



FACULTY OF SCIENCE

SCHOOL OF BIOTECHNOLOGY AND
BIOMOLECULAR SCIENCES

BIOC2181

FUNDAMENTALS OF BIOCHEMISTRY

Course Outline

Term 2, 2019

1. Information about the Course

| | | | | |
|--|--|--------------|------------|--|
| Year of Delivery | 2019 | | | |
| Course Code | BIOC2181 | | | |
| Course Name | Fundamentals of Biochemistry | | | |
| Academic Unit | School of Biotechnology and Biomolecular Sciences | | | |
| Level of Course | Level 2 | | | |
| Units of Credit | 6UOC | | | |
| Session(s) Offered | Term 2 | | | |
| Assumed Knowledge, Prerequisites or Co-requisites | BABS1201 Molecules, Cells and Genes and CHEM1011 Chemistry A or CHEM1031 Higher Chemistry A or CHEM1831 Chemistry for Health, Exercise and Medical Science | | | |
| Face-to-Face Hours per Week | 6 | | | |
| Number of Weeks | 10 weeks | | | |
| Commencement Date | Monday 3 rd of June, 2019 | | | |
| Summary of Course Structure (for details see 'Course Schedule') | | | | |
| Component | HPW | Time | Day | Location |
| LECTURES | 3 | | | |
| Lecture 1 | 1 | 10 am | Monday | CLB 8 |
| Lecture 2 | 1 | 5 pm | Thursday | Mathews B |
| Lecture 3 | 1 | 1 pm | Friday | CLB 8 |
| LABORATORIES | 3 | | | |
| Lab – Option 1 | 3 | 10 am - 1 pm | Thursday | Wallace Wurth 122 Wallace Wurth 123 |
| Lab – Option 2 | 3 | 2 pm - 5 pm | Thursday | Wallace Wurth 122 Wallace Wurth 123 |
| ONLINE TUTORIALS | 1 | | | |
| TOTAL | 7 | | | |

2. Staff Involved in the Course

| Staff | Role | Name | Contact Details | Consultation Times |
|---------------------------|------------------------------|---|--|----------------------------|
| Course Convenor | | Dr Nirmani Wijenayake | b.wijenayakeg@unsw.edu.au | By appointment |
| Additional Teaching Staff | Lecturers | Dr Anne Galea A/Prof Vladimir Sytnyk Dr Rebecca LeBard A/Prof Kyle Hoehn | a.galea@unsw.edu.au v.sytnyk@unsw.edu.au r.lebard@unsw.edu.au k.hoehn@unsw.edu.au | By appointment |
| | Demonstrators & Tutors | See Moodle for demonstrator lists | Moodle Discussion Boards | Scheduled laboratory times |
| | Technical & Laboratory Staff | Dr Kate Roberts Dr Owen Sprod | Not Applicable | Scheduled laboratory times |

3. Course Details

| | |
|----------------------------------|---|
| Course Description | BIOC2181 Fundamentals of Biochemistry introduces modern biochemistry, fundamental aspects of the structure-function relationships of proteins and an overall coverage of intermediary metabolism. Major topics covered include: the nature and functions of enzymes; the metabolic working of cells, tissues and organs; the interrelationships between pathways of carbohydrate, lipid and amino acid metabolism; the vital roles of enzymes and hormones in catalysis and metabolic regulation; the energy-trapping mechanisms of animals and plants; and interesting variations on the central metabolic pathways in various life forms. The practical coursework complements the lectures and introduces the principles of biochemical analysis. |
| Course Aims | <ul style="list-style-type: none"> This course aims to introduce students to modern biochemistry with an emphasis on how we, as humans, convert foods to useful energy. This course also aims to provide a solid context for new learning material by providing clinical, medical and everyday applications that correspond to the central themes and topics. Practicals are designed to reinforce the core biochemical concepts covered in lectures and introduce students to current laboratory techniques and biochemical assays. |
| Student Learning Outcomes | <p>By the end of this course, you will be able to:</p> <ol style="list-style-type: none"> Describe and compare the major metabolic pathways in humans. Explain the various mechanisms that control and regulate anabolic and catabolic processes simultaneously in the cells of living tissues. Discuss the changes that occur in metabolic pathways during specific scenarios such as fasting, starvation, obesity and exercise and genetic diseases. Perform a range of biochemical assays, analytical techniques and biochemical calculations through the application of current scientific methods in an experimental environment. Design experiments to diagnose medical conditions and analyse and interpret data to confirm the diagnosis |

