# Bioinformatics 331

**Semester One, 2012**

<table>
<thead>
<tr>
<th><strong>Unit study package number:</strong></th>
<th>307692</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode of study:</strong></td>
<td>Internal</td>
</tr>
<tr>
<td><strong>Tuition pattern summary:</strong></td>
<td>Lecture 2 X 1 hour weekly, Practical 1 X 3 hours weekly</td>
</tr>
<tr>
<td><strong>Credit value:</strong></td>
<td>25</td>
</tr>
<tr>
<td><strong>Pre-requisite units:</strong></td>
<td>Molecular Genetics 233 or equivalent</td>
</tr>
<tr>
<td><strong>Co-requisite units:</strong></td>
<td>Biochemistry 233</td>
</tr>
<tr>
<td><strong>Anti-requisite units:</strong></td>
<td>NIL</td>
</tr>
<tr>
<td><strong>Additional Requirements:</strong></td>
<td>NIL</td>
</tr>
<tr>
<td><strong>Result type:</strong></td>
<td>Grade and Mark</td>
</tr>
<tr>
<td><strong>Approved incidental fees:</strong></td>
<td>All fee information can be obtained through the Fees Centre. Visit <a href="http://fees.curtin.edu.au">fees.curtin.edu.au</a> for details.</td>
</tr>
</tbody>
</table>

**Scheduled times and Venues:**

- **Lecture:** Tues 9-10am, Wed 9-10am – 404:204
- **Practical:** Thurs 9-12 – 308:104

**Unit Coordinator/Lecturer:**

- **Name:** Dr Steven Bottomley
- **Phone:** 9266 4369
- **Email:** S.Bottomley@curtin.edu.au
- **Building:** Room: 308.203
- **Consultation times:** TBA

**Lecturer/Tutor:**

- **Name:** Ms Eleanor Morgan
- **Phone:** 9266 7516 / 0408004369
- **Email:** e.morgan@curtin.edu.au
- **Building:** Room: 308.205
- **Consultation times:** TBA

**Administrative contact:**

- **Name:** FSSO
- **Phone:** 9266 3685
- **Email:** currentstudents@health.curtin.edu.au
- **Building:** Room: 400:Lev2

**Learning Management System:**

FLECS - Blackboard ([oasis.curtin.edu.au](http://oasis.curtin.edu.au))
Syllabus
Bioinformatics and functional genomics in the organisation and analysis of nucleotide sequences (DNA) and amino acid sequences (protein). Spans biology and information science.

Introduction
Bioinformatics 331 is a CORE unit in the Molecular Genetics & Biotechnology course.

Bioinformatics and functional genomics entails the organisation and analysis of molecular biological data. It is a relatively new discipline and describes the nexus between biology and information science. Bioinformatics uses computers to collect, store, retrieve and analyse biological data, and is a necessary discipline to take advantage of the vast amount of raw biological data accumulating at an exponential rate as a consequence of the genome projects currently being undertaken around the world.

This unit will assist you in learning new skills in computational biology and will introduce new unifying concepts in molecular science. It is a challenging and rewarding path to follow; I trust you will enjoy the journey.

I have provided my contact details above. Feel free to contact me if you have any problems, questions or concerns as the semester progresses. I encourage you, however, to initially post questions or problems to the bulletin board located on the unit Blackboard site. Your fellow students may be able to provide an answer, and if not, will almost certainly be interested in my response!

Best wishes for the coming semester,
Eleanor (Nell) Morgan
Unit Coordinator

Unit Learning Outcomes
On successful completion of this unit students can:

<table>
<thead>
<tr>
<th>Graduate Attributes addressed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Access and retrieve biological information by independently searching relevant databases</td>
</tr>
<tr>
<td>2. Generate and analyse local and global alignments of homologous nucleotide and amino acid sequences based on evolutionary concepts.</td>
</tr>
<tr>
<td>3. Design specific and generic primers for sequences in preparation for PCR.</td>
</tr>
<tr>
<td>4. Construct and interpret phylogenetic trees showing evolutionary relationships between homologous sequences</td>
</tr>
<tr>
<td>5. Analyse genomic and protein sequences to predict genic structure and protein function</td>
</tr>
<tr>
<td>6. Apply bioinformatics methods to contemporary problems in biomedical science. Report on this information in a professional manner.</td>
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</table>
Curtin’s Graduate Attributes

<table>
<thead>
<tr>
<th>Apply discipline knowledge</th>
<th>Thinking skills</th>
<th>Information skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication skills</td>
<td>Technology skills</td>
<td>Learning how to learn</td>
</tr>
<tr>
<td>International perspective</td>
<td>Cultural understanding</td>
<td>Professional skills</td>
</tr>
</tbody>
</table>

Find out more about Curtin’s Graduate attributes at the Office of Teaching & Learning website: [otl.curtin.edu.au](http://otl.curtin.edu.au)

Learning Activities

Students are expected to attend two one hour lectures and one 3 hour computer laboratory session each week. The completion of practical exercises will require the use of a number of online and desktop applications. All applications used are either available over the internet or available for free download, so much of the work can be completed on the student's home computer. However, regular attendance at the laboratory sessions is highly recommended.

