centred, no underline or stop]

Subheading

Effect of NMDA receptor blockade on neuronal viability

[Upper and lower case in bold print, centred or right justified, no stop]

Further subheading

LDH release

[Upper and lower case in bold italic print, centred or right justified, no stop]

Word Processing: There are some conventions that should be followed. Paragraphs should be created by leaving a blank line and not by indenting. Do not put spaces before a punctuation mark because it might then be carried over to the beginning of a new line.

All punctuation marks should have only a *single* space *after* them, never before. In the days of typewriters, colons and full points were conventionally followed by two spaces. It is not necessary or desirable to do so in a word-processor, because the application will stretch that space preferentially, especially in fully-justified text (i.e. text with straight left and right margins as in this section). Word-processors allow you to cut and paste graphs and figures into the text rather than putting them on separate pages with legends on the facing page. This should be done wherever possible. Use the spelling checker, but ensure that it is set to 'English (UK)' and not 'English (US)' by using the 'Language' option on the Tools menu. Remember that you will still need to proof-read the final draft; the spelling checker will not find all errors. Pay special attention to names and technical terms.

Spelling.

'UK English' rather than 'US English' forms should be used: *e.g.* fibre *not* fiber.

Student's *t* test should have a capital and apostrophe); the *t* should be italicised.

"It's" should never be written in formal prose; always use 'it is'. The possessive is "its".

Numbers less than eleven should be spelled in full, unless they refer to specific units, *e.g.* '6 days', but 'six subjects.'

Note that 's', 'h', 'min' [no stop] and 'd' are the abbreviations for seconds, hours, minutes and days, respectively. The multiplier 'k' as in km (kilometre) is always lower case. The abbreviations for units never take an 's-plural'.

Headers and *Footers* are provided in word processors: a Header can be used to insert space and/or a running title at the top of each page; a Footer does the same at the bottom of the pages.

Pagination should be checked as the last stage in preparing a manuscript. It is usual to adjust the text so that odd lines or parts of lines do not appear at the beginning or end of a page. The adjustment may be done by inserting blank lines in appropriate places or by using the **Insert Page Break**

command. *Word* has a 'Control widows and orphans' option (see **Format** menu, **Paragraph, Line & Page breaks** tab). Remember to set the page style (**Page Setup**) and printer type (*via Chooser*) before doing this and work from the beginning of the text.

Font. Choose your font with care. Some fonts take up a lot of space and others may not be suitable for laser-printing. For this reason you should avoid fonts named after cities. *Garmond* (used in these notes) has been found to be a satisfactory, clear and reasonably compact font. Resist the temptation to use very ornate fonts (e.g. *London* or *Zapf Chancery*) for body-text. Resist also the more complex styles such as *Outline*. Underlining does not look very attractive in laser-printing and you may prefer to use italics for emphasis.

Fonts are designed for different purposes and a font that is easy to read on a screen (e.g. *Geneva*) is not necessarily suitable for body-text. *Times* is designed for narrow columns and does not look well in A4 pages and should not be used. *Times New Roman* shares many of the characteristics of *Times* (compact, with a lot of white space) but looks better.

Spacing. With conventional typewriters, it was conventional and desirable to double-space the text to aid clarity. If a type-size larger than 10 pt is used, it is unnecessary to double-space. If you use 12 pt body text, 1.5 spacing may be adequate. Try it and check with your supervisor if in doubt. (This text is 10 pt and single-spaced.)

Special Fonts. Greek characters are available in the font *Symbol*.

Preparing Material for PowerPoint presentations: Students are required to make oral presentations from time to time — another important skill. The usual means of presenting visual information is via Microsoft PowerPoint or similar applications.

- *Legibility.*

Anything less than 18 pt body text will be difficult to read.

Headings should be about 24 pt.

Using a 'sans-serif' font (e.g. *Helvetica*) will often improve legibility. *Times* is not suitable for projection.

Bolding the text is helpful too.

Diagrams will usually need to be enlarged before incorporating into slides.

It is useless to merely copy pages from papers or books onto slides — the print size will be neither big enough nor dense enough.

- *Density.* Five lines is the useful maximum

Bullet points are better than continuous prose.

If you are tempted to put more on, think again: are you trying to write your speaking notes onto the acetate?

It is not good technique to simply read out what is on the screen.

