At Trinity College, aspects of microbiology are taught as part of the biology curriculum in the Junior and Senior Freshman years in Natural Sciences. Suitably qualified students may specialize in Microbiology in the Sophister years.

Microbiology is a two-year moderatorship course run by the School of Genetics and Microbiology. It encompasses microbial & molecular genetics, microbial genomics, cellular & molecular biology, microbial pathogenesis, medical microbiology, immunology, virology, applied aspects of microbiology and biotechnology. Senior Sophister students study in specialized areas of modern microbiology and carry out a full-time, nine-week research project. The Microbiology Junior Sophister course advisor Dr Alastair Fleming should be consulted in the first instance concerning entry requirements.

Microbiology graduates find employment in research laboratories in universities, research institutes, industry, hospitals, in the scientific civil service, police forensic laboratories, public health laboratories, quality control laboratories in the food, dairy and beverage industries, as well as areas such as education, scientific publishing, technical sales, technical services, marketing and in management.
**Junior Sophisters:**
The JS year consists of a diverse programme of lectures, laboratory practicals, tutorials and a research essay. The JS year is a 60 credit course composed of five core 10 credit modules consisting of lectures (5 credits) and associated practicals (5 credits), and a 5 credit research essay and transferable skills course. Students also have the opportunity to take an optional Microbiology course (5 credits), or can take a Broad Curriculum option (5 credits).

**Assessment and Examination Procedures**
All core Microbiology module lecture components (totalling 25 credits) will be examined in one of five written papers taken in the annual examination period in Trinity Term.

Practical components (totalling 25 credits), Research Essay and Transferable Skills (MI3M03, 5 credits) and the Microbiology optional course (MI3M07, 5 credits) will be assessed in-course by laboratory practical report, practical test, written test or other assignments.

Marks for Microbiology modules MI3M01-MI3M06 plus the Optional Course (MI3M07 or Broad Curriculum) will form the JS Microbiology mark that is carried forward to Moderatorship. This combined mark will constitute 20% of the Moderatorship mark.

The following table outlines the organization and composition of the modules (MI3M01 - MI3M06) which make up the Junior Sophister Microbiology year. Each principle module is weighted at 5 or 10 ECTS and is composed of between one and six elements. Detailed descriptions of the lecture and laboratory components follow on pages 4-12. The information in this booklet may be subject to change depending on staff availability and circumstance.
Table 1. Microbiology Junior Sophister Modules

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Module Title</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI3M01</td>
<td>Microbial Physiology &amp; Biochemistry [AF]</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Microbial Physiology (L)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bacterial Surfaces (L)</td>
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<td>Protein Structure &amp; Function (L)</td>
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<tr>
<td></td>
<td>Protein Analysis (L)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biomembranes Laboratory (P) &amp; Cell Imaging (T)</td>
<td></td>
</tr>
<tr>
<td>MI3M02</td>
<td>Microbial Pathogenicity &amp; Immunology [KR]</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Bacterial Pathogenicity (L)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Virology (L)</td>
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<tr>
<td></td>
<td>Introduction to Immunology (L)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bacterial Pathogenicity Laboratory (P)</td>
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<tr>
<td></td>
<td>Virology Laboratory (P)</td>
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<tr>
<td>MI3M03</td>
<td>Research Essay &amp; Transferable Skills [AF &amp; KR]</td>
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<tr>
<td></td>
<td>Research Essay (ES)</td>
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<td></td>
<td>Transferable Skills (T)</td>
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<td>MI3M04</td>
<td>Bacterial Molecular Biology &amp; Genetics [KD]</td>
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<td></td>
<td>Microbial and Molecular Genetics (L)</td>
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<td></td>
<td>Transcription, Translation and Replication (L)</td>
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<td>Microbial &amp; Molecular Genetics Laboratory (P)</td>
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<tr>
<td>MI3M05</td>
<td>Eukaryotic Molecular Biology &amp; Genetics [UB]</td>
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<tr>
<td></td>
<td>Eukaryotic Molecular and Cell Biology (L)</td>
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<tr>
<td></td>
<td>Molecular Biotechnology (L)</td>
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<td>Genomics (L)</td>
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<td></td>
<td>Molecular Genetics &amp; Biotechnology Laboratory (P)</td>
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<tr>
<td>MI3M06</td>
<td>Applied Microbiology [CK &amp; MM]</td>
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<tr>
<td></td>
<td>Applied Microbiology [L]</td>
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<td></td>
<td>Antimicrobial Agents (L)</td>
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<td>Bioinformatics Laboratory (P)</td>
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<td></td>
<td>Statistics (T)</td>
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<tr>
<td>MI3M07</td>
<td>Microbiology Past &amp; Present [NNB &amp; AF]</td>
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<td>Optional Course</td>
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<td></td>
<td>The evolution and impact of Microbiology (L/T)</td>
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<td></td>
<td>Current Topics in Microbiology (S/T)</td>
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</tbody>
</table>

Abbreviations used: L, Lecture; P, Practical; T, Tutorial; ES, Essay; S, Seminar. Module managers are indicated by initials in parenthesis.
MI3MO1: Microbial Physiology & Biochemistry (Prof A. Fleming)
10 ECTS Credits

1. Microbial Physiology: The lectures deal with specialized bacterial and fungal cell wall components, nutrient uptake mechanisms and regulation, microbial metabolism (glycolysis, aerobic and anaerobic respiration, fermentation), adaptation to nutrient depletion and cell death.