During the course of the semester you are required to complete ten practical exercises and one project. The practical exercises will be assessed using the Blackboard online test facility. Each practical test is open book and worth 15 marks for a total of 45% of the final mark. The Project report will be submitted electronically via the Blackboard Assignment tool. The project is worth 30% of the final mark. In addition, a supervised 2 hour written examination, worth 25% of the total mark, will be held during the final examination period at the end of semester. You are expected to achieve an overall pass (50% or higher) on the exercise assessment component, the project component and the final exam in order to pass the unit. Students should note that failure in any of the three assessment components may lead to a fail grade in the unit even though the total mark may exceed 50%.

Learning Resources

Highly Recommended Texts
Purchase of these textbooks is not essential, but is highly recommended:


Additional Recommended Texts
You do not have to purchase the following textbooks but you may like to refer to them.

• J M Claverie and C Notredame (2006). Bioinformatics for Dummies (Math and Science). 2nd edition. For Dummies USA


Online Resources
• Blackboard Learning Management System - http://lms.curtin.edu.au
• You will also be referred to a wide range of resources, including locations for software downloads and help documentation, on the internet. You will also need to access a variety of internet servers in order to search databases and complete particular analyses.

Assessment Schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>Value (%)</th>
<th>Date due</th>
<th>Unit Learning Outcome(s) assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Tests</td>
<td>3 X 15 = 45</td>
<td>See p7</td>
<td>1-5</td>
</tr>
<tr>
<td>Project</td>
<td>30</td>
<td>May 28</td>
<td>1,2,4,5,6</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25</td>
<td>TBA</td>
<td>1-6</td>
</tr>
</tbody>
</table>

Detailed information on assessment tasks

Practical Exercises

Practical exercise assessments will be in Blackboard Quiz/Test format. You will be required to work through each exercise and obtain a set of results. It is recommended that you keep a portfolio of the completed exercises along with a written interpretation of results. This will assist you during the practical assessment. Practical assessments will cover the expected results, interpretation and conclusions, along with answers to questions posed. Relevant theory from lecture and resource material will also be covered. Questions will be a combination of multiple choice, matching and short answer.

Project

One major project will be assigned during the semester. The project will require you to proceed through a logical series of analyses with different software packages, with concomitant interpretation of each set of results, in order to come up with a reasonable solution to several related biological questions. The project will be marked according to the following criteria:

- Introduction (~700-1000 words) 5 marks
- Aims (concise statement of project aims) 1 mark
- Methods 3 marks
- Results presentation and interpretation 7 marks
- Discussion of results and conclusions plus critical appraisal 9 marks
- Overall presentation (professionalism/referencing) 5 marks

TOTAL 30 marks

The introduction should cover background concepts and/or theory, and should lead into a concise description of the project aims, as in any scientific paper. The Methods should include brief descriptions of the applications used and details of important parameter settings (such that the analysis could be repeated by the reader). A synopsis/table of
results should be presented in the Results section for each analysis. However, DO NOT paste in several pages of an analysis (e.g. Blast result) in this section. The complete analysis may be presented as an appendix in a separate document (for blast results, only include the first few pages, not the entire report if large). The use of appropriate references is expected in the Introduction and Discussion. Referencing must be full, consistent, and must include authors’ names and dates in the text, rather than numbers. A full reference list must be provided, as well as a bibliography (there is a difference). Project submissions are expected to be of a high professional standard.

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**Referencing style**

Students should use the Chicago referencing style when preparing assignments. More information can be found on this style from the Library website:  
[library.curtin.edu.au/research_and_information_skills/referencing](library.curtin.edu.au/research_and_information_skills/referencing)

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**Fair assessment through moderation**

Moderation describes a quality assurance process to ensure that assessments are appropriate to the learning outcomes, and that student work is consistently evaluated by assessors. Minimum standards for the moderation of assessment are described in the Assessment Manual, available from [policies.curtin.edu.au/policies/teachingandlearning.cfm](policies.curtin.edu.au/policies/teachingandlearning.cfm)

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**Late penalties**

Students are expected to submit each assessment on or before the due deadline date. Failure to do so (without prior arrangement) will result in a 10% penalty per calendar day (e.g. 10% per day off the ‘total’ marks available – an assignment worth 25 marks will lose 2.5 marks every day it is late). An assignment more than 7 days overdue will not be marked.

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**Pass requirements**

You must gain an average mark of at least 50% for the exercises assessed, a mark of at least 50% for each of the projects, and a mark of at least 50% for the final exam. Failure to achieve this could result in failure of the unit even if the overall unit mark is greater than 50%. This is at the discretion of the unit coordinator in conjunction with the Board of Examiners.

