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The published on-line version of the Course Profile is the authoritative version and by the publication of the Course Profile on-line the University deems the student has been notified of and read the course requirements.

1. General Course Information

1.1 Course Details

COURSE CODE	3030NSC
COURSE TITLE	Applied Bioinformatics
ACADEMIC ORGANISATION	ESC School of Environment and Science
TRIMESTER	Trimester 1 2021
MODE	Mixed Mode
LEVEL	Undergraduate
LOCATION	Nathan, On Campus
CREDIT POINT VALUE	10

Course Description:

Bioinformatics has become the must-know for experimental researchers in the areas of molecular biology, biotechnology, chemistry, environmental sciences and biomedical sciences. The "Applied Bioinformatics" lecture/lab course consists of background lecture and hand-on computer laboratory practice. The course will provide a step-by-step guide through current bioinformatic tools and databases; students will apply their knowledge to analyse DNA and protein sequences. A basic understanding of biology and a knowledge of using internet browsers will be advantageous.

Assumed Background:

A basic understanding of genetics and molecular biology, such as that taught in 1042SCG Genetics and Evolutinary Biology or 2012NSC Molecular Biology, would be advantagous.

1.2 Course Introduction

An understanding of bioinformatics is fundamentally important to biological scientists and medical researchers, who use the study of genes and the regulation of gene products to understand development and phenotype, health and disease. The genomes of many more organisms (in excess of 1,000) have become available, and with it, gigabytes of accompanying information. One consequence of this information flood is the "data rich- insight poor" phenomenon, as the sheer volume of information overwhelms those who can most benefit from it. This course aims to teach students how to access, filter, critically analyse and extract information from the sequence databases.

Previous Student Feedback

The current course profile had been updated to better suit T1 timetable, with strong emphasis on providing the students with current applicable analytical skills to increase the employability of graduates in research and industry.
This emphasis was driven by students' feedback from previous offering of the course:

> I really enjoyed having a theory lesson separate from a prac lesson.
> I also really enjoyed the practical aspect of the course, working with different programs and learning different techniques.
>
> Use of real world tools was very benefical, the lab courses were easily the best part of the course and really helped with my side research programs, particularly in protein visualisation and analysis.

Other changes include shortening the lectures and workshops to 2 hours, instead of 3 and covering less theory topics in the presentations, but focusing on the most relevant ones and cover them in more depth, following feedback from students:

> This course could be improved by not having the three hour theory lesson. Maybe shorten it to two hours because past that time, i lose focus really quickly.
>
> With the powerpoints, some of the fat can be cut, some information was very surface level, and not worth including in the course, such as some of the different MSA`s.

1.3 Course Staff

Primary Convenor **Dr Ido Bar**	
PHONE	07 3735 7292
EMAIL	i.bar@griffith.edu.au
CAMPUS	Nathan Campus
BUILDING	Science 2 (N34)
ROOM	2.37

Convenor **Dr Alex Cristino**	
PHONE	(07) 373 57641
EMAIL	a.cristino@griffith.edu.au
CAMPUS	Nathan Campus
BUILDING	GRIDD 2 (N75)
ROOM	1.20D

Lecturer **Dr Frank Sainsbury**	
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CAMPUS	Nathan Campus
BUILDING	GRIDD 2 (N75)
ROOM	1.20A

1.4 Timetable

Timetables are available on *the Programs and Courses website*.

NB: Details contained in this Section of the course profile and Section 4.1 Learning Activities are to be read in conjunction with the official class timetable. The published class timetable which is the authoritative source for timetabling information for all campuses can be located by clicking on the above link.

1.5 Lecture Capture

It is standard practice at Griffith University that lectures timetabled in lecture capture-enabled venues are recorded and made available to students on the relevant course site, in accordance with the University's Lecture Capture Policy.

The lecture series delivered as part of this course will be recorded and accessible via the Learning@Griffith course site.