2. Bacterial Surfaces: These lectures deal with the structure and function of bacterial envelope components, surface proteins and polysaccharides. The contribution of each component to bacterial survival and pathogenesis is examined. Biosynthesis, post-translational modification and secretion of protein and polysaccharide structures are described. The potential to use bacterial surface structures as vaccine antigens and to exploit our knowledge of biosynthetic pathways to discover new antimicrobial drug targets are discussed.

3. Protein Structure & Function: The lectures involve a description of protein structure and folding, beginning with amino acid chemistry. The hierarchy of protein folds, and the forces that shape a compact and globular 3-dimensional structure are discussed. Specific examples are shown, such as DNA-binding proteins, globins, and immunoglobulins to highlight the link between fold and function. Prion proteins are discussed in the context of protein folding.

4. Protein Analysis: The lectures will detail the different methods used for the analysis of proteins including descriptions of techniques such as mass spectroscopy and NMR spectroscopy. Lecture 1; The physical and analytical chemistry of biological systems – Biophysics for the ‘rest of us’; Spectroscopy in general. Lecture 2; UV/Vis spectrophotometry; “left or right-handed” molecules; the world of fluorescence. Lecture 3; Partially-folded proteins; neurodegenerative diseases; measuring protein stabilities. Lecture 4; Fluorescence polarization; lasers; Why biochemists like to “FRET” about protein interactions. Lecture 5; Mass spectrometry and proteomics; the structural genomics initiative.

MI3MO1 is examined during the annual examination period in Trinity Term.

5. Laboratory course in Biomembranes: This laboratory course deals with preparation of inner and outer membranes of Escherichia coli, analytical techniques for bacterial membranes including Lowry protein assay, SDS-PAGE, Western blotting and numeracy exercises. The course is designed to maximize hands-on experience and to teach data handling, presentation and interpretation.

6. Tutorials in Cell Imaging: These tutorials will introduce students to imaging of cells in the broadest sense from high resolution electron microscopy to imaging of cells and organelles with advanced light microscopy. It will cover transmission and scanning electron microscopy, and light, fluorescence, epifluorescence and confocal microscopy. The tutorials will focus on illustrating the techniques with worked examples and will highlight the applications and limitations of the various approaches.

The practical class and cell imaging tutorials are assessed in course at the end of the respective courses.
MI3MO2: Microbial Pathogenicity & Immunology (Prof K. Roberts)
10 ECTS Credits

1. Bacterial Pathogenicity:
The course covers the molecular basis of bacterial pathogenesis, including adhesion to host cells and tissue, invasion of mammalian cells, survival within professional phagocytes, evasion of innate immune responses and damage to host tissue. The major bacterial protein toxins will be covered (cholera enterotoxin, neurotoxins, and shiga toxins, pore-forming cytolysins, and superantigens). Several important bacterial pathogens will be discussed including *Escherichia coli*, *Listeria monocytogenes*, *Staphylococcus aureus*, and *Neisseria meningitidis*.

2. Virology:
This course discusses the diversity amongst viruses and how viruses are grouped and classified. It describes a variety of virus replication strategies and ways in which viruses interact with host cells during entry, replication and egress. Specific viruses are showcased to highlight important aspects of virology, such as virus-host interactions, disease, emerging viruses, transmission and control methods. Viruses of topical interest include: Picornaviruses; Influenza viruses; Poxviruses; Papillomaviruses; HIV; Hepatitis viruses.

3. Introduction to Immunology:
The study of the organs, cells, molecules and genes that work together in the body to detect and respond to danger, damage, infection and malignancy. This course introduces the cells and molecules involved and some of the mechanisms used to exert their effects.

*MI3MO2 is examined during the annual examination period in Trinity Term.*

4. Laboratory course in Bacterial Pathogenicity: Tests that are used in the clinical microbiology laboratory to distinguish *Staphylococcus aureus* from *S. epidermidis* will be performed. Quantitative measurement of bacterial biofilm formation and adhesion to immobilized ligands will be performed in a 96 well microtitre plate format. An ELISA to measure antibodies to a specific antigen in serum will be performed.

*The practical is assessed at the end of the laboratory course. The assessment takes the form of MCQ/Short Answer/Data handling or interpretation paper.*

5. Laboratory course in Virology: This course is divided into wet laboratory practical classes and tutorials in the computer room. The laboratory classes cover aseptic technique, cell culture, safe use of Microbiological Safety Cabinets and methods used to quantify viruses. The self-directed tutorials in the computer lab investigate virus gene sequences and evolution, and viral transmission routes and how we try to control the spread of viruses. The final session involves a series of short presentations given by the class.

