Unit Outline
Structural Bioinformatics 332. 2012
Unit Details

<table>
<thead>
<tr>
<th>Unit Index No:</th>
<th>307693</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit points:</td>
<td>25</td>
</tr>
<tr>
<td>Prerequisite Units:</td>
<td>Biochemistry 233&amp;234; Molecular Biology 233; Microbiology 233, and Bioinformatics 331</td>
</tr>
<tr>
<td>Online Teaching Unit Category:</td>
<td>Essential.</td>
</tr>
<tr>
<td></td>
<td>That is, unit materials and resources are available from the unit's Blackboard site and it is essential that students use this site to complete the unit. The online unit site is designed to be a significant component of the unit. It is absolutely necessary for students to have full Internet and web access.</td>
</tr>
<tr>
<td>Requirements:</td>
<td>Ownership of, or access to, recommended textbook (or companion/supplementary textbook). Ownership of, or access to, appropriately configured computer with Internet and web access (either on or off campus).</td>
</tr>
<tr>
<td>Unit Coordinator:</td>
<td>Dr Steven Bottomley</td>
</tr>
<tr>
<td>Address:</td>
<td>School of Biomedical Sciences Curtin University of Technology GPO Box U1987 PERTH WA 6845</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:S.Bottomley@curtin.edu.au">S.Bottomley@curtin.edu.au</a></td>
</tr>
<tr>
<td>Phone:</td>
<td>(08) 9266 4369</td>
</tr>
<tr>
<td>Fax:</td>
<td>(08) 9266 2342</td>
</tr>
</tbody>
</table>

*Please read this outline completely and carefully before commencing your study in this unit!*
Welcome!

Welcome to Structural Bioinformatics 332 (SB332)! Take the time to read this unit outline thoroughly. It explains most of what you need to know about this unit. If you have any difficulty understanding what is required of you, or you need clarification of any item in this unit outline, then please contact the unit coordinator immediately.

Protein structure and function is emphasized in this unit. In particular, we will explore the technologies needed to determine their structure, predict their structure, determine their function, and visualise or model their structure. This emphasis on proteins reflects the crucial importance of the structure and function of proteins in life - they are responsible for almost all processes occurring in life.

The recent completion of the draft sequence of the human genome has led to an increase in the number of DNA and protein sequences. Unfortunately, this has produced a sequence – structure gap such that we now have over 90,000 annotated protein sequences (in the Swiss-Prot database), but only about 14,000 3-D protein structures (in the pdb database). This gap is significant, because it means that we don’t have the 3D structural information to help determine a protein's role or function. Two general methods are being used to address this sequence-structure gap: structural bioinformatics and structural genomics. Structural bioinformatics uses a combination of sequence information and existing 3D protein structures to determine, predict, and model protein structure and function. Structural genomics uses a combination of sequence information and high throughput methods for x-ray crystallography and nuclear magnetic resonance to determine 3D protein structure.

I hope you will find this unit enjoyable, challenging and rewarding in terms of the time and effort you invest in it. I particularly hope that it stimulates your interest in the field of structural bioinformatics, molecular visualisation, molecular modelling, protein structure prediction and other technologies! Hopefully, your interest will motivate you to pursue your studies at a higher level! Please do not hesitate to contact me at any stage if you have any academic questions or comments on the unit.

Dr Steven Bottomley
Unit Coordinator & Lecturer

First things first...What you need to do first!

• Read and understand this unit outline. You must understand what is required of you and how the unit is structured. If you do not understand any part of this unit outline, then please ask your unit coordinator for further clarification.
• Check the ‘Structural Bioinformatics 332’ unit Blackboard site.
• Review the Biochemistry 231 molecular visualisation tutorials for review soon after you commence your study.
Unit Learning Outcomes

Learning outcomes are a useful guide for you to know what to expect from the unit and what to expect from yourself. Both theoretical and practical aspects of structural bioinformatics are covered. The five general learning outcomes for Structural Bioinformatics 332 are as follows:

<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>Assessment of Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Remember and understand facts, techniques, and concepts pertaining to protein structure and the structural bioinformatics syllabus</td>
<td>End of semester exam</td>
</tr>
<tr>
<td>2 Communicate, analyse, and evaluate knowledge in protein structure and structural bioinformatics</td>
<td>Practical Assignment</td>
</tr>
<tr>
<td>3 Use computers, and appropriate software, to manage and analyse protein sequence and structure data</td>
<td>Practical Assignment</td>
</tr>
<tr>
<td>4 Apply new and existing knowledge to solve problems in structural bioinformatics</td>
<td>End of semester exam Practical Assignment</td>
</tr>
<tr>
<td>5 Demonstrate competent and professional use of molecular visualization and other software</td>
<td>Practical Assignment</td>
</tr>
</tbody>
</table>

More specific learning objectives, and how they relate to the overall unit learning objectives, are listed for each lecture and practical.

