

SECTION A – TEACHING, LEARNING AND ASSESSMENT

COURSE AIMS

This is a defining course for the Bachelor of Science Microbiology major and Bachelor of Biotechnology programs. The course focuses on three main areas, that specifically deal with microorganisms: genomics, bioinformatics and biotechnology. It is designed to provide in-depth studies of the molecular biology of prokaryotic microorganisms as applied to genes, genome organisation and evolution, molecular physiology, and methods for studying genomes and bioinformatics. In addition, the important and varied role of microorganisms in industrial and biotechnological processes will be studied. The course follows on from the core second year Microbiology and / or Microbial Physiology courses and prepares students for the option of further postgraduate studies in Microbiology or Biotechnology and / or employment in industry. It further emphasises the importance of microorganisms in our understanding of life and the environment.

LEARNING OUTCOMES

The course provides an advanced coverage of the many facets of microbiology and how it impacts on our everyday lives. After completion of this course, students will have an understanding of the following:

1. Characteristics, organisation and function of microbial genomes
2. Techniques for sequencing microbial genomes and the analysis of sequence data by computers
3. Use of genomics in microbial systematics and the comparison of organisms
4. Evolutionary changes in organisms and the prospect of life elsewhere
5. Growth, survival and evolution of microbes through interactions with their environment
6. How microbes are used to improve the environment and produce commercially valuable products in biotechnology processes
7. Computers and bioinformatics
8. How to critically analyse scientific literature and be able to present this information in the form of a written assignment

CONTENT, ORGANISATION AND TEACHING STRATEGIES

The course will be taught in modules consisting of lectures and computer labs. The lecture periods will be used to provide the course detail. Computer labs will provide further explanation and understanding of the content using web based bioinformatics resources.

Lectures will be presented in-person at Nathan campus and video-conferenced to Logan campus. Computer-based labs will only be held at the Nathan Campus.

Contact Summary

Lectures will be presented as three-hour sessions once a week. Students are expected to attend all of these sessions. Interactive computer-based bioinformatics workshops are scheduled as two-hour sessions and form an integral part of the course.

CONTENT SUMMARY

Section 1. Lecture Schedule and modules:

Course content will be presented in six modules with each module separated into numerous topics. Depending on the depth of material, the modules can run for one, two or three weeks. The following table represents a summary of the course content, the weeks in which the modules will run in, and the assessment items associate with the modules and when the assessment items are to be submitted.

Topic	Module	Content	Weeks	Assessment Dates
1.	Domain <i>Archaea</i>	Cell structure, habitats, physiology, molecular biology & biotechnology Evolution and	1, 2	Not applicable

Topic	Module	Content	Weeks	Assessment Dates
	Extreme Environments & Astrobiology	molecular adaptation and strategies of extreme environment microbes; extraterrestrial life.		
2	Bioinformatics: An introduction	Databases, functional genomics, protein structure-function relationships (Computer labs- General Bioinformatics methods related to the topic)	3, 4	Not applicable
3	Bioinformatics: Molecular Evolution	Concepts of Evolution, ribosomal RNA & phylogeny (Computer labs- phylogeny tools)	5 - 7	Bioinformatics 1: rRNA alignments & secondary structures due week 8
4.	Bioinformatics: Microbial genomes	Gene transfer mechanisms and microbial diversity, prokaryotic & eukaryotic genomes, sequencing and studying genomes, comparative genomics of pathogenic microbes (Computer labs- Comparative genomics & Systems Biology)	8, 9	Bioinformatics 2: KEGG / Metabolic pathways due week 11
5.	Environmental Biotechnology	Bioremediation, Bioleaching, Microbial-enhanced oil recovery (MEOR), Wastewater treatment	10, 11	Not applicable
6.	Industrial microbiology	Foods, supplements & beverages, pharmaceuticals, Commercial enzymes	12	Environmental / Industrial Microbiology Quiz in week 13

Professor Bharat Patel will teach Topics 1 to 4 (weeks 1 to 9) Dr Tony Greene topics 5 & 6 (weeks 10 to 12). Lectures will be held on Fridays from 9.00 to 12.000 (N61_-2.06, Law) and computer labs will be held on Wednesdays from 12:00-14:00 in N13_1.04 (Environment 2).

Section 2. Assignment Topics:

Bioinformatics Assignment 1- rRNA alignments & secondary structures: The details are available at the URL <http://trishul.sci.gu.edu.au/courses/ss13bmm/assignment1.pdf>

Bioinformatics Assignment 2- KEGG / Metabolic pathways: The details are available at the URL <http://trishul.sci.gu.edu.au/courses/ss13bmm/assignment2.html>

ASSESSMENT

Summary of Assessment

The table below summaries the assessment items for the course. The two bioinformatics assessment items are worth 15% each, the quiz is worth and the final 1.5 hour end-of-semester exam is worth a further 55%. The two Bioinformatics assignments are due by COB of the Friday of the week they are due in.

Item	Assessment Task	Length	Weigh	Total Marks	Relevant Learning Outcomes	Due Day and Time
1.	Bioinformatics 1: rRNA alignments & secondary structures	Requires specific answers	15%	100	7	Week 8
2.	Bioinformatics 2: KEGG / Metabolic pathways	Requires specific answers	15%	100	1, 2, 3	Week 11
3.	Quiz	30 mins	15%	100	4, 5, 6	Week 13
4.	End-of-semester examination	1.5 hours	55%	100	1 - 6	Examination period

Note: The assignments should be submitted no later than 5pm of the Friday of the week they are due in. Failure to submit the assignment by the specified time as specified above will result in zero marks unless there is documentary evidence of medical or other extenuating circumstances. Without a prior authorised extension, late submission of assignments will result in a loss of 10% of marks per day.