2. Aims, Outcomes & Graduate Attributes

2.1 Course Aims

This course will provide students with the knowledge of where to go to find relevant information, and the skills to extract and critically evaluate this information from the public sequence datasets. The course is practical orientated and teaches research skills in the field of bioinformatics. The skills acquired will be broadly applicable to other subjects in the biology and biotechnology fields. The course is tailored to biologists, and hence no computer programming will be required.

By the end of this course, students will be able to conduct basic searches to find and compare gene sequences and motifs, predict and construct protein structural models and analyse high throughput Next-Generation-Sequencing genomic data using local and web-based bioinformatics analysis tools. Students will understand the principles of managing large datasets and

different approaches to query them to extract relevant data.

2.2 Learning Outcomes

After successfully completing this course you should be able to:

1 Analyse DNA, gene and/or protein sequences to charcterise their function, structure, homology, etc. using a range of web and command-line based tools.

2 Conduct database searches for DNA, gene or protein sequences and extract useful information, such as their sequences, homologs, related scientific publications, diseases and more.

3 Interpret and communicate bioinformatics analysis results either informally through in class or online discussions with peers and staff or in the form of a brief scientific report.

4 Work independently or with other students to complete set tasks.

2.3. Graduate Attributes

For further details on the Griffith Graduate please click here

Griffith University prepares influential graduates to be:

- Knowledgeable and skilled, with critical judgement
- Effective communicators and collaborators
- Innovative, creative and entrepreneurial
- Socially responsible and engaged in their communities
- Culturally capable when working with First Australians
- Effective in culturally diverse and international environments

This table demonstrates where each of the Griffith Graduate Attributes is taught, practised and assessed in this course.

For further details on the Griffith Graduate Attributes please refer to The Griffith Graduate policy.

University wide attributes

GRADUATE ATTRIBUTE	TAUGHT	PRACTISED	ASSESSED
Knowledgeable and skilled, with critical judgement	•	•	•
Effective communicators and collaborators		•	•
Innovative, creative and entrepreneurial	•	•	•

3. Learning Resources

3.1 Required Resources

Details of your Required Learning Resources are available from the Reading List.

3.2 Recommended Resources

Details of your Recommended Learning Resources are available from the Reading List.

3.3 University Learning Resources

The University provides many facilities and support services to assist students in their studies. Links to information about University support resources that are available to students are included below for easy reference.

Readings - New online service enabling students to access Required and Recommended Learning resources. It connects to the library catalogue to assist with quickly locating material held in Griffith libraries and enables students to manage and prioritise their readings, add personal study notes and export citations.

Learning@Griffith - there is a dedicated website for this course via the Learning@Griffith at myGriffith.

Academic Integrity Tutorial - this tutorial helps students to understand what academic integrity is and why it matters. You will be able to identify types of academic misconduct, understand what skills you will need in order to maintain academic integrity, and learn about the processes of referencing styles.

Student Support - provides a range of services to support students throughout their studies including personal support such as Counselling and Health Services; Academic support; and Financial and Welfare support.

The Careers and Employment Team provides: Career Wellbeing, Career Planning and Decision Making, Finding Jobs, Skills Identification and Development, Graduate Employment Information, LinkedIn Profile Review, Interview Preparation, Online Psychometric and Aptitude Test Preparation, International Student Support, Disability Disclosure Strategies and Higher Degree Research (HDR) Career Consultations.

Library and Learning Services: Library and Learning Services provides a wide range of quality client-focused services and programs to students, researchers and staff of the University. Library and Learning Services works in collaboration with the academic community to achieve academic and research outcomes.

Support for learning - the University provides access to common use computing facilities for educational purposes.

Code of Practice - Griffith Information Technology Resources.