Syllabus

A syllabus is a brief list the topics to be learned in a unit. The syllabus is indicated by the topics of a lecture, a practical, or a tutorial. The syllabus presently includes the following components: Review of molecular forces including: H-bonding, electrostatic, and hydrophobic interactions. Basic and advanced aspects of protein structure including peptide bond, secondary structure, tertiary structure and quaternary structure. Protein stability and energetics. Protein structure methods. Protein structure databases. Computer based molecular modelling and visualization. Prediction of protein structure and function. Protein Folding. Aspects of drug discovery and drug design.

Special note: We are constantly reviewing the syllabus, and teaching approach, of Structural Bioinformatics 332. Consequently, you may find changes occurring in lecture content, timing, or teaching approach throughout the semester. This may lead to a little inconvenience (in that the topics in the schedule may be altered), but this is certainly not an indication of disorganisation. These changes hopefully benefit students by offering interesting, up to date, and potentially ‘cutting edge’ topics as well as innovative approaches to teaching and learning. This can also benefit you by allowing you to be more competitive, and knowledgeable, in your future careers. You may also find that you are asked for your feedback on any potential change in syllabus.
Unit Coordinator and Lecturers

If you have any questions or requests specifically relating to your ability to conduct Structural Bioinformatics 332, then you should contact your unit coordinator in the first instance. Your unit coordinator is Dr Steven Bottomley. Your lecturer for this unit will mainly be Dr Steven Bottomley, but Professor Erik Helmerhorst and Professor Ricardo Mancera also usually present lectures. Other invited lecturers may also contribute to the unit. Contact details for your unit coordinator and lecturers are shown in the table below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Office</th>
<th>email</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Steven Bottomley (Unit coordinator &amp; lecturer)</td>
<td>308:204</td>
<td><a href="mailto:s.bottomley@curtin.edu.au">s.bottomley@curtin.edu.au</a></td>
<td>9266 4369</td>
</tr>
<tr>
<td>Professor Ricardo Mancera (Lecturer)</td>
<td>305:161</td>
<td><a href="mailto:r.mancera@curtin.edu.au">r.mancera@curtin.edu.au</a></td>
<td>9266 1017</td>
</tr>
<tr>
<td>Professor Erik Helmerhorst (Lecturer)</td>
<td>305:135</td>
<td><a href="mailto:e.helmerhorst@curtin.edu.au">e.helmerhorst@curtin.edu.au</a></td>
<td>9266 9716</td>
</tr>
</tbody>
</table>

Communication with lecturers

Lecturers are always approachable and welcome your questions. Do not be afraid to ask the lecturer questions. However, please be aware that the demands on a lecturer's time are great and the lecturer may not be able to respond immediately to your question (either from a personal visit, telephone call, email, or written note). Most academics are involved in both teaching and research. You should know that up to 50% of academics total time (in a year) is available for teaching and the remaining time is for research, meetings, and many other duties.

Please also note that as a result of a recent Academic Workload Management System implemented by the university (which allocates time for all activities conducted by a lecturer) the maximum time available for the activities of consultation, assessment, and feedback is 1.5 hours per student. This will obviously affect the time available for these particular activities.

Generally, all lecturers have an 'open door' policy. This means that the lecturers are available at most times during semester for student consultation and questions. If the lecturer can’t see you immediately, or you need to establish a definite time for the meeting, then you will be required to make an appointment. There may also be times during semester where the lecturer, for whatever reason, is unavailable for any student consultation. If for some reason, you feel you can’t approach the lecturers in person then take advantage of the other ways of communicating with lecturers such as: telephone, during class (by asking questions), by the Blackboard bulletin board, by email, or even by a note left in the lecturer’s mail box (found outside the office on the ground floor in Building 308)!