*This course is assessed through continual assessment in the form of short answer questions completed during each session and a short presentation to the class.*
1. Research Essay: A list of research essay titles is provided to the JS class which then devises a selection procedure such that individual members of the academic staff are each allocated three or four students. The essay will not be a summary of standard textbook information. A starter reference will be provided by the academic supervisor concerned and students will be expected to conduct a thorough review of the relevant current literature including reviews, journal articles, symposia and reports and textbooks. Their essays will be based on the results of their reviews. The research essay must be typed and must not exceed 4000 words. A peer critique/feedback exercise is associated with the research essay which is designed to develop critiquing skills. The list of essay titles and more specific instructions with regard to write-up and the peer critique process will be issued to the class in late October. The deadline for handing in essays will be towards the middle of January.

The research essay is internally assessed.

2. Transferable Skills: Tutorials will be held with the primary aim of giving the student the tools necessary to submit a high quality research essay: Tutorials will cover topics including; (i) performing a search of biomedical literature using PubMed, (ii) understanding a research paper and writing a summary, (iii) writing a research essay, (iv) using Powerpoint to prepare figures and presentations, (v) composing a bibliography using Endnote, and (vi) understanding and avoiding plagiarism. The course is also designed to ensure that Sophister students in Microbiology are fully aware of the computers, computing facilities and IT resources available to them in College.

Assessment is based on student attendance and participation as well as marks given for evidence of application of skills within the essay.
1. **Microbial and Molecular Genetics:** This lecture course presents an evidence-based description of the basic cellular processes of transcription, translation and DNA replication. The approach is to discuss in detail the players involved and their roles in each of the processes. The major mechanisms by which bacteria regulate expression of genetic material as well as aspects of bacterial replication and recombination will be discussed. The course covers the major events in transcription initiation, positive and negative control of transcription, coordinated control of transcription, the operon, the regulon, the stimulon, an introduction to global regulation, DNA structure and gene regulation, environmental adaptation through variations in gene expression, stereotypic and stochastic responses, and transposition – insertion sequences IS1 and IS3, transposons Tn3, Tn5, Tn7, Tn10 and the life cycle of bacteriophage Mu.

*MI3M04 is examined during the annual examination period in Trinity Term.*

2. **Laboratory course in Microbial and Molecular Genetics:** This course covers the theory and practice of bacterial molecular genetics, with an emphasis on gene regulation and the bacterial response to environmental stress. Practical aspects include the use of reporter gene fusions to detect environmentally-regulated promoters, reporter gene assays, detection of regulatory genes by transposon mutagenesis, marker rescue, characterization of regulatory mutants and complementation tests. The course also covers the application of whole genome analysis methods to the study of bacterial gene expression.

*The practical is assessed by written examination immediately after the end of the course.*
1. Eukaryotic Molecular Biology and Cell Biology. Lectures discuss all aspects of eukaryotic gene expression from transcription to translation including the organisation and packaging of nucleic acids within the nucleus, the basic mechanisms of RNA biogenesis in eukaryotic cells including transcription, processing and export from the nucleus, concepts of steady state levels of messenger RNAs, the balance between RNA synthesis and degradation, the basic mechanisms of mRNA degradation and translation as well as the folding, sub-cellular trafficking, modification and degradation of nascent proteins in eukaryotic cells.

The course also includes lectures on how cell division is regulated by external and internal forces. The role of the major gene products such as cyclins and cyclin-dependent kinases (CDKs) and their regulators, the CDK inhibitors, in regulating the cell cycle are discussed. Additionally, lectures will examine how cancer develops as a result of mutation of genes that regulate cell division.

2. Molecular Biotechnology. Lectures introduce the student to ways in which molecular biology techniques can be applied to current problems in Industry, Agriculture and Medicine. Topics covered include the major scientific discoveries leading to the development of the field of biotechnology, recombinant DNA techniques and genetic engineering in bacteria and yeasts, concepts of production of genomic and cDNA libraries and whole genome sequencing. The production of recombinant proteins in prokaryotic and eukaryotic cells for industrial use or for use in human gene therapy are discussed as is the role of monoclonal antibodies as therapeutic agents in human disease. The lecture course also introduces the students to the use of bioinformatic databases and software, and their use in the analysis of genomes.

3. Genomics. Lectures will introduce students to current techniques used for the analysis of genomes, transcriptomes and proteomes.

Assessment: MI3M05 is examined during the annual examinations in Trinity Term.

4. Laboratory course in Molecular Genetics and Biotechnology. This laboratory course introduces students to a variety of techniques used in microbial genetics, molecular biology and biotechnology. Students will develop an understanding of commonly used techniques in microbial genetics such as plasmid transformation, DNA amplification by polymerase chain reaction, plasmid isolation and DNA separation by gel electrophoresis. Topics will include the life cycle of haploid and diploid cells of the common bakers’ yeast *Saccharomyces cerevisiae*, mating between haploid cells and the ability of yeast strains to carry out fermentation of sugars to alcohol. Students will also carry out a large scale lager brew using industrial lager strains of yeast. Students will gain experience in recombinant protein purification and protein separation by gel electrophoresis.

This practical is assessed at the end of the laboratory course. The assessment will include a written exam and a take-home assignment.
MI3M06: Applied Microbiology (Prof C. Kroger)

1. **Applied microbiology:** Lectures will discuss the essential features of microbiology relevant to the environment, food, pharmaceutical industries and clinical settings. While food and medicinal applications are a big portion of applied microbiology, the study of microorganisms has led to commercial industries which are involved with, and affect, almost all aspects of human life. The course includes lectures that will cover main areas in Applied Microbiology: (i) Environmental microbiology and water quality; (ii) Food microbiology; (iii) Biotechnology; and (iv) Clinical microbiology and Public Health.