4. Course Schedule

| Week | Week Begins | LECTURE Monday 10am CLB 8 | LECTURE Thursday 5pm Mathews B | LECTURE Friday 1pm CLB 8 | ONLINE TUTORIALS | PRACTICAL Thursday 10am or 2pm Wallace Wurth 122/123 |
|------|-------------|---|--|--|--|--|
| 1 | 3 June | Introduction NWG | Carbohydrates VS | Glycolysis VS | Online Safety Quiz Biochemical Calculations Videos | Biochemical Calculations |
| 2 | 10 June | PUBLIC HOLIDAY | Regulation VS | TCA Cycle VS | Biochemical Calculations Revision | Practical 1: Spectrophotometry |
| 3 | 17 June | Science Communication and Experiment Design NWG | Amino Acids AG | Proteins AG | Lecture Review 1 | BIOCHEMICAL CALCULATIONS QUIZ |
| 4 | 24 June | Enzymes AG | Enzyme Kinetics AG | Oxidative Phosphorylation (1) NWG | Lecture Review 2 | Practical 2: Glycolysis Trial Exam |
| 5 | 1 July | Oxidative Phosphorylation (2) NWG | Oxidative Phosphorylation (3) NWG | Glycogen Metabolism NWG | Lecture Review 3 | Practical 3: Glucose Tolerance Practical 4: Oxygen Electrode Simulation (Online) |
| 6 | 8 July | Gluconeogenesis NWG | Protein Catabolism RLB | The Urea Cycle RLB | Lecture review 4 | TEST 1 |
| 7 | 15 July | Introduction to Fats NWG | Lipoproteins NWG | Fat oxidation NWG | Lecture review 5 | GROUP PROJECT DRAFT PROTOCOL Experimental Design Feedback |
| 8 | 22 July | Fat synthesis and Ketone bodies NWG | Hormonal Control of Metabolism RLB | Fuel Supply in Exercise RLB | Lecture review 6 | Practical 5: Separation Technique - TLC |
| 9 | 29 July | Metabolic Specialisation of Tissues KLH | Fuel Supply in Fasting KLH | OPTIONAL REVISION | Lecture Review 7 | GROUP PROJECT FINAL PROTOCOL AND PRESENTATION |
| 10 | 5 Aug | | | | | TEST 2 |

NWG - Nirmani Wijenayake; **AG** – Anne Galea; **VS** - Vladimir Sytnyk; **RLB** – Rebecca LeBard; **KLH** – Kyle Hoehn

5. Assessment Tasks and Feedback

| Task | Knowledge & abilities assessed | % of total mark | Date of Assessment Task | Feedback | | |
|--------------------------------------|---|-----------------|--|------------------------------|--------------------|--|
| | | | | WHO | WHEN | HOW |
| Biochemical Calculations Quiz | Ability to perform biochemical calculations | 20 | Week 3, Thursday 20 th of June - during the lab | Tutor | Week 4 | During the lab |
| Test 1* | Theory presented in all of AG and VS lectures and NWG's OX-PHOS lectures. | 25 | Week 6, Thursday 11 th of July – during the lab | Course Coordinator | Week 7 | Through Moodle |
| Group Project | Experimental design and understanding the relevance of biochemistry in real life through case studies. The project is divided into four assessable components: <ul style="list-style-type: none"> • Reflection Diary (5%) • Draft protocol (7%) • Final Protocol (8%) • Presentation (10%) | 30 | Week 9 – Thursday 1 st of August - during the lab | Tutor and Course Coordinator | Week 9 and Week 11 | Written and verbal feedback + Through Moodle |
| Test 2* | Theory presented in all the lectures after NWG's OX-PHOS lectures. | 25 | Week 10, Thursday 8 th of August – during the lab | Course Coordinator | Study Break | Through Moodle |
| TOTAL: | - | 100 | - | - | - | - |

* Please note that the format of the two Tests will be a combination of multiple choice, short answer and long response questions. Further details of each assessment task will be released on Moodle prior to each test.