You must always include your name, student number, and subject in any correspondence with your lecturer or unit coordinator. Anonymous calls or notes will generally be ignored.
Unit Materials

Textbooks and References
Three texts are particularly useful for unit:


Each of these books is an excellent aid to your study and parts of these texts will be used to inform, illustrate, and complement the syllabus. Both the Gu&Bourne and Mike Williamson books are available in relatively small numbers in the bookshop and there is a copy of the Gu&Bourne book in the library. Fortunately, Curtin staff and students currently have full online text access to the Kessel&Ben-Tal ebook through the CRCnetBase web site. If you log in and use a Curtin-computer on campus you should be able to download pdf versions of chapters in this ebook from the following web site: http://www.crcnetbase.com/isbn/9781439810712

If you are not using a Curtin computer or you are not on campus, then you will first have to use your web browser to log into the Curtin Library Catalogue, navigate to the ‘Databases A-Z’ site and select CRCnetBase from the list of databases. Once you are at the CRCnetBase web site you will see a subject list on the left of the browser window. Click the small triangle to the left of the ‘Computer Science and Engineering’ link to expand the list. Then click on the ‘Computational Biology’ link. You should then be able to see, and select, the book title on the right hand list.

However, no textbook is ‘perfect’ and you will need to use other textbooks, journal articles and various resources to help you with your learning. Other excellent, and very useful, complementary textbooks include:


Various other resources to help you with your study include the Internet (some useful web sites are listed below), your friends, colleagues, tutors, lecturers, and professional people you know. You should make every attempt to read the textbooks and other literature.

Web-Based Resources

You should now be able to effectively explore the Internet where there is a wealth of freely available information. You may also be referred to some web sites during the course of your study. **Please Note:** When using the Internet you must ensure that the source of information
comes from a reputable, qualified, and professional institution or person. Useful web sites include:

- Interactive Internet tutorials and resources at the School of Biomedical Sciences Biochemistry web site at: http://wbiomed.curtin.edu.au/teach/biochem/
- Interactive protein structure tutorial on the SB332 Blackboard site.
- Curtin University library have various guides for study and research skills see: http://library.curtin.edu.au/study-and-research-tools/index.cfm
- International Society for Computational Biology: http://www.iscb.org/

Learning Aids

The main learning aids for this unit include:

- Your choice of a textbook
- Printed or Adobe Acrobat (pdf) files of lectures
- ilectures
- Interactive Internet tutorials and resources at the School of Biomedical Sciences Biochemistry web site at: http://wbiomed.curtin.edu.au/teach/biochem/
- Interactive protein structure tutorial on the Schools web site (URL above).
- Internet resources listed on SB332 Blackboard site
- Molecular visualisation programs RasMol, JAMVLE, Deep View, and Chimera
- Practical guided tutorials and practical sessions
- Blackboard bulletin board

You should make use of these aids to complement and enhance your own learning.

Delivery of Unit

Time for lectures, practicals, and tutorials allocated as follows:

- Lecture  2 x 1 hour per week
- Practical  1 x 3 hours per week

Lectures

Attendance at all lectures is strongly recommended. Why? Well, the lecturer may cover material in a slightly different way or have a particular emphasis on some concepts that will not always be obvious in the handouts (printed or electronic). Lectures also give you a convenient opportunity to ask your lecturer questions and to discuss the subject with your colleagues. It is by asking questions that you learn. Some lectures are presently being modified, and updated, and may not yet be available on Blackboard.

The subject of a lecture may be given earlier or later than that shown in the indicated schedule. Some lectures may also be extended or curtailed. The content of the lectures may also change at the ‘last minute’. These ‘last minute’ changes are certainly not an indication of disorganisation. You should understand that these changes are usually designed to present recent material, aid student learning, or to adjust to the perceived progress of the student cohort. They are for the benefit of students and not meant to be inconvenient or to confuse. These changes are at the discretion of the lecturer and unit coordinator and may also be the result of feedback from the student cohort.
Please understand the following:

- Please do not expect a lecture to always be a ‘one-way’ learning experience (lecturer to you) where you can ‘sit back and relax’ or be ‘entertained’. You will be expected to think and to contribute during the lecture through activities such as: answering questions, asking questions, providing feedback, performing calculations, and applying your knowledge. The lecture then becomes a more active and involved ‘two-way’ learning experience that will help you!
- Be prepared for lectures! Read the lecture notes, textbook chapters, and any other reading before attending lectures.
- In some lectures there may be no formal presentation or only a brief presentation. The remainder of the lecture will be conducted as a group discussion where you will be expected to discuss and answer questions. In these cases you will be asked to read specific lecture notes, or other material, before attending the lecture.
- Lectures should be viewed as your study guide to each topic.
- Parts of the syllabus may not be presented as lectures (e.g. as practical laboratory activities), but you still need to study and know this subject matter.
- Your attention in the lecture is important for your learning. Consequently, please don’t attend the lecture if you intend to talk with your friends about other things or if you want to sleep. Any unnecessary, disruptive, or unrelated activity by students during lectures may result in the embarrassment of the student(s) being asked to leave the lecture.
- If lectures and lecture notes are unavailable for any reason (or even if they are available) you are still responsible for making your own notes during the lecture!