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**Plagiarism**

Plagiarism occurs when work or property of another person is presented as one’s own, without appropriate acknowledgement or referencing. Plagiarism is a serious offence. For more information refer to [academicintegrity.curtin.edu.au](academicintegrity.curtin.edu.au)

**Plagiarism Monitoring**

Work submitted may be subjected to a plagiarism detection process, which may include the use of systems such as ‘Turnitin’. For further information see [http://academicintegrity.curtin.edu.au/students/turnitin.cfm](http://academicintegrity.curtin.edu.au/students/turnitin.cfm).

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**Additional information**

**Enrolment:**
It is your responsibility to ensure that your enrolment is correct - you can check your enrolment through the eStudent option on OASIS, where you can also print an Enrolment Advice.

Supplementary/Deferred Exams:
Supplementary and deferred examinations granted by the School of Biomedical Sciences will be held in July, 2011, exact dates TBA. Notification to students will be made after the School of Biomedical Sciences Board of Examiners meeting via the Official Communications Channel (OCC) in OASIS. It is the student's responsibility to check their OASIS account for official Curtin correspondence on a weekly basis. If your results show that you have been awarded a supplementary or deferred exam you should immediately check your OASIS email for details.

Student Rights and Responsibilities
It is the responsibility of every student to be aware of all relevant legislation and policies and procedures relating to his or her rights and responsibilities as a student. These include:

- the Student Charter
- the University’s Guiding Ethical Principles
- the University’s policy and statements on plagiarism and academic integrity
- copyright principles and responsibilities
- the University’s policies on appropriate use of software and computer facilities

Information on all these things is available through the University’s “Student Rights and Responsibilities” website at: students.curtin.edu.au/rights.

Recent unit changes
We welcome feedback as one way to keep improving this unit. Students are encouraged to give unit feedback through eVALUate, Curtin’s online student feedback system (see http://evaluate.curtin.edu.au/info/index.cfm). Recent changes to this unit include:

1. Change 1 X 2 hour lecture to 2 X 1 hour lectures (2011)
2. Provision of iLectures on Blackboard for lectures and tutorials (2010)
3. Reduction in workload – dropping one written project (2009)
4. Replacing written exercise reports with online quiz assessment (2008)

## Program calendar

<table>
<thead>
<tr>
<th>Week</th>
<th>Begin Date</th>
<th>Lecture Tues 9-10 404:204 Wed 9-10 404.204</th>
<th>Practical Thurs 9-12 308:104</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>27 Feb</td>
<td>Intro to Bioinformatics Biopolymers Databases (in lab)</td>
<td>Ex 1 DB searching</td>
<td></td>
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<tr>
<td>2.</td>
<td>5 March</td>
<td>Dot Plots Pairwise Seq Aln</td>
<td>Ex 2 - Pairwise Sequence Alignment</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>12 March</td>
<td>Primer Design DB search strategies</td>
<td>Ex 3a – Primer Design Ex 3b - BLAST</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>19 March</td>
<td>Multiple Seq Aln Molecular Evolution</td>
<td>Ex 4a – MSA Ex 4b - Adv Primer Design</td>
<td>Project out</td>
</tr>
<tr>
<td>5.</td>
<td>26 March</td>
<td>Phylogenetics I</td>
<td>Ex 5 Phylogenetic Analysis I</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>2 April</td>
<td>Phylogenetics II</td>
<td>Ex 6 Phylogenetic Analysis II</td>
<td>Prac Quiz 1 (1-4)</td>
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<tr>
<td>7.</td>
<td>9 April</td>
<td>Tuition Free Week</td>
<td>Tuition Free Week</td>
<td></td>
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<tr>
<td>8.</td>
<td>16 April</td>
<td>Molecular Evolution II</td>
<td>Ex 7 Case Studies of Mol Evol</td>
<td></td>
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<tr>
<td>9.</td>
<td>23 April</td>
<td>Protein Function Analysis</td>
<td>Ex 8 Analysis of ESTs</td>
<td></td>
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<tr>
<td>10.</td>
<td>30 April</td>
<td>Functional Genomics I</td>
<td>Ex 9 Genome Annotation</td>
<td>Prac Quiz 2 (5-7)</td>
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<tr>
<td>11.</td>
<td>7 May</td>
<td>Functional Genomics II</td>
<td>Ex 10 High Throughput Data Analysis</td>
<td></td>
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<tr>
<td>12.</td>
<td>14 May</td>
<td>Proteomics</td>
<td>Project work</td>
<td></td>
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<tr>
<td>13.</td>
<td>21 May</td>
<td>L1. Gene/Protein Ontology L2. Revision</td>
<td>Prac Test / Postgrad presentations</td>
<td>Prac Quiz 3 (8-10)</td>
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<tr>
<td>14.</td>
<td>28 May</td>
<td>Study Week</td>
<td>Study Week</td>
<td>Project due 28 May</td>
</tr>
<tr>
<td>15-16</td>
<td>4-15 June</td>
<td></td>
<td>Exam Period</td>
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