3.5 Other Learning Resources & Information

Resources will be provided through the course Learning@Griffith website

4. Teaching & Learning Activities

4.1 Learning Activities

Week Commencing	Activity	Learning Outcomes
8 Mar 21	**Introduction to Bioinformatics (Lecture Series):** Introduction to bioinformatics: a review of relevant fundamental biological concepts, sequencing platforms, file formats and analysis environments (Windows/ Linux/Web).	2, 3, 4
15 Mar 21	**Bioinformatics databases (Lecture Series):** Introduction to bioinformatics databases and portals - how to navigate them, what information they include, file formats used, and tolls and programs to query and extract information.	2, 3, 4
22 Mar 21	**Sequence Alignments (Lecture Series):** Review the theory of aligning pairs of biological sequences and how it used to interrogate databases using programs like BLAST.	1, 2, 3, 4
29 Mar 21	**Multiple Sequence alignments & Phylogenetics (Lecture Series):** Review the theory of aligning multiple sets of biological sequences, learn how to apply this using programs such as CLUSTALW and introduce the concepts of motif and pattern discovery. The theory and practice of phylogenetics will commence in this series of lectures.	1, 2, 3, 4
12 Apr 21	**Gene discovery and annotation (Lecture Series):** Review the theory and practical tools used to identify patterns within known genes or proteins as well as how genes are identified from large datasets such as genome sequencing projects.	1, 2, 3, 4
19 Apr 21	**Gene expression analysis (Lecture Series):** Review the theory and practical tools used to characterise and compare expression patterns of genes in experimental settings and how gene expression is measured from large datasets such as genome sequencing projects.	1, 2, 3, 4
26 Apr 21	**Revision and quizes (Review):** A revision of the learned theory and practicals in preparation for theory and applicative quizzes and final assessment.	1, 2, 3, 4
3 May 21	**Proteomics (Lecture Series):** Proteomics refers to the large-scale experimental analysis of proteins and proteomes. Students will be introduced to the theory and tools used to infer protein composition, sequences and functional annotations, as well as methods for protein purification, such as Mass Spectrometry, Liquid Chromatography, etc.	1, 2, 3, 4
10 May 21	**Protein structure modelling and prediction (Lecture Series):** Students will be introduced to the theory and programs used to devise molecular models of protein structures and visualise them.	1, 2, 3, 4
17 May 21	**Genomic variation (Lecture Series):** Students will be introduced to the theory of genomic variation and methods used to identify genetic markers and how they are used in a range of medical, biological and agricultural applications.	1, 2, 3, 4
24 May 21	**Genome assembly and annotation (Lecture Series):** Students will be introduced to the theory and methods used to assemble a genome from high throughput next generation sequencing data. Students will learn to use the web-based tool Galaxy to assemble and annotate microbial genomes	1, 2, 3, 4
31 May 21	**Preparation for final assessment (Review):** A revision of the learned theory and practicals in preparation for the final assessment.	1, 2, 3, 4

4.2 Other Teaching and Learning Activities Information

If a lecture or tutorial class is scheduled on a public holiday (or is cancelled for any unexpected reason), this class will normally not be repeated.

Students Repeating a Course: Normally, students repeating a course should not ‘carry forward’ marks from a previous attempt. Assessment items are usually offered to provide formative experience as well as a summative assessment. Therefore, NO MARK for any assessment item from a previous attempt will be carried forward.

5. Assessment Plan

5.1 Assessment Summary

This is a summary of the assessment in the course. For detailed information on each assessment, see **5.2 Assessment Detail** below.

ASSESSMENT TASK	DUE DATE	WEIGHTING	MARKED OUT OF	LEARNING OUTCOMES	MAXIMUM EXTENSION PERIOD
Test or quiz Quiz 1	28 Apr 21 During workshop, N79_2.08	20%	20 marks	1, 2, 3, 4	
Test or quiz Quiz 2 - Assessment of practical skills	5 May 21 During workshop, N79_2.08	30%	30 marks	1, 2, 3, 4	
Assignment - Problem Solving Assignment Gene annotation and protein prediction	13 Jun 21 17:00	50%	50 marks	1, 2, 3, 4	