Your understanding of each topic will only be achieved satisfactorily with broader reading of your text and other reference materials. Remember, it is your understanding of the topics that will be assessed in this unit! You may also find that you need to study more (or less) than other students depending upon your existing knowledge and ability. Please understand that ultimately you are responsible for your own learning!

Please also note that the recent Academic Workload Management System implemented by the university (which allocates time for all activities conducted by a lecturer) allocates a maximum time of two hours for updating, reviewing, or changing an existing lecture topic or developing a new lecture topic in an existing unit. Consequently, this will necessarily affect the frequency, coverage, and quality of comprehensive updates of the subject material by the lecturer.

**Practical Classes**

Practicals in this unit are designed to help you develop computer-based skills in molecular visualization, protein structure analysis, and problem solving skills. Other learning objectives for practicals are listed in the practical notes. Lecturers or tutors will be available at agreed times during the practical sessions, so you should use these sessions to ask questions and clarify concepts. All practical sessions are computer based. There are no ‘wet’ laboratory practical sessions in this unit. Practicals are conducted at dates and times according to the proposed study schedule.

**Important points to note about Practicals:**

- Most practicals are organised to contain at least two components: (1) tutorial activities for skill development and preparation for the assignment activities, (2) the assignment activities.
• The practical sessions require you to use various software for structural analysis of proteins.
• You should read the practical notes before attending the class and complete any pre-lab activities.
• You should use all of your time in the laboratory to complete the required practical activity.
• Practical sessions are conducted in the 'Mac Lab' in 308:104 according to the study schedule.

Feedback

Feedback is necessarily a two-way process. Feedback involves you providing information to help the lecturers learn more about you, your knowledge, or correct any misunderstanding. Your lecturers provide you information to help you learn, correct any misunderstanding, or clarify what you need to do. Feedback in this unit is considerable and occurs in two basic forms:

(1) when verbal or written information is exchanged directly between you and your lecturer
(2) when you receive written answers or explanations from an assessment, from ‘Questions for Learning’, from lectures, from any practical activity, feedback session, from any tutorial or from PeerWise.

Feedback can occur at any time during semester either in class or out of class. Feedback ‘out of class’ can occur through Curtin’s Blackboard learning management system (e.g. Announcements and the Bulletin Board) by any other form of acceptable communication (e.g. email or personal appointment).

Blackboard

Blackboard is Curtin University’s e-learning infrastructure and is used extensively in Structural Bioinformatics 332. It is important, and your responsibility, that you check the Blackboard discussion board, and announcements, at least once a day. Failure to check Blackboard may mean that you miss out on important information or details that affect your learning, your grade, or your progress in the unit.

Study Load

You will need to spend at least 5 hours a week outside of scheduled classes studying in this unit to be successful. You may need more time if you don’t have a strong background in chemistry or biochemistry.

Assessments

All the syllabus including information from lectures, textbooks, practicals, and any other indicated resources are assessable. Assessment in Structural Bioinformatics 332 is designed with the following aims:

• to help you learn structural bioinformatics
• to give you various opportunities to demonstrate your learning and achievement of the learning outcomes. That is, your achievement in Structural Bioinformatics 332 does not depend upon just one ‘end of semester’ exam.
• reward your performance for achieving the learning outcomes
• allow you to study continuously rather than ‘cram’ at the end of semester
• provide appropriate and timely feedback
• discriminate between those students who do the work and those who do not
• establish, maintain, and protect internationally recognised academic standards
• monitor your learning and your achievement of the learning outcomes
• provide a formal evaluation of your achievement in this unit for your degree qualification

A summary of the assessments is listed in the following table. If you work diligently you will find that all of the assessments are achievable during semester.

