Course outline

Code: SCI502
Title: ‘Omics’ and bioinformatics

Faculty of: Science, Health, Education and Engineering
Teaching Session: Session 6
Year: 2017
Course Coordinator: Dr Scott Cummins, scummins@usc.edu.au; Tel: (07) 54565501

1. What is this course about?
1.1 Course description
This course will focus on advanced methods in genetics and ‘omic’ technologies. You will learn theory of ‘omics’ and be guided through practical methods in genomics, transcriptomics, proteomics, metabolomics and advanced microscopy, and computer skills used in ‘omics’ research. The knowledge gained can be applied to a range of disciplines in biology, from genetics, biomedicine, agriculture and fisheries.

1.2 Course content
Themes covered will include methods to isolate biomolecules (DNA, RNA, protein/peptide, metabolites), biomolecule identification, and how to measure their abundance in tissues. These include histology, in situ hybridisation, antibody production, immunoassays, microscopy and mass spectrometry. You will also learn to use the equipment for biomolecule isolation, identification and abundance.

2. Unit value
12 units
3. **How does this course contribute to my learning?**

<table>
<thead>
<tr>
<th>Specific Learning Outcomes</th>
<th>Assessment Tasks</th>
<th>Graduate Qualities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define and apply complex terms used in ‘Omic’ research</td>
<td>Tasks 1 and 2</td>
<td>Knowledgeable.</td>
</tr>
<tr>
<td>Apply methods and techniques used for gene, peptide, metabolite detection in genetic and biomedical research</td>
<td>Tasks 1 and 2</td>
<td>Knowledgeable. Creative and critical thinkers.</td>
</tr>
<tr>
<td>Evaluate and justify report findings from practical sessions in laboratory activities and from the literature review</td>
<td>Task 1, 2 and 3</td>
<td>Creative and critical thinkers. Knowledgeable.</td>
</tr>
<tr>
<td>Describe and examine strategies used in the literature to find genes from expected biological and metabolic pathways</td>
<td>Task 1, 2, 3</td>
<td>Ethical.</td>
</tr>
<tr>
<td>Demonstrate and apply computer skills used in ‘Omics’ research</td>
<td>Task 1, 2, 3</td>
<td>Empowered. Knowledgeable.</td>
</tr>
</tbody>
</table>

4. **Am I eligible to enrol in this course?**

Refer to the *Coursework Programs and Awards - Academic Policy* for definitions of “pre-requisites, co-requisites and anti-requisites”

4.1 **Enrolment restrictions**

This course is available to students in SCI805. Undergraduate or HDR students at USC who demonstrate relevant background knowledge, skills and experience may seek permission to enrol from Course Coordinator.

4.2 **Pre-requisites**

Nil

4.3 **Co-requisites**

Nil

4.4 **Anti-requisites**

Nil

4.5 **Specific assumed prior knowledge and skills (optional)**

Students are expected to have prior knowledge in biology, biochemistry and basic genetics at undergraduate level to achieve best possible learning outcomes from this course.
5. How am I going to be assessed?

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

5.2 Assessment tasks

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Assessment Tasks</th>
<th>Individual or Group</th>
<th>Weighting %</th>
<th>What is the duration / length?</th>
<th>When should I submit?</th>
<th>Where should I submit it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laboratory reports</td>
<td>Individual</td>
<td>50</td>
<td>500 words per lab report (one report per week x 10)</td>
<td>From week 2 to week 8</td>
<td>Blackboard</td>
</tr>
<tr>
<td>2</td>
<td>Literature review of ‘omic’ application</td>
<td>Individual</td>
<td>30</td>
<td>2,000 words</td>
<td>Week 8</td>
<td>Blackboard</td>
</tr>
<tr>
<td>3</td>
<td>Oral presentation</td>
<td>Individual</td>
<td>20</td>
<td>20 minutes presentation + 5 minutes Q&amp;A</td>
<td>Week 8</td>
<td>In class</td>
</tr>
</tbody>
</table>

100%

Assessment Task 1: Laboratory reports

**Goal:** To demonstrate the cumulative learning and understanding in the application of methods and techniques and computer skills used in genomics, transcriptomics, proteomics and metabolomics research.