2. **Antimicrobial Agents:** These lectures cover (i) the general properties of the major antimicrobial agents in use and under investigation, (ii) targets/mechanisms of action of current and potential drugs, and (iii) mechanisms of drug resistance in microbial pathogens.

*Assessment: MI3M06 is examined during the annual examinations in Trinity Term.*

3. **Bioinformatics class:**
The Bioinformatics class is a combination of introductory lectures and a practical component. It allows students to put into practice basic bioinformatic methods. With guidance, students work individually in this course to develop hands-on skills to mine common public scientific databases and use sequence analysis tools to investigate biological questions.

*The bioinformatics component will be assessed in course.*

4. **Statistics Tutorials:** The main objective of this module component is to make students see the need for understanding data analyses as a step preceding the design of new experiments. These tutorials include: 1. Description of main concepts in Statistics including sampling, descriptive statistics and probability distributions. 2. Probabilities and Probability Distributions. 3. Hypothesis testing. 4. Analysis of Variance. 5. Linearity testing of relationships between variables. 6. Factor variance analysis and re-building of new hypothesis. The course is given in 4 sessions of two hours each and the understanding of the students is examined through a final test, which includes 4 questions. Two of the questions are short answers and the other two consist on developing a problem and unfolding the possible conceptual and statistical solutions. The course is highly active and requires the active participation of the students. This is assured by presenting example problems and by asking students to form groups to address the problem.

*The statistics component is assessed by test at the end of the lecture course.*
Optional Courses:

Students can choose between either:

**MI3M07: Microbiology, past and present (Prof N. Ní Bhriain)**
5 ECTS Credits

1. **The evolution and impact of Microbiology:** This component of the module will look at the emergence and development of the discipline of Microbiology. A combination of lectures and tutorials will allow students to consider the influence of Microbiology and Microbiologists on, *inter alia*, mankind’s thinking about the origins of life and the nature of disease; the discovery of the varied natures and lifestyles of “germs”; the many and various approaches taken to combat microorganisms and their unwanted effects; the parts microbes have played in plagues, pestilences, conquests & colonisations and the roles of microorganisms as enemies and allies in warfare. Students will also consider some of the Microbiological challenges facing modern societies.

   This component will be assessed on the basis of attendance, engagement, completion of in-course assignments and an end-of-course test.

2. **Current Topics in Microbiology:** This component will feature tutorials with various members of staff in which current topics in microbiology will be discussed. Typically members of staff will identify 4 appropriate seminars from the Microbiology Department’s seminar programme and students taking this course will be obliged to attend these seminars as well as attending related pre- and post- seminar briefings and tutorials. Alternatively, tutorials may be based on recent scientific discoveries or topics of interest highlighted in the press. Students will be expected to actively participate in all discussions and to complete written assignments based on seminar/tutorial content.

   This component will be assessed based on attendance and engagement as well as marks given to assignments.

**OR**

Broad Curriculum (BC) Cross Faculty and Language Course
5 ECTS Credits

These modules provide students with the opportunity to study outside their principle discipline and are taught over the Michaelmas and Hilary terms. Language modules provided by the Centre for Language and Communication Studies aim to provide added value to undergraduate studies. These modules are designed to help develop practical communication skills for study or work experience abroad. All modules are offered on a substitution basis, i.e. you may only take a BC module or language module provided that you drop an optional module of your course to the same value in credits.

For latest information see [https://www.tcd.ie/Broad_Curriculum/](https://www.tcd.ie/Broad_Curriculum/)

BC assessments are performed in-course.
JUNIOR SOPHISTER YEAR: Overall Structure

Microbiology Modules ................................................................. 55 ECTS Credits

Microbiology, past and present OR Broad Curriculum......................... 5 ECTS Credits

Total .............................................................. 60 ECTS Credits

JUNIOR SOPHISTER YEAR: Attendance

Attendance at all lectures and laboratory practical sessions is compulsory. Laboratory practical sessions will start punctually; latecomers may not be admitted to the session. Medical certification is required for any absences from practical sessions. Absences amounting to more than 20% of the contact hours from any practical component of a module may result in exclusion from the in-course assessment for that component.

EXAMINATION STRUCTURE: General

Three components will contribute towards the final Junior Sophister Microbiology mark viz:

(a) Marks from end of year examinations of lectures (totalling 25 ECTS Credits)
(b) Marks for in-course assessment of laboratory practicals, research essay, and tutorials (totalling 30 ECTS Credits) and
(c) Marks from EITHER the in-course assessment of the optional Microbiology, past and present course (MI3M07; 5 ECTS Credits) OR from in-course assessment of the Broad Curriculum course (totalling 5 ECTS Credits).

The final Junior Sophister mark for Microbiology accounts for 20% of the Moderatorship mark.
EXAMINATION STRUCTURE: Core Modules

There will be five written examination papers; one paper per core microbiology module. Each paper will be of 1.5 hour duration. The paper format is detailed below.