<table>
<thead>
<tr>
<th>Components of Assessment</th>
<th>Form of Assessment</th>
<th>Semester Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical Assignments</td>
<td>Various practical assignments (to be advised throughout the semester)</td>
<td>60%</td>
</tr>
<tr>
<td>Exam</td>
<td>End of semester exam covering aspects of the entire syllabus.</td>
<td>40%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

**Important Notes**

In accordance with Curtin policy, you are advised that this unit is a significant unit in which failure twice may lead to termination of your course. You are required to attempt all components of the assessment. Failure to attempt one, or more, components of the assessment, where there is no valid reason for the lack of an attempt, may result in a ‘Failed-Incomplete’ (F-IN) grade being allocated at the end of semester regardless of the total mark achieved. You are also required to achieve satisfactory marks (usually 50% of the assessment mark) in all components of the assessments. Failure in any component of the assessment may result in failing the unit regardless of the total marks achieved. Please note that the percent allocation of marks, or form of assessment, may be changed at the discretion of the unit coordinator. However, you will be notified of any change. Please also note that it is possible that some of your assessments will assume, and may require you to demonstrate, knowledge from Biochemistry 233, Biochemistry 234, and Bioinformatics 331.

**Practical Assignments**

Practical assignments are designed to: (1) help you learn, and practice, the subject material; (2) develop computer-based skills; and (3) reward you for your structural bioinformatics knowledge and effective practical application of that knowledge. Your assignments will comprise computer-based tasks that you will have to complete before the submission deadline. Each assignment will assume that you have developed the appropriate computer-based skills by first completing the appropriate practical tutorials.
Exam

You must complete one end of semester exam worth 50% of your total mark. Further details about the exam will be announced later in the semester. However, it is likely to include numerical questions and short answer questions. It may also involve the use of software.

Extensions

Extensions of time for taking any of the required assessments are not usually possible. If there are any extenuating circumstances (such as a medical emergency) then alternative arrangements may be made on a case-by-case basis. However, evidence must be provided such as a dated, and signed, medical certificate.

Late Submissions

Any unauthorized late submission will result in a decrease in marks of at least 10% of the assessment mark for each day overdue. For example, if an assessment is worth 20% of your total semester mark then the penalty for two days overdue would be:

\[ 2 \times (10/100 \times 20\%) = 4\% \]

Thus, the total mark available for the assessment would be: 20-4=16%. This does not mean you would receive 16% because it would depend upon the quality of your submission according to the marking criteria.

Supplementary Assessments

If you fail the unit then you may be offered a supplementary assessment. Supplementary assessments are awarded only at the discretion of the Board of Examiners. They are not an automatic right and the Board of examiners will carefully review each individual case. The aim of a supplementary assessment is to allow the student a chance to correct minor problems or deficiencies in the initial assessment and not to gain extra study time or correct major problems. The number of supplementary assessments awarded for each student will be kept to a minimum for a study period and a particular course of study.

Supplementary assessments, if awarded, will be indicated on the official Curtin examination result statement posted to all students, and will also be listed on the School notice board about 24 hours after the Board of Examiners meeting. It is your responsibility to check your status. A student who does not take a scheduled supplementary assessment has no claim to a further assessment. If you are awarded a supplementary assessment it is imperative that you confirm the type, and schedule, of the assessment. Assessments may be in any appropriate format including: multiple choice questions, short answer, essay, or project. The unit coordinator will determine the type of assessment after consulting with lecturers and the Board of Examiners.

Deferred Assessment

Deferment of an assessment is not automatic. Students may be permitted by the relevant Board of Examiners to defer an assessment for circumstances outside of the student’s control. However, a student’s overall performance may be taken into account in granting permission to defer an assessment. Applications for deferment on health grounds or as a result of extenuating circumstances must be submitted not later than seven (7) days after the end of the relevant assessment was due to be submitted during the semester. Detailed medical certificates should be attached to the application where appropriate.
Plagiarism Policy

Collaboration with other students is encouraged, but ALL submitted assignments and assessments must be YOUR OWN WORK. Consequently, you must be careful to appropriately cite all references you use in your answers to the assignment questions. Collusion or plagiarism will not be tolerated. Please note that electronic checks may be made on any submitted written assignment using specialist software that detects significant similarities from the Internet and from known references.

Please understand that it is not acceptable to simply copy the words of other students or authors when completing any assessment or assignment in this unit. This action constitutes plagiarism and is regarded as academic malpractice. The penalties for plagiarism can be severe and may include termination from your course of study. All direct quotes must be correctly attributed to the author and should be kept to a minimum. Also, you should include a list of references to acknowledge the source(s) of information used to produce any written work. You should also familiarize yourself with Curtin University’s policy on academic (student) integrity and plagiarism at: http://academicintegrity.curtin.edu.au./studentbook.html.