6. Course Topics and Additional Class Information

| | |
|--|---|
| <p>Expectations from Students</p> | <p>GENERAL:</p> <ul style="list-style-type: none"> • Check Moodle announcements daily. • Follow the Moodle timetable • Must allocate 1-2 hours for extra online + group activities each week <p>PRACTICALS: A pass in BIOC2181 is conditional upon a satisfactory performance in the practical program.</p> <ul style="list-style-type: none"> • This means 100% lab ATTENDANCE is required. • A medical certificate or other forms of evidence is required from students who are absent from the practical sessions due to illness or other misadventure. • Medical certificates are to be submitted via email to the course coordinator within three days of the absence. • See practical program section on next page for more details. <p>LECTURES:</p> <ul style="list-style-type: none"> • Attend ALL lectures and try to take comprehensive lecture notes. • DO NOT rely solely on online lecture recordings, lecture hand-outs, lecture notes from other students and text-books. <p>ONLINE TUTORIALS:</p> <ul style="list-style-type: none"> • Online tutorials must be completed in your own time. • Read specific instructions on Moodle to find out the due dates for these tutorials. |
| <p>Major Topics</p> | <ul style="list-style-type: none"> • Amino acids, protein structure, enzymes and enzyme kinetics (Lecturer: Dr Anne Galea) • Carbohydrates, glycolysis and the TCA cycle (Lecturer: Dr Vladimir Sytnyk) • Oxidative phosphorylation (ATP generation) (Lecturer: Dr Nirmani Wijenayake) • Glycogen metabolism and gluconeogenesis (Lecturer: Dr Nirmani Wijenayake) • Fats: digestion, transport, breakdown & synthesis (Lecturer: Dr Nirmani Wijenayake) • Protein catabolism and the urea cycle (Lecturer: Dr Rebecca LeBard) • Integration of metabolic pathways, hormones and whole-body metabolism (Lecturers: Dr Kyle Hoehn and Dr Rebecca LeBard) |
| <p>Lecture Reviews</p> | <ul style="list-style-type: none"> • 7 online lecture reviews are scheduled to revise previous lecture topics. • These provide you with the opportunity to revise course content and reflect upon your own level of comprehension of the material presented in lectures and integrated with laboratory classes. • Work on these reviews independently in your own time. • The reviews will provide you with specific feedback based on your answers. |
| <p>Tests</p> | <ul style="list-style-type: none"> • 2 tests held during the term. • Each test is worth 25%. • The lecture content covered in each test will not be reassessed again. <p>NOTE: Students who experience any difficulty in writing English for academic purposes such as reports, exam short answer or written questions, or problems comprehending multiple choice questions should consult an advisor at “The Learning Centre” located in the foyer of the main library entrance to obtain relevant information or up to one hour a week of private consultation with a peer writing assistant.</p> |