**Paper 1 (1.5h): Module MI3M01 (5 ECTS)**
- Section A ......................................................... Microbial Physiology
- Section B ......................................................... Bacterial Surfaces
- Section C ......................................................... Biochemistry

**Rubric:** Answer 3 questions; one question from a choice of two from each of Sections A, B and C.

**Paper 2 (1.5h): Module MI3M02 (5 ECTS)**
- Section A ......................................................... Bacterial Pathogenicity
- Section B ......................................................... Virology
- Section C ......................................................... Introduction to Immunology

**Rubric:** Answer 3 questions; one question from a choice of two from each of Sections A, B and C.

**Paper 3 (1.5h): Module MI3M04 (5 ECTS)**
- Section A, B and C: .................................................. Microbial and Mol Genetics
- ......................................................... Transcription/translation/replication

**Rubric:** Answer 3 questions; one question from a choice of two from each of Sections A, B and C.

**Paper 4 (1.5h): Module MI3M05 (5 ECTS)**
- Section A: .............................................................Eukaryotic Cell & Mol Biology
- Section B: ............................................................. Molecular Biotechnology & Genomics

**Rubric:** Answer 3 questions; one question from a choice of three in Section A, and one question from a choice of three from section B, and one further question from either Section A or B.

**Paper 5 (1.5h): Module MI3M06 (5 ECTS)**
- Section A, B & C ..................................................... Applied Microbiology & Antimicrobial Agents

**Rubric:** Answer 3 questions; one question from a choice of two from each of Sections A, B and C.
EXAMINATION STRUCTURE: In-course Assessments

In-course assessment of laboratory work, the research essay and tutorials contributes 50% of the total Junior Sophister marks in Microbiology.

Assessment of practical work can take various forms including MCQ, short answers, laboratory notebooks, essays, problem solving and interpretation of data. The form may vary from year to year. Students will be informed about the nature of the assessment to be used by the course supervisor and the timing/duration of the assessment if under examination conditions.

Course components examined in this manner include:

<table>
<thead>
<tr>
<th>Course code*</th>
<th>Course title</th>
<th>ECTS</th>
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</thead>
<tbody>
<tr>
<td>MI3M01-P/T</td>
<td>Biomembrane &amp; Cell Surfaces/Cell Imaging</td>
<td>5</td>
</tr>
<tr>
<td>MI3M02-P</td>
<td>Bacterial Pathogenicity &amp; Virology</td>
<td>5</td>
</tr>
<tr>
<td>MI3M03-RE/T</td>
<td>Research Essay/Transferable skills</td>
<td>5</td>
</tr>
<tr>
<td>MI3M04-P</td>
<td>Microbial &amp; Molecular Genetics</td>
<td>5</td>
</tr>
<tr>
<td>MI3M05-P</td>
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<tr>
<td>MI3M06-P/T</td>
<td>Applied Microbiology-Bioinformatics/Statistics</td>
<td>5</td>
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<tr>
<td><strong>TOTAL:</strong></td>
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<td>30</td>
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</tbody>
</table>

N.B. Some in-course assessments may take place during Reading Weeks.

*See Table 1 for full course details and description of abbreviations.
EXAMINATION REGULATIONS

In order to be permitted to proceed into the Senior Sophister year, JS students must attain an overall mark of 45% in Microbiology (Core subjects + Optional Microbiology, past and present/BC subjects).

In order to pass the JS examination and to be eligible for an Ordinary B.A. degree, students must achieve 40% or higher in each of their modules, or pass by compensation or aggregation.

To compensate / aggregate students must

(i) obtain an overall JS mark of 40% or higher AND

EITHER (compensate)

(ii) Obtain individual marks of 40% or higher in modules to the value of 40 credits with a minimum mark of 30% in each of the failed modules up to a maximum of 20 credits.

OR (aggregate)

(iii) Obtain individual marks of 40% or higher in modules to the value of 40 credits with a minimum mark of 30% in additional modules of at least 10 credits.

Students who achieve an overall 35% or higher, but who are not qualified to proceed to Moderatorship, can repeat the JS year in order to qualify to proceed to Moderatorship or qualify for an Ordinary B.A. degree.

Students whose overall mark is 34% or lower are not permitted to repeat the JS year and must withdraw from the degree course in Science.

Students may not repeat any academic year more than once within a degree programme and may not repeat more than two academic years within a degree programme, except with the special permission of the University Council.

(Based on General Regulations & Information, the College Calendar 2016/2017, and Faculty of Engineering, Mathematics & Science Annual Examination Regulations, The College Calendar 2016/2017)

MARKING GUIDELINES

Faculty guidelines on awarding grades for essays and examination answers in the Sophister years can be found in Appendix D in this booklet.
Guinness Prize in Microbiology

This prize was founded in 1983 by Guinness Ireland Limited. It is awarded annually to the in-coming JS Microbiology student who has performed best in their Senior Freshman examinations. **Value €200 book token.**

Microbiology Society Prize

This prize was first awarded in 2003 to the student who performed best in the JS examinations. **Value Stg £200**, a certificate and a year’s free Undergraduate Membership of the Society.