5.2 Assessment Detail

Title: Quiz 1
Type: Test or quiz
Learning Outcomes Assessed: 1, 2, 3, 4
Due Date:
28 Apr 21 During workshop, N79_2.08
Weight: 20%
Marked out of: 20
Task Description:
Students will complete a 1 hour quiz in class that will assess the theoretical components taught in the first six weeks, including the introductory lecture series in the form of short answers.
Criteria & Marking:
The students will be marked based on the following criteria:

1. Knowledge (80%) - the students will demonstrate their knowledge by providing correct answers to the questions based on the theory and principles presented in Weeks 1 - 6, including correct use of technical and scientific terms.
2. Style (20%) - the correct use of English language, including correct grammar, spelling, formatting (such as italics and letter case for scientific names), punctuation marks and sentence structure (when applicable)

Assessments will be marked within 2 weeks of submission and feedback will be provided individually via the submission system on L@G. Additional feedback will be provided to the entire class in the revision session and will cover common mistakes and reenforce areas that seem to haven't been fully understood based on student feedback and the assessment marking.

Submission: Via the 'Assignments' tool in Learning@Griffith. Text Matching Tool - Safe Assign.

This assessment item:
- is a school based activity
- is an individual activity
- does not include a self assessment activity
- does not have a re-attempt provision

Title: Quiz 2 - Assessment of practical skills
Type: Test or quiz
Learning Outcomes Assessed: 1, 2, 3, 4
Due Date:
5 May 21 During workshop, N79_2.08
Weight: 30%
Marked out of: 30
Task Description:
Students will complete a 1.5 hour quiz in class that will assess their abilities to analyse and intrepret biological sequences, this quiz will assess all practical skills learnt in the course from week 1 to 6.
Criteria & Marking:
Students will be provided with a set bioinformatic tasks (including but not limited to: recover gene sequence, identify homologs, align sequences) and then will provide short written answers.

The students will be marked based on the following criteria (from a total of 30 marks):

1. Knowledge (70%) - the students will demonstrate their knowledge by applying the method suitable to solve the questions based on the methods and tools taught and practiced in Weeks 1 - 6
2. Accuracy (30%) - obtaining the correct results from the applied methods, including correct use of technical and scientific terms, formatting of scientific names, scientific units, etc.

Assessments will be marked within 2 weeks of submission and feedback will be provided individually via the submission system on L@G. Additional feedback will be provided to the entire class in the following workshop and will cover common mistakes and reenforce areas that seem to haven't been fully understood based on student feedback and the assessment marking.

Submission: Via the 'Assignments' tool in Learning@Griffith. Text Matching Tool - Safe Assign.

This assessment item:
- is a school based activity
- is an individual activity
- does not include a self assessment activity
- does not have a re-attempt provision

Title: Gene annotation and protein prediction
Type: Assignment - Problem Solving Assignment
Learning Outcomes Assessed: 1, 2, 3, 4
Due Date:
13 Jun 21 17:00
Weight: 50%
Marked out of: 50
Task Description:
- Students will be given a biological question to solve from data such as unknown sequence/s from a sequencing project, gene counts from an expression experiment, or genomic variant data from a population.
- Using the bioinformatics skills learned throughout this trimester the student's task is to solve the question, which may include, for example, identifying gene or genes present in the sequences, determine what proteins these genes encode, and predict what the structure and function of these proteins should be. Other tasks may incluyde performing differential expression analysis of genes or proteins, population genetics analysis, etc.
- The assessment will be presented in form of a scientific research article.
  The article should consists of:
  - 1. Title and Author
    2. Abstract (a short summary of the study; maximum of 200 words)
    3. Introduction (describe the background of the study, the gene/protein; maximum of 500 words)
    4. Materials and Methods (describe how the analyses were performed, which software was used, etc; maximum of 500 words)
    5. Results (what are your findings? Maximum of 500 words)
    6. Discussion (interpret your findings, compare to literature; maximum of 750 words)
    7. References (in Harvard style)
    8. Tables (if required)
    9. Figures with caption
    10. Supplementary material: All digital files you generated for this assignment, neatly ordered and collated, compressed into one archive file (zip, rar, tar, gz, or bzip2).