| | |
|--|---|
| <p>Practical Program</p> | <p>As mentioned before, a pass in BIOC2181 is conditional upon a satisfactory performance in the practical program.</p> <p>A satisfactory performance means that:</p> <ol style="list-style-type: none"> 1. You have completed and achieved a mark of 100% in the online Laboratory H&S Quiz PRIOR to your first lab in Week 1 2. You have completed all pre-lab quizzes and achieved a mark of 100% PRIOR to each lab. You will be allowed multiple attempts for each quiz until you achieve a mark of 100%. 3. You have attended ALL the practical classes. 4. Completion of post-lab discussion questions. Your Demonstrator will check and assess your work as being either 'Satisfactory' or 'Unsatisfactory'. If an 'Unsatisfactory' mark is awarded, it will be your responsibility to find out why and you will be given an opportunity to rectify any problems. 5. You have tidied and cleaned your equipment and workspace as instructed by the demonstrators and technical staff each week. 6. You have contributed equally to the group project and met the deadlines set by the course coordinator and the group. |
| <p>Relationship to Other Courses within the Program</p> | <p>This course essentially covers the same material as BIOC2101 Principles of Biochemistry (Advanced), but in less detail and with more emphasis on the function of organisms and less emphasis on some of the underlying chemical mechanisms.</p> <p>As an alternative to BIOC2101, BIOC2181 Fundamentals of Biochemistry provides a comprehensive introduction to biochemistry for students who do not intend to proceed to Level III Biochemistry. It does not fulfill the prerequisite requirements for Level III Biochemistry, but the Head of School may give approval for students with a grade of credit to enroll in Level III courses.</p> |

7. Additional Resources and Support

| | |
|---|--|
| Text Books | <p>Recommended Texts:</p> <ul style="list-style-type: none"> • <i>Biochemistry - A Short Course</i> (4th edition), by Tymoczko J.L., Berg J.M. & Stryer L. (W H Freeman and Company), 2019. <p>OR</p> <ul style="list-style-type: none"> • <i>Biochemistry and Molecular Biology</i> (6th Edition), by Elliot W.H. & Elliot D.C. (Oxford University Press), 2018. <p>Additional Biochemistry Reference Texts:</p> <ul style="list-style-type: none"> • <i>Essential Biochemistry</i>, by Pratt, C.W. & Cornely, K. • <i>Concepts in Biochemistry</i> by Boyer, R. • <i>Biochemistry</i> by Berg J.M., Tymoczko J.L. & Stryer L. • <i>Fundamentals of Biochemistry</i> Voet, Voet and Pratt. |
| Lab Manual | <p>The BIOC2181 lab manual will be available on LabArchives, the electronic lab notebook, that will be used in this course. You can also download the lab manual as a PDF through Moodle. You are NOT REQUIRED to print nor buy a copy of the manual.</p> |
| Required and Additional Readings | <p>Details of recommended readings and reference materials will be provided by individual lecturers during lectures and online via Moodle.</p> |
| Recommended Internet Sites | <p>Details of recommended internet sites will be provided by individual lecturers during lectures and online via Moodle.</p> |
| Societies | <p>ASBMB – Australian Society for Biochemistry and Molecular Biology www.asbmb.org.au</p> |

8. Required Equipment, Training and Enabling Skills

| | |
|--|--|
| Equipment Required | <p>Practical Requirements: laboratory coat, closed shoes (no thongs, sandals, or open-toed shoes), and safety glasses.</p> |
| Enabling Skills Training Required to Complete this Course | <p>ELISE, Online OHS Quiz conducted via Moodle in Week 1 of Session.</p> |