An additional prize (**approx. €50**) is awarded to the Junior Sophister student who gains the highest mark for in-course assessments. In odd years the prize comes from the **Lesley White Memorial Prize Fund** (see College Calendar for more details).

Awards for the Guinness and Society for General Microbiology prizes are based on the results from the Annual Examinations in May (Trinity term) only. To be eligible for the Lesley White award, students must have qualified to proceed to moderatorship.
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Ext</th>
<th>College E-mail</th>
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<tbody>
<tr>
<td><strong>Prof. C. J. Dorman</strong></td>
<td><strong>Head of School</strong></td>
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<td><strong>Prof. U. Bond</strong></td>
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<td><strong>Prof. T. J. Foster</strong></td>
<td><strong>Prof. Emeritus</strong></td>
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<td><strong>Prof. M. Mullins</strong></td>
<td><strong>Assistant Professor of Microbiology</strong></td>
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<td><strong>Prof. K. Roberts</strong></td>
<td><strong>SS Co-ordinator</strong></td>
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<tr>
<td><strong>Prof. A. Fleming</strong></td>
<td><strong>JS Co-ordinator</strong></td>
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<td><strong>Prof. J. Geoghegan</strong></td>
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<td><strong>Prof. S. Corr</strong></td>
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<td><strong>Prof. C. Kroger</strong></td>
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- **Position**
  - Professor of Microbiology
  - Prokaryotic Gene Regulation Laboratory
  - Associate Professor of Microbiology
  - Eukaryotic Gene Regulation Laboratory
  - Professor of Molecular Microbiology
  - Staphylococcus aureus Laboratory
  - Assistant Professor of Microbiology
  - Yeast Chromatin Laboratory
  - Assistant Professor of Microbiology
  - Staphylococcal Pathogenesis Laboratory
  - Assistant Professor of Microbiology
  - Virolary Laboratory
  - Assistant Professor of Microbiology
  - Virology Laboratory
  - Assistant Professor of Microbiology
Microbiology moderatorship learning outcomes

Upon successful completion of this programme, students will be able to:

- Demonstrate in written and oral form a foundation level of knowledge and understanding of the biological, physical and quantitative sciences underpinning microbiology.

- Demonstrate in written and oral form an advanced level of knowledge and understanding of the principles of microbiology, including:
  - the nature and diversity of microorganisms and the methods of studying them
  - the genetic, biochemical and physiological processes occurring in some of the best-characterised microorganisms
  - the interactions between some of the best-characterised pathogenic microorganisms and their hosts
  - the roles, uses and manipulation of microorganisms in health and disease, agriculture, biotechnology and the environment
  - the roles of microorganisms as model systems in related fields
  - the scientific method of investigation and testing of hypotheses and the distinction between scientific and unscientific arguments.

- Demonstrate in written and oral form a detailed, critical knowledge and understanding, supported by the use of advanced textbooks, journal articles and data sets, of one or more specialist areas, some of it at the current boundaries of the field.

- Apply the knowledge and understanding gained to the critical analysis of experimental data, to sustaining evidence-based arguments on microbiological hypotheses, to solving microbiological problems and to designing microbiological experiments.

- Pursue with a degree of independence an original microbiological research project including project planning; identification, appraisal and safe application of the appropriate experimental techniques; accurate recording and presentation of data; identification of the limitations of and sources of error in experiments; analysis and interpretation of complex data; formulation of logical conclusions; and appraisal of the project outcome in the context of related, published work.

- Demonstrate proficiency in the application of computers to such problems as the searching of literature databases, analysis of biological sequence data, visualisation of biological macromolecules and analysis of experimentally acquired data.

- Demonstrate recognition of the value of scientific inquiry and an understanding of the ethical responsibilities of scientists.
• Demonstrate the capacity to apply international standards and practices within the discipline.

• Act effectively, under the guidance of senior scientists as necessary, as an individual, as part of a team, and/or in a multidisciplinary environment.

• Communicate information and ideas at a high level to both specialist and non-specialist audiences.

• Show that they have acquired the learning skills necessary to update their knowledge and to undertake further study with a high degree of autonomy.
A. Plagiarism

All students are required to access the online central repository in which all information and resources on plagiarism have been consolidated. This facility explains what plagiarism is, and how it can be avoided. The central repository is being hosted by the Library and is located at http://tcd-ie.libguides.com/plagiarism.

It includes the following:

(i) The 2016-17 Calendar entry on plagiarism for undergraduate and postgraduate students;
(ii) The matrix explaining the different levels of plagiarism outlined in the Calendar entry and the sanctions applied;
(iii) Information on what plagiarism is and how to avoid it;
(iv) ‘Ready, Steady, Write’, an online tutorial on plagiarism which must be completed by all students;
(v) The text of a declaration which must be inserted into all cover sheets accompanying all assessed course work;
(vi) Details of software packages that can detect plagiarism, e.g. Turnitin.