Students Rights and Responsibilities

You are responsible for your own learning. It is also important for you to read and understand the following statement:

“It is the responsibility of every student to be aware of all relevant legislation and policies and procedures relating to their 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; students’ responsibility to check enrolment; deadlines, appeals and grievance resolution; and electronic communication with students. Further information is available at: www.students.curtin.edu.au/rights/”

Mobile Phones

As a courtesy to both lecturers and other students, if you have a mobile phone, please ensure that it is turned off (or on silent) during lecture, tutorial and practical sessions. Students who do not comply with this request may be asked to leave the class. Mobile phones should also be turned off (or on silent) and not used at all during exams.

2 Teaching and Learning at Curtin 2009. Office of Teaching and Learning. Curtin University of Technology p16
<table>
<thead>
<tr>
<th>Week</th>
<th>Week Begin</th>
<th>Lecture Wednesday 11am-12noon 408:1501</th>
<th>Lecture Thursday 12noon to 1pm 400:219</th>
<th>Practical Wednesday 2pm-5pm 308:104</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16-Jul</td>
<td>Introduction to Structural Bioinformatics (SB)</td>
<td>Protein Structure Databases (SB)</td>
<td>Introduction to Practicals</td>
</tr>
<tr>
<td>2</td>
<td>23-Jul</td>
<td>Molecular Visualisation &amp; File Formats (SB)</td>
<td>Molecular Forces (SB)</td>
<td>Practical 1 PDB Files</td>
</tr>
<tr>
<td>3</td>
<td>30-Jul</td>
<td>Amino Acids and Peptide Bond (SB)</td>
<td>Protein Structure 1 (SB)</td>
<td>Practical 2 Peptide Bond Tutorial &amp; Assignment</td>
</tr>
<tr>
<td>4</td>
<td>6-Aug</td>
<td>Protein Structure 2 (SB)</td>
<td>Protein Structure 3 (SB)</td>
<td>Practical 3 Deep View Tutorial</td>
</tr>
<tr>
<td>5</td>
<td>13-Aug</td>
<td>Protein Structure Methods 1 (SB)</td>
<td>Protein Structure Methods 2 (SB)</td>
<td>Practical 4 Deep View Assignment</td>
</tr>
<tr>
<td>6</td>
<td>20-Aug</td>
<td>Protein Structure Methods 3 (SB)</td>
<td>Protein Folding</td>
<td>Practical 5</td>
</tr>
<tr>
<td>7</td>
<td>27-Aug</td>
<td>Tuition Free Week</td>
<td>Tuition Free Week</td>
<td>Tuition Free Week</td>
</tr>
<tr>
<td>8</td>
<td>3-Sep</td>
<td>Structural Bioinformatics &amp; Drug Discovery (SB)</td>
<td>Ligand-Protein Interactions (RM)</td>
<td>Practical 6</td>
</tr>
<tr>
<td>9</td>
<td>10-Sep</td>
<td>Ligand-Protein Docking (RM)</td>
<td>Drug Design (RM)</td>
<td>Practical 7</td>
</tr>
<tr>
<td>10</td>
<td>17-Sep</td>
<td>Molecular Modelling (SB)</td>
<td>Secondary Structure Prediction (SB)</td>
<td>Practical 8</td>
</tr>
<tr>
<td>11</td>
<td>24-Sep</td>
<td>Tertiary Structure Prediction (SB)</td>
<td>Structure Comparison (SB)</td>
<td>Practical 9</td>
</tr>
<tr>
<td>12</td>
<td>1-Oct</td>
<td>Homology Modelling [SB]</td>
<td>Protein Structure-Function 1 (SB)</td>
<td>Practical 10</td>
</tr>
<tr>
<td>13</td>
<td>8-Oct</td>
<td>Protein Structure Function 2 (SB)</td>
<td></td>
<td>TBA</td>
</tr>
<tr>
<td>14</td>
<td>15-Oct</td>
<td>Exam Study Week</td>
<td>Exam Study Week</td>
<td>Exam Study Week</td>
</tr>
<tr>
<td>15</td>
<td>15-Oct</td>
<td>Exam Week</td>
<td>Exam Week</td>
<td>Exam Week</td>
</tr>
</tbody>
</table>

Note: SB = Dr Steven Bottomley, EM = Professor Erik Helmerhorst, RM = Professor Ricardo Mancera. TBA = to be announced