

Course Outline

Code: MBT355 Title: Bioinformatics

Faculty:	Science, Health, Education and Engineering
School:	Science & Engineering
Teaching Session:	Semester 1
Year:	2019
Course Coordinator:	Renfu Shao Email: rshao@usc.edu.au
Course Moderator:	Tianfang Wang

Please go to the USC website for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?

1.1 Description

This course will introduce you the principles and key concepts of bioinformatics and will start with basics about DNA, RNA and protein, then progress to databases, sequence alignments, evolutionary history reconstruction, genome annotation, and analysis of gene and protein expression. Systems biology, linux system and programming will also be introduced. Computer-based labs will provide you hands-on experience with databases and bioinformatics tools, and develop your skills in the analysis of biological data.

1.2 Course topics

Bioinformatics, sequence, structure, database, genomics, transcriptomics, systems biology, programming

2. What level is this course?

300 level Graduate - Independent application of graduate knowledge and skills. Meets AQF and professional requirements. May require pre-requisites and developing level knowledge/skills. Normally taken in the 3rd or 4th year of an undergraduate program

3. What is the unit value of this course?

12 units

4. How does this course contribute to my learning?

Specific Learning Outcomes On successful completion of this course you should be able to:	Assessment Tasks You will be assessed on the learning outcome in task/s:	Graduate Qualities or Professional Standards mapping Completing these tasks successfully will contribute to you becoming:
Explain and describe the principles and key concepts of bioinformatics.	1, 2, 3	Knowledgeable.
Critically analyse how bioinformatics is used to make discoveries in biological sciences.	1, 3	Creative and Critical Thinking
Develop skills in literature review, database search, and the use of bioinformatics tools to address questions in biology.	1, 2	Empowered.
Demonstrate skills to communicate scientific ideas to a variety of audiences regarding concepts in bioinformatics.	1	Empowered.

5. Am I eligible to enrol in this course?

Refer to the [USC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1 Enrolment restrictions

Nil

5.2 Pre-requisites

LFS252 or SCI212 or BIM202

5.3 Co-requisites

Nil

5.4 Anti-requisites

Nil

5.5 Specific assumed prior knowledge and skills (where applicable)

Basic knowledge in genetics and molecular biology and basic computer skills

6. How am I going to be assessed?

6.1 Grading scale

Standard – High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL)

6.2 Assessment tasks

Task No.	Assessment Tasks	Individual or Group	Weighting %	What is the duration / length?	When should I submit?	Where should I submit it?
1	Practical reports	Individual	35	150 words	Weekly	Blackboard
2	Essay	Individual	30	2000 words	Week 13	Blackboard
3	End of semester exam	Individual	35	2 hours	Central exam period	Central exam venue
			100%			

Assessment Task 1: Practical reports

Goal:	This task is designed to assist you to develop your conceptual understanding and practical skills in bioinformatics. You will use bioinformatics tools to address questions in biology.	
Product:	Practical reports	
Format:	There are weekly practical activities in this course. Each practical comprises a set of short-answer questions. You are required to submit a report to answer the questions from each practical. Submit each report electronically to Blackboard - Safe Assign before 5 pm, Wednesday, in the following week after you undertake the practical.	
Criteria:	You will be assessed on quality and extent of: <ul style="list-style-type: none"> • Completeness of all reports • Explanations and descriptions • Application of bioinformatics tools 	
Generic skill assessed		Skill assessment level
Organisation		Graduate
Problem solving		Graduate
Applying technologies		Graduate

Assessment Task 2: Essay

Goal:	To develop research and writing skills and in-depth understanding of scientific literature on a chosen bioinformatics tool and its use in biological discoveries.	
Product:	Essay	
Format:	<p>You are required to submit an essay developed from your research concerning a bioinformatics tool of your choice. Search and review the literature published in peer-reviewed journals such as <i>Bioinformatics</i>, <i>Genome Research</i>, <i>Molecular Biology and Evolution</i>, <i>Nucleic Acids Research</i>, etc. Limit your essay to 2,000 words (excluding figures, tables, references and appendixes).</p> <p>Your essay must cover the following four aspects:</p> <ol style="list-style-type: none"> 1. Introduction of your chosen bioinformatics tool. Include information such as who developed the tool, what the tool is for, where the tool was published, how users can access this tool, who used the tool, etc. (20%) 2. Principles and rationale of your chosen bioinformatics tool. Explain how the tool is designed (30%) 3. Use of the bioinformatics tool in biological research. Explain what questions the bioinformatics tool has been used to address. Provide at least two examples in which the tool has facilitated discoveries. (40%) 4. Future improvement of the tool. Offer your opinions and comments how the tool may be improved. (10%) <p>Submit your essay electronically to Blackboard - Safe Assign before 5 pm, Friday, in Week 13 unless you have won an extension by completing the online quizzes and short-answer questions. You will get 1-day extension for submission if you complete all of the online quizzes, and an additional 1-day extension if you complete all of the online short-answer questions. Furthermore, if you are in the top 30% on Leaderboard ranking, you will get an extra 1-day extension. Leaderboard ranking is determined by the sum of your scores from online quizzes and short-answer questions.</p>	
Criteria:	You will be assessed on quality of: <ul style="list-style-type: none"> • Description of the chosen bioinformatics tool • Explanation of the principles and rationale of the tool • Application of the tool • Appropriate selection of academic literature. • Critique of the literature • Critical analysis of the tool • Communication and use of references 	