All students must complete the online tutorial on avoiding plagiarism ‘Ready, Steady, Write’, located at http://tcd-ie.libguides.com/plagiarism/ready-steady-write

All students must complete the cover sheets containing the following declaration, when submitting assessed work:

I have read and I understand the plagiarism provisions in the General Regulations of the University Calendar for the current year, found at: http://www.tcd.ie/calendar

I have also completed the Online Tutorial on avoiding plagiarism ‘Ready, Steady, Write’, located at http://tcd-ie.libguides.com/plagiarism/ready-steady-write

For the rules governing the plagiarism procedure please see www.tcd.ie/calendar. The relevant outcome following the assessment of the level of plagiarism can be found here: (http://tcd-ie.libguides.com/plagiarism/levels-and-consequences).
The 2015-16 Calendar entry on plagiarism;

Plagiarism

82 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 an offence against University discipline. The University considers plagiarism to be a major offence, and subject to the disciplinary procedures of the University.

83 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.

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;
(iii) fail to distinguish between information which needs no acknowledgement because it is firmly 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.

84 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. Not to 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.
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.

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

86 Students should ensure the integrity of their work by seeking advice from their lecturers, tutor or supervisor on avoiding plagiarism. All schools and 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.

87 If plagiarism as referred to in §82 above is suspected, in the first instance, the head of school, or designate, will write to the student, and the student’s tutor advising them of the concerns raised and inviting them to attend an informal meeting with the head of school, or designate, (The director of teaching and learning (undergraduate) may also attend the meeting as appropriate. As an alternative to their tutor, students may nominate a representative from the Students’ Union to accompany them to the meeting) and the lecturer concerned, in order to put their suspicions to the student and give the student the opportunity to respond. The student will be requested to respond in writing stating his/her agreement to attend such a meeting and confirming on which of the suggested dates and times it will be possible for the student to attend. If the student does not in this manner agree to attend such a meeting, the head of school, or designate, may refer the case directly to the Junior Dean, who will interview the student and may implement the procedures as referred to under Conduct and College Regulations §2.

88 If the head of school, or designate, forms the view that plagiarism has taken place, he/she must decide if the offence can be dealt with under the summary procedure set out below. In order for this summary procedure to be followed, all parties attending the informal meeting as noted in §87 above must state their agreement in writing to the head of school, or designate. If the facts of the case are in dispute, or if the head of school, or designate, feels that the penalties provided for under the summary procedure below are inappropriate given the circumstances of the case, he/she will refer the case directly to the Junior Dean, who will interview the student and may implement the procedures as referred to under Conduct and College Regulations §2.

89 If the offence can be dealt with under the summary procedure, the head of school, or designate, will recommend to the Senior Lecturer one of the following penalties:
(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.

90 Provided that the appropriate procedure has been followed and all parties in §87 above are in agreement with the proposed penalty, the Senior Lecturer may approve the penalty and notify the Junior Dean accordingly. The Junior Dean may nevertheless implement the procedures as referred to under Conduct and College Regulations §2.

B. Attendance

*Taken from The University of Dublin Calendar 2013-2014 Part 1*

17 All students should enter into residence in or near Dublin and must begin attendance at the College not later than the first day of teaching term, and may not go out of residence before the last day of teaching term, unless they have previously obtained permission from the Senior Lecturer through their tutor.

18 Students must attend College during the teaching term. They must take part fully in the academic work of their class throughout the period of their course. Lecture timetables are published through my.tcd.ie and on school or department notice-boards before the beginning of Michaelmas teaching term. The onus lies on students to inform themselves of the dates, times and venues of their lectures and other forms of teaching by consulting these timetables.

19 **The requirements for attendance at lectures and tutorials vary between the different faculties, schools and departments.** Attendance is compulsory for Junior Freshmen in all subjects. The school, department or course office, whichever is relevant, publishes its requirements for attendance at lectures and tutorials on notice-boards, and/or in handbooks and elsewhere, as appropriate. For professional reasons lecture and tutorial attendance in all years is compulsory in the School of Engineering, the School of Dental Science, the School of Medicine, the School of Nursing and Midwifery, the School of Pharmacy and Pharmaceutical Sciences and for the B.Sc. in Clinical Speech and Language Studies. Attendance at practical classes is compulsory for students in all years of the moderatorship in drama and theatre studies and drama studies two subject moderatorship.

20 In special circumstances exemption from attendance at lectures for one or more terms may be granted by the Senior Lecturer; application for such exemption must be made in advance through the tutor. Students granted exemption from attendance at lectures are liable for the same annual fee as they would pay if attending lectures. Students thus exempted must perform such exercises as the Senior Lecturer may require. If these exercises are specially provided, an additional fee is usually charged.

21 Students who in any term have been unable, through illness or other unavoidable cause, to attend the prescribed lectures satisfactorily, may be granted credit for the term by the Senior Lecturer but must perform such supplementary exercises as the Senior Lecturer may require. The onus for informing the Senior Lecturer of illness rests with individual students who should make themselves familiar with the general and more detailed school or course regulations regarding absence from lectures or examinations through illness. In addition, issues with students may arise from time to time, which in the opinion of the Senior Lecturer affect a student’s ability or suitability to participate in his or her course. If required by the Senior Lecturer, students (other than those subject to §28 below) are obliged to undergo a medical examination or assessment by a doctor or specialist nominated by the Senior Lecturer at the expense of the College for the purpose of obtaining an opinion as to the student’s medical fitness to continue with his/her studies or as to his/her ability or suitability to participate in his/her course to the standards required by the College. Students found to be unfit following such a medical examination or assessment may be required to withdraw until such times as they are deemed fit to resume their studies. Students who fail to attend such a medical examination or assessment within a
reasonable period may be required by the Senior Lecturer to withdraw until such time as they attend the aforementioned medical examination or assessment and are deemed fit to resume their studies.