Criteria & Marking:
Students will be provided with a set bioinformatic tasks (including but not limited to: recover gene sequence, identify homologs, align sequences) and then will provide short written answers. All modules taught in the course will be assessed.

The students will be marked based on the following criteria (from a total of 50 marks):

- Style (grammar, nomenclature, scientific writing structure, referencing) - 10
- Demonstrate technical knowledge (applying needed tools) - 20
- Collect and write results – 10
- Analyse results and discuss relevance to previous studies - 10

Assessments will be marked within 2 weeks of submission and feedback will be provided individually via the submission system on L@G.

Submission: Via the 'Assignments' tool in Learning@Griffith. Text Matching Tool - Safe Assign.

This assessment item:
- is a school based activity
- is an individual activity
- includes a self assessment activity
- does not have a resubmission provision

5.3 Late Submission

For all non-Honours Dissertation courses: An assessment item submitted after the due date, without an approved extension, will be penalised. The standard penalty is the reduction of the mark allocated to the assessment item by 5% of the total weighted mark for the assessment item, for each working day that the item is late. A working day will be defined as Monday to Friday. Assessment items submitted more than five working days after the due date will be awarded zero marks. To understand how the mark is reduced please refer to Assessment Procedures for Students.

For all Honours Dissertation courses: Enrolment in an Honours degree shall be cancelled and the candidature terminated if the candidate fails to lodge their Honours dissertation by the prescribed date including any approved extensions.

5.4 Other Assessment Information

Supplementary Assessment is not available for this course.

Final Grades

A student's final grade for this course will be based on the aggregation and weighting of marks across assessment, any mandatory pass components and grade cut-offs. Grade cut-offs can vary, so you will need to wait for the official release of grades to be sure of your grade for this course.

- This course is a graded course (i.e 7, 6, 5, 4, 3, 2, 1).

6. Policies & Guidelines

This section contains the details of and links to the most relevant policies and course guidelines. For further details on University Policies please visit the Policy Library

6.1 Assessment Related Policies and Guidelines

University Policies & Guidelines

The University's assessment-related policies can be found in the Griffith Policy Library.

Please refer to the following specific policies:

- Assessment Policy
- Assessment Procedure for Students

6.2 Other Policies and Guidelines

University Policies and Guidelines

Students are responsible for ensuring that they have read all sections of the Course Profile for the course/s in which they are enrolled in any enrolment period. The published online version of the Course Profile is the authoritative version and by the publication of the Course Profile online, the University deems the student has been notified of and read the course requirements. Variations to the Course Profile during the trimester of offer are not permitted except in exceptional circumstances and will be advised in writing to all enrolled students and via the *Learning@Griffith* website. Additional information regarding the content of this course may be published on the *Learning@Griffith* website.

Copyright matters

Copyright applies to all teaching materials and materials generated by students which substantially relate to Griffith University courses. *Students are warned against selling Griffith University teaching materials and their student notes online through commercial websites during and after their studies.* You will almost certainly be in breach of copyright law and Griffith's IT Code of Practice if you post these materials on the internet and commercial websites. Please refer to the Copyright Guide for Students for further information.

Health and Safety

Griffith University is committed to providing a safe work and study environment. However, all students, staff and visitors have an obligation to ensure the safety of themselves and those whose safety may be affected by their actions. Staff in control of learning activities will ensure as far as reasonably practical, that those activities are safe and that all safety obligations are being met. Students are required to comply with all safety instructions and are requested to report safety concerns to the University.

General health and safety information is available on the Health, Safety and Wellbeing website.

Other Key Student-Related Policies

All University policy documents are accessible to students via the Griffith Policy Library and links to key policy documents, in addition to those listed in 6.1 above, are included below for easy reference:

- Student Communications Policy
- Health and Safety Policy
- Student Administration Policy
- Student Charter
- Student Review and Appeals Policy
- Student Review and Appeals Procedures
- Student Complaints Policy