Generic skill assessed	Skill assessment level
Communication	Graduate
Problem solving	Graduate
Information literacy	Graduate

Assessment Task 3: End of semester exam

Goal:	To assess learning and understanding of the principles and key concepts of bioinformatics. This exam will also cover how bioinformatics is used to make discoveries in biology.
Product:	Final exam
Format:	You will sit a 2-hour exam based on the lectures given in the course. The exam will be held under official exam conditions in a centralised exam venue. The exam will comprise multiple choice and short answer questions. Online quizzes and short answer questions will be provided from each lecture to help you prepare the end of semester exam. You are strongly encouraged to complete all of the online quizzes and short-answer questions.
Criteria:	You will be assessed on quality of: <ul style="list-style-type: none"> • Knowledge, explanations and descriptions of bioinformatics concepts and principles. • Critical analysis of how bioinformatics is used to make discoveries in biological sciences. • Communication of scientific ideas to a variety of audiences regarding concepts in bioinformatics
Generic skill assessed	Skill assessment level
Problem solving	Graduate
Communication	Graduate

7. What are the course activities?

7.1 Directed study hours

Lecture: weeks 1-13, 2 hours per week; computer-based labs: weeks 1-13, 2 hours per week.

7.2 Teaching semester/session(s) offered

Sippy Downs: Semester 1

7.3 Course content

Teaching Week / Module	What key concepts/content will I learn?	What activities will I engage in to learn the concepts/content?	
		Directed Study Activities	Independent Study Activities
1	DNA, RNA and protein	Lecture and comp lab	Readings available on Blackboard
2	Sequence technology, data generation and quality assessment	Lecture and comp lab	Readings available on Blackboard
3	Databases	Lecture and comp lab	Readings available on Blackboard
4	Sequence alignments	Lecture and comp lab	Readings available on Blackboard
5	Recovering evolutionary history	Lecture and comp lab	Readings available on Blackboard
6	Revealing genome features	Lecture and comp lab	Readings available on Blackboard
7	Secondary structures	Lecture and comp lab	Readings available on Blackboard
8	Tertiary structures	Lecture and comp lab	Readings available on Blackboard
9	From structure to function	Lecture and comp lab	Readings available on Blackboard
10	Gene and protein expression analysis	Lecture and comp lab	Readings available on Blackboard
11	Systems biology	Lecture and comp lab	Readings available on Blackboard
12	Linux system and programming	Lecture and comp lab	Readings available on Blackboard
13	Revision	Revision	Not applicable

Please note that the course activities may be subject to variation.

8. What resources do I need to undertake this course?

Please note that course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Blackboard site. Please log in as soon as possible.

8.1 Prescribed text(s)

Please note that you need to have regular access to the resource(s) listed below as they are required:

Author	Year	Title	Publisher
M. Zvelebil and J.O. Baum	2008	<i>Understanding Bioinformatics</i>	Garland Science

8.2 Specific requirements

Nil

9. Risk management

Risk assessments have been performed for all laboratory classes and a low level of health and safety risk exists. Some risks concerns may include equipment, instruments, and tools; as well as manual handling items within the laboratory.

It is your responsibility as a student to review course material, search online, discuss with lecturers and peers, and understand the health and safety risks associated with your specific course of study. It is also your responsibility to familiarise yourself with the University's general health and safety principles by reviewing the [online Health Safety and Wellbeing training module for students](#), and following the instructions of the University staff.

10. What administrative information is relevant to this course?

10.1 Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

10.2 Assessment: Additional requirements

Eligibility for Supplementary Assessment

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

- The final mark is in the percentage range 47% to 49.4%
- The course is graded using the Standard Grading scale
- You have not failed an assessment task in the course due to academic misconduct

10.3 Assessment: Submission penalties

Late submission of assessment tasks will be penalised at the following maximum rate:

- 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task.
- 10% (of the assessment task's identified value) for the third day
- 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.
- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task.

Weekdays and weekends are included in the calculation of days late.

To request an extension, you must contact your Course Coordinator and supply the required documentation to negotiate an outcome.

10.4 Study help

In the first instance, you should contact your tutor, then the Course Coordinator. Additional assistance is provided to all students through Academic Skills Advisers. To book an appointment or find a drop-in session go to [Student Hub](#).

Contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au

10.5 Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website:

<http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

10.6 General Enquiries

In person:

- **USC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **USC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **USC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **USC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au