**Product:** Weekly report of 500 words (10-week duration) Weeks 2 and 3 reports will be formative.

**Format:** The weekly laboratory reports will include short essay responses aligned to activities and techniques conducted in Week 2-10. The relevant weekly questions will be posted on Blackboard. Each report will be worth five marks.

**Criteria**

You will be assessed on the quality and extent of your ability to:

- Define and apply complex terms used in ‘Omic’ research
- Plan, design, evaluate, justify and apply methods and techniques used for gene, peptide, metabolite detection in ethical genetic and biomedical research
- Describe and examine strategies used in the literature to find genes from expected biological and metabolic pathways
- Apply computer skills used in ‘Omics’ research

**Generic skill assessed** | **Skill assessment level**
--- | ---
Problem solving | Advanced
Communication | Advanced
Organisation | Advanced
Applying technologies | Advanced
Assessment Task 2: Literature review of ‘omic’ application

**Goal:** To expand the apply literature review, analysis and synthesis skills of of the literature, newly developed methods in one of the areas of “Omics”

**Product:** Literature Review.

**Format:** You will search and analyse published information and write up a 2000 word literature review. The review will contain the following information:
- Presentation of knowledge and research problems for the chosen topic, background and aims of the review
- Literature search, quality assessment of studies and data extraction
- Theoretical approach/methods and techniques used for the chosen topic
- Synthesis of data and results in tables and figures
- Discuss contribution of previous research, theory and conceptualisation
- Identification of ‘knowledge gap’ and relevance of future study
- Conclusions and recommendations.
- References (referencing style, e.g. BMC Genetics and Genomics)

The review may include a meta- or statistical analysis and discussion of ethical practices.

Submission of a skeleton in week 3, draft review in week 9 and final review in week 12

**Criteria**

You will be assessed on the quality and extent of your ability to:
- Correctly interpret and apply complex terms used in ‘Omic’ research.
- Apply methods and techniques used for gene, peptide, metabolite detection in ethical genetic and biomedical research.
- Justify report findings.
- Examine strategies used in the literature to find genes from expected biological and metabolic pathways.
- Demonstrate and apply computer skills in ‘Omics’ research.
- Critically review published information; write in scientific publication format and present findings from the literature in a format as required by international journals for review papers.

<table>
<thead>
<tr>
<th>Generic skill assessed</th>
<th>Skill assessment level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information literacy</td>
<td>Advanced</td>
</tr>
<tr>
<td>Communication</td>
<td>Advanced</td>
</tr>
</tbody>
</table>

Assessment Task 3: Oral presentation

**Goal:** To demonstrate the cumulative learning of “Omic” methods and techniques and their applications in biology, genetics and biomedical research

**Product:** Presentation

**Format:** 20-minute individual oral presentation with five minutes of question and answer time. Questions will be fielded from both tutors and peers.

Your oral presentation should be supported with visuals (e.g. PowerPoint slides) with a maximum of 15 slides.

Your oral presentation should include the main sections as covered in Task 2 (Literature Review):
- Statement of the research problem, background and aims of the review.
- Literature search and data synthesis (including experimental designs, sample size, data records and analysis tools).
- Theoretical or conceptual approach used for the chosen topic
- Synthesised results, discussion and recommendations
- Ethical considerations.
- References (referencing style, e.g. BMC Genetics/Genomics).
Criteria | You will be assessed on the quality and extent of your ability to:
--- | ---
| • Examine strategies used in the literature to find genes from expected ethical biological and metabolic pathways
| • Demonstrate and apply computer skills used in ‘Omic’ research.
| • Use oral communication skills, scientific content (gap in knowledge, research issues, synthesised results from the literature, recommendations and suggestions of methods used) for the chosen topic and in relation to “Omic” technologies in biomedical and genetic research.
| • Identify and justify and methods/techniques used to address complex issues in ‘omic’ research

<table>
<thead>
<tr>
<th>Generic skill assessed</th>
<th>Skill assessment level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applying technologies</td>
<td>Advanced</td>
</tr>
<tr>
<td>Problem solving</td>
<td>Advanced</td>
</tr>
</tbody>
</table>

5.3 Additional assessment requirements

Plagiarism
In order to minimise incidents of plagiarism and collusion, 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.