Use your diagrams as a tool to walk through your explanations

(this allows you to become less dependent on notes/bullet points you have written)

Further information on plagiarism

1 Plagiarism is interpreted by the University as the act of presenting the work of others as one's own work, without acknowledgement.

Plagiarism is considered as academically fraudulent, and the University considers plagiarism to be a form of academic misconduct and subject to the disciplinary procedures of the University.

2 Plagiarism can arise from deliberate actions and also through careless thinking and/or methodology. The offence lies not in the attitude or intention of the perpetrator, but in the action and in its consequences.

Plagiarism can arise from actions such as:

- (a) copying another student's work;
- (b) enlisting another person or persons to complete an assignment on the student's behalf.
- (c) quoting directly, without acknowledgement, from books, articles or other sources, either in printed, recorded or electronic format;
- (d) paraphrasing, without acknowledgement, the writings of other authors.
- (e) Presenting text generated by GenAI as your own work

Examples (c) and (d) in particular can arise through careless thinking and/or methodology where students:

- (i) fail to distinguish between their own ideas and those of others.
- (ii) fail to take proper notes during preliminary research and therefore lose track of the sources from which the notes were drawn [*this is occurring regularly in submitted exams and significant instances of this will be followed up*]
- (iii) fail to distinguish between information which needs no acknowledgement because it is firmly established in the public domain and information which might be widely known, but which nevertheless requires some sort of acknowledgement;
- (iv) come across a distinctive methodology or idea and fail to record its source.

All the above serve only as examples and are not exhaustive.

Students should submit work done in co-operation with other students only when it is done with the full knowledge and permission of the lecturer concerned. Without this, work submitted which is the product of collusion with other students may be considered to be plagiarism.

3 It is clearly understood that all members of the academic community use and build on the work of others. It is commonly accepted also, however, that we build on the work of others in an open and explicit manner, and with due acknowledgement. Many cases of plagiarism that arise could be avoided by following some simple guidelines:

- (i) Any material used in a piece of work, of any form, that is not the original thought of the author should be fully referenced in the work and attributed to its source. The material should either be quoted directly or paraphrased. Either way, an explicit citation of the work referred to should be provided, in the text, in a footnote, or both. To not do so is to commit plagiarism.

- (ii) When taking notes from any source it is very important to record the precise words or ideas that are being used and their precise sources.
- (iii) While the Internet often offers a wider range of possibilities for researching particular themes, it also requires particular attention to be paid to the distinction between one's own work and the work of others. Particular care should be taken to keep track of the source of the electronic information obtained from the Internet or other electronic sources and ensure that it is explicitly and correctly acknowledged.

4 It is the responsibility of the author of any work to ensure that he/she does not commit plagiarism.

5 Students should ensure the integrity of their work by seeking advice from their lecturers, tutor or supervisor on avoiding plagiarism. All departments should include, in their handbooks or other literature given to students, advice on the appropriate methodology for the kind of work that students will be expected to undertake.

6 If plagiarism as referred to in (2) above is suspected, the Course coordinator will arrange an informal meeting with the student, the student's tutor*, and the lecturer concerned, to put their suspicions to the student and give the student the opportunity to respond.

<https://www.tcd.ie/academic-affairs/academic-policies/academic-integrity/>

If the course Coordinator forms the view that plagiarism has taken place, he/she must notify the Senior Lecturer in writing of the facts of the case and suggested remedies, who will then advise the Junior Dean. The Junior Dean will interview the student if the facts of the case are in dispute. Whether or not the facts of the case are in dispute, the Junior Dean may implement the procedures set out in Section 5 (Other general regulations).

7. If the offence can be dealt with under the summary procedure, the course coordinator will recommend:

a) that the piece of work in question receives a reduced mark, or a mark of zero;

or

b) if satisfactory completion of the piece of work is deemed essential for the student to rise with his/her year or to proceed to the award of a degree, the student may be required to re-submit the work. However, the student may not receive more than the minimum pass mark applicable to the piece of work on satisfactory re-submission.

8. Provided that the appropriate procedure has been followed and all parties above are in agreement with the proposed penalty, the course coordinator may approve the penalty and notify the Junior Dean accordingly. The Junior Dean may nevertheless implement the procedures set out in Section 5 (Other General Regulations).

* As an alternative, students nominate a representative from the Students' Union to accompany them to the meeting.