22 Students who are unable to attend lectures (or other forms of teaching) due to their disability should immediately contact the Disability Service to discuss the matter of a reasonable accommodation. Exceptions to attendance requirements for a student, on disability grounds, may be granted by the Senior Lecturer following consultation with the student’s school, department or course office, and the Disability Service.

23 Students who find themselves incapacitated by illness from attending lectures (or other forms of teaching) should immediately see their medical advisor and request a medical certificate for an appropriate period. Such medical certificates should be copied to the school, department or course office, as appropriate, by the student’s tutor.
C. The European Credit Transfer and Accumulation System (ECTS)

The European Credit Transfer and Accumulation System (ECTS) is an academic credit system based on the estimated student workload required to achieve the objectives of a module or programme of study. It is designed to enable academic recognition for periods of study, to facilitate student mobility and credit accumulation and transfer. The ECTS is the recommended credit system for higher education in Ireland and across the European Higher Education Area.

The ECTS weighting for a module is a measure of the student input or workload required for that module, based on factors such as the number of contact hours, the number and length of written or verbally presented assessment exercises, class preparation and private study time, laboratory classes, examinations, 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. The Trinity academic year is 40 weeks from the start of Michaelmas Term to the end of the annual examination period 1 ECTS credit represents 20-25 hours estimated student input, so a 10-credit module will be designed to require 200-250 hours of student input including class contact time and assessments.

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

Provided by the Bologna Desk (Senior Lecturer’s Office, TCD), June 2008
### C. Guidelines on Awarding Grades for Essays & Examination Answers in the Sophister Years

Note that these guidelines are for use as a general reference. Differences may occur between disciplines.

<table>
<thead>
<tr>
<th>Mark Range</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>I 90-100</td>
<td>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.</td>
</tr>
<tr>
<td>80-89</td>
<td>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.</td>
</tr>
<tr>
<td>70-79</td>
<td>MAINLY OUTSTANDING ANSWER; falls short on presentation and reading or thought beyond the course, but retains insight and originality typical of first class work.</td>
</tr>
<tr>
<td>II-1 65-69</td>
<td>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.</td>
</tr>
<tr>
<td>60-64</td>
<td>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.</td>
</tr>
<tr>
<td>II-2 55-59</td>
<td>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.</td>
</tr>
<tr>
<td>Score Range</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>50-54</td>
<td>INCOMPLETE ANSWER; suffers from significant omissions, errors and misunderstandings, but still with understanding of main concepts and showing sound knowledge. Several lapses in detail.</td>
</tr>
<tr>
<td>III 45-49</td>
<td>WEAK ANSWER; limited understanding and knowledge of subject. Serious omissions, errors and misunderstandings, so that answer is no more than adequate.</td>
</tr>
<tr>
<td>40-44</td>
<td>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.</td>
</tr>
<tr>
<td>F-1 35-39</td>
<td>MARGINAL FAIL; inadequate answer, with no substance or understanding, but with a vague knowledge relevant to the question.</td>
</tr>
<tr>
<td>30-34</td>
<td>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.</td>
</tr>
<tr>
<td>F-2 0-29</td>
<td>UTTER FAILURE; with little hint of knowledge. Errors serious and absurd. Could also be a trivial response to the misinterpretation of a question.</td>
</tr>
<tr>
<td>U.G.</td>
<td>Ungraded</td>
</tr>
</tbody>
</table>
E. Student Information System (SITS) – Access via my.tcd.ie

The student information system is accessible to all staff and students via the web portal my.tcd.ie

All communications from College will be sent to you via your online portal which will give you access to an ‘in tray’ of your messages. You will also be able to view your timetables online, both for your teaching and for your examinations. All fee invoices/payments, student levies and commencement fees will be issued online and all payments will be carried out online. You will be able to view your personal details in the new system – some sections of which you will be able to edit yourself. **It is important that you check this information and keep it up to date.** Your examination results will also now be communicated to you via the online portal.

For help with the system contact the Academic Registry
https://www.tcd.ie/academicregistry/contact/

- Monday, Wednesday, Friday 9.30 – 5.00
- Tuesday and Thursday 9.30 – 6.00

- Email: academic.registry@tcd.ie
- Tel: +353 (0) 1 896 4500
F. Blackboard

The Microbiology Department is now using Blackboard to deliver your student notes and reading lists. Simply follow these steps:

1. Go to www.mymodule.tcd.ie
2. Click TCD Student and Staff login
3. Enter your student name and password.
4. Click on modules for relevant student notes.
5. Or use the following link to go directly to the page:
   [http://www.tcd.ie/Microbiology/local/Student/students.php](http://www.tcd.ie/Microbiology/local/Student/students.php)

G. Disability Service Student Handbook

Please go to the link below to access the Disability Service Student Handbook


H. Health and Safety Form

You will be provided with forms A, B & C, please complete and return as appropriate.