Eligibility for Supplementary Assessment
Your eligibility for supplementary assessment in a course is dependent on the following conditions applying:

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

5.4 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 to negotiate an outcome.

6. How is the course offered?

6.1 Directed study hours
Lectures: 2 hours
Laboratory sessions: 2 hours
Tutorials: 2 hours

6.2 Teaching semester/session(s) offered
Session 6 each year
### 6.3 Course activities

<table>
<thead>
<tr>
<th>Day</th>
<th>What key concepts/content will I learn?</th>
<th>What activities will I engage in to learn the concepts/content?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Directed Study Activities</td>
</tr>
<tr>
<td>1</td>
<td>Introduction to ‘Omic’ technologies and ethical practices</td>
<td>Lecture</td>
</tr>
<tr>
<td>2</td>
<td>Genome: DNA isolation, genome sequencing, NCI network and Photoshop</td>
<td>Lecture, practical</td>
</tr>
<tr>
<td>3</td>
<td>Transcriptome: RNA isolation, primer design, RT-PCR and gene detection Submission of a skeleton of the literature review for initial feedback</td>
<td>Lecture, tutorial</td>
</tr>
<tr>
<td>4</td>
<td>Transcriptome sequencing, histology, qPCR, in situ hybridisation</td>
<td>Lecture, practical</td>
</tr>
<tr>
<td>5</td>
<td>Proteome: Protein/peptide isolation, LC-mass spectrometry, protein/peptide identification and quantitation</td>
<td>Lecture, tutorial</td>
</tr>
<tr>
<td>6</td>
<td>Metabolome: Metabolite isolation and identification</td>
<td>Lecture, practical</td>
</tr>
<tr>
<td>7</td>
<td>Genomic variation: Genotyping and parentage assignment Submission of the draft literature review for individual feedback</td>
<td>Lecture, tutorial</td>
</tr>
<tr>
<td>8</td>
<td>Submission of the final review and seminar and oral presentations of own analyses</td>
<td>Lecture, practical</td>
</tr>
</tbody>
</table>

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

### 7. What resources do I need to undertake this course?

#### 7.1 Prescribed text(s):

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

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online multi-author</td>
<td>2016</td>
<td>Current Protocols in:</td>
<td>Wiley Online Library</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Molecular Biology</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Bioinformatics</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Protein science</td>
<td></td>
</tr>
</tbody>
</table>

#### 7.2 Required and recommended readings

Lists of required and recommended readings may be found for this course on its Blackboard site. These materials/readings will assist you in preparing for tutorials and assignments, and will provide further information regarding particular aspects of your course.

#### 7.3 Specific requirements

Nil
7.4 Risk management
Risk assessments have been performed for all laboratory classes and a moderate level of health and safety risk exists. Moderate risks are those associated with laboratory work such as working with chemicals and hazardous substances. You will be required to undertake laboratory induction training and it is also your responsibility to research and understand the risks associated with your specific course of study and to familiarise yourself with the University’s general health and safety principles by reviewing the online induction training for students.

8. How can I obtain help with my studies?
In the first instance you should contact your tutor, then the Course Coordinator. Additional assistance is provided to all students through Peer Advisors and Academic Skills Advisors. You can drop in or book an appointment. To book: Tel: +61 7 5430 2890 or Email: student central@usc.edu.au

9. Links to relevant University policies 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


10. General enquiries
In person:
- Sippy Downs - Student Central, Ground Floor, Building C
- USC SouthBank - Student Central, Building B, Ground floor (level 1)
- USC Gympie - Student Central, 71 Cartwright Road, Gympie
- USC Fraser Coast - Student Central, Building A

Tel: +61 7 5430 2890
Email: studentcentral@usc.edu.au