Assessment Details:

Please note the following:

1. All assessment items for the course are compulsory and a pass in each of the assessment items is required to pass the course.
2. Failure to submit the assignment by the specified time as specified in "Summary of Assessment" above will result in zero marks unless there is documentary evidence of medical or other extenuating circumstances. Without a prior authorised extension, late submission of assignments will result in a loss of 10% of marks per day.
3. Students are required to attend the quizzes at either Nathan or Logan. If students do not wish to attend the quiz at the campus where they are enrolled, then they should advise the convenor. Quiz attendance is compulsory; failure to attend or complete the quiz at the specified time will result in a zero mark for the quiz unless documentary evidence of medical or other extenuating circumstances is provided to the Convenor within one week of the date of the quiz. Where satisfactory documentation is provided, an alternative sitting of the quiz can be offered.
4. Results of the assignments and quizzes will be posted at <http://trishul.sci.gu.edu.au/courses/ss13bmm/>

Assessment Tasks 1 & 2- Bioinformatics Assignments (15% each):

The first page of the assignment should include your surname, name, student ID and the course code. The assignment should be based on your own independent research of the topic and summarised in your own words. Avoid regurgitating information taken directly from books, journals or websites. Remember that non-peer reviewed websites may contain incorrect or unproven information. I strongly suggest that you seek assistance from the library in using EndNote database referencing software if you are unfamiliar with it. The software allows you to search library databases such as the NCIB PubMed and download references and abstracts from these searches onto to your own computer. The references can be than be inserted into your Word assignment document while you are writing. After completion of your written work, the bibliography can be formatted into a relevant citation style of your choice.

Assessment Task- Quiz (final marks = 15%):

A multiple-choice quiz of 30 minutes duration will be held in week 13. You will need to pass this assessment item to pass the course.

Assessment Task 3: End-of-semester Exam (final marks = 55%):

The exam will consist of a range of question types including multiple choice questions and short answer questions. The exam format will be discussed in week 12 or 13.

Rationale for assessment:

The Bioinformatics assignments will be used to assess the student's ability to research, analyse and retrieve information from the web resources. The assignments will assist students in undertaking hands on exercises in modern biology and expose them to the use of extensive bioinformatics resources including molecular databases, and online / off line data mining and analysis tools.

The quizzes will test the understanding of the course matter in specific modules and will be in the form of multiple choice questions. They will cover material in preceding lectures and the exact content covered will be advised in the class prior to the quiz.

The end of semester exam is aimed at testing the overall concepts and understanding of the course detail for all modules. It will be a combination of multiple choice questions and short answer questions. It will be undertaken during the end of semester exam period.

GRADUATE SKILLS

The course contributes to the development of graduate skills that students should acquire throughout their program. These skills are listed below.

Graduate Skills	Taught	Practised	Assessed
Effective communication (written)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Effective communication (oral)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Effective communication (interpersonal)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Information literacy	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Problem solving	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Critical evaluation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Work autonomously	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Work in teams	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Creativity and innovation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ethical behaviour in social / professional / work environments	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Responsible, effective citizenship	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

TEACHING TEAM

Course Convenor

Convenor Details	Nathan & Logan
Campus Convenor	Professor Bharat Patel
Email	b.patel@griffith.edu.au
Office Location	Science 2, 2.36
Phone	3735 7695
Fax	3735 7773
Consultation times	Please contact via email or phone to arrange an appointment

Additional teaching team members

Dr Tony Greene, Email: t.greene@griffith.edu.au. Details of any additional members to the teaching team will be provided in the lectures, via email or on the noticeboard of the learning@griffith website.

COURSE COMMUNICATIONS

The course convenor will communicate and make any announcements in the lectures and workshops. Announcements and information will also be placed on the noticeboard of the Learning@griffith website and students should consult it regularly in between scheduled classes. As students are expected to attend the scheduled classes, explanations and clarification of any issues can be made then. Students can also contact the convenor via email or phone or make an appointment at a suitable time for an individual consultation.

TEXTS AND SUPPORTING MATERIALS

Reading Material: Lecture summary is available at the URL <http://trishul.sci.gu.edu.au/courses/ss13bmm/> and at the Learning@Griffith website. Remember that the material provided at the websites is only a summary of the lectures. For further reading, students should refer to the University library or electronic databases and journals. Students should also refer to either of the following two text books:

- (a) Madigan, Martinko and Parker, *Brock Biology of Microorganisms*, Prentice Hall International, 2006, 11th edition

(b) Prescott, Harley and Klein, *Microbiology*. McGraw-Hill, 2005 6th edition

Computer-based Bioinformatics: Several websites will be shown and discussed during the lectures and during the computer labs. Important links have been provided as part of the lecture summary at the URL <http://trishul.sci.gu.edu.au/courses/ss13bmm/>

SECTION B – ADDITIONAL COURSE INFORMATION

Enrolment in this course is granted on the basis that a grade of P (Pass) or better has been achieved in any Pre-requisite or Prior Assumed requirement in this course as listed in this outline. Failure to meet this requirement may result in you having difficulty with the course and not being able to complete it successfully. Any additional support or special assistance cannot be expected nor requested if the prerequisite and/or prior assumed requirements have not been met.

Students should refer to the URL <http://trishul.sci.gu.edu.au/courses/ss13bmm/> and Learning@Griffith website for further information about this course.