9. Administration Matters

| | |
|--|--|
| <p>Assessment Procedures</p> | <p>Missed Practical Classes:</p> <p>If you miss a practical class due to illness or some other unavoidable circumstance that can be verified via professional documentation, email your course coordinator within three days of the absence. Separate “Catch-Up” labs/skill sessions are not conducted but if you are able to attend an alternative lab during the week of your absence, you may contact the course coordinator to ask for permission to do so. If you cannot attend an alternative lab/skill session, then you will need to catch up on missed work by speaking to your demonstrator/tutor or class colleagues.</p> <p>Missed Tests:</p> <p>If you miss a test due to illness or some other unavoidable circumstance that can be verified via professional documentation, <u>you must apply for special consideration</u> according to the UNSW Special Consideration and Further Assessment Policy. The applications for special consideration will be processed at the end of the semester and students will be invited to sit a supplementary exam on the supplementary exam date (see next page).</p> <p>Group Project:</p> <p>As the group project is an ongoing assessment, no extensions will be granted for the different components. Any issues you may have should be discussed with your course coordinator as they arise.</p> |
| <p>UNSW Assessment Policy¹</p> | <p>Students who believe that their performance, either during the session or in the end of session exams, may have been affected by illness or other circumstances may apply for special consideration. Applications can be made for compulsory class absences such as (laboratories and tutorials), in-session assessments tasks, and final examinations.</p> <p>You must submit the application prior to the start of the relevant exam, or before a piece of assessment is due, except where illness or misadventure prevent you from doing so. If you become unwell on the day of the exam or fall sick during an exam, you must provide evidence dated within 24 hours of the exam, with your application. You must obtain and attach Third Party documentation before submitting the application. Failure to do so may result in the application being rejected.</p> <p>UNSW has a fit to sit/submit rule which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so.</p> <p>Further information on special consideration can be found at https://student.unsw.edu.au/specialconsideration.</p> <p>HOW TO APPLY FOR SPECIAL CONSIDERATION</p> <p>The application must be made through Online Services in <u>myUNSW</u> (My Student Profile tab > My Student Services > Online Services > Special Consideration).</p> <p>Students will be contacted via <i>their official university email</i> as to the outcome of their application. It is the responsibility of all students to regularly consult their official student email accounts and myUNSW in order to ascertain whether or not they have been granted further assessment.</p> |

¹ [UNSW Assessment Policy](#)

| UNSW Assessment Policy (continued) | <p>SUPPLEMENTARY EXAMINATIONS: The University does not give deferred examinations. However, further assessment exams may be given to those students who were absent from the mid-session or final exams through illness or misadventure. Special Consideration applications for these tests will only be considered after the final examination period when lists of students sitting supplementary exams/tests for each course are determined at School Assessment Review Group Meetings. Students will be notified via the online special consideration system as to the outcome of their application. It is the responsibility of all students to regularly consult their official student email accounts and myUNSW to ascertain whether they have been granted further assessment.</p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Supplementary Exams Period for Term 2 - 2019: 9 September – 13 September</p> </div> <p>Further assessment exams will be offered on one of these days ONLY and failure to sit for the appropriate exam may result in an overall failure for the course. Further assessment will NOT be offered on any alternative dates.</p> | | | | | | | | |
|---|---|----------------|--|---|-----------------|---|--|--------------------|---|
| Equity and Diversity | <p>Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course Convenor prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or http://www.studentequity.unsw.edu.au/).</p> <p>Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.</p> | | | | | | | | |
| Student Complaint Procedure² | <table border="1" style="width: 100%;"> <thead> <tr> <th style="background-color: #cccccc;">School Contact</th> </tr> </thead> <tbody> <tr> <td> John Wilson Grievance Officer School of Biotechnology and Biomolecular Sciences j.e.wilson@unsw.edu.au Tel: 9385 1748 </td> </tr> </tbody> </table> | School Contact | John Wilson Grievance Officer School of Biotechnology and Biomolecular Sciences j.e.wilson@unsw.edu.au Tel: 9385 1748 | <table border="1" style="width: 100%;"> <thead> <tr> <th style="background-color: #cccccc;">Faculty Contact</th> </tr> </thead> <tbody> <tr> <td> Dr Gavin Edwards Associate Dean (Academic Programs) g.edwards@unsw.edu.au Tel: 9385 4652 </td> </tr> </tbody> </table> | Faculty Contact | Dr Gavin Edwards Associate Dean (Academic Programs) g.edwards@unsw.edu.au Tel: 9385 4652 | <table border="1" style="width: 100%;"> <thead> <tr> <th style="background-color: #cccccc;">University Contact</th> </tr> </thead> <tbody> <tr> <td> Student Conduct and Appeals Officer (SCAO) within the Office of the Pro-Vice-Chancellor (Students) and Registrar. Tel: 02 9385 8515, email: studentcomplaints@unsw.edu.au University Counselling and Psychological Services³ Tel: 9385 5418 </td> </tr> </tbody> </table> | University Contact | Student Conduct and Appeals Officer (SCAO) within the Office of the Pro-Vice-Chancellor (Students) and Registrar. Tel: 02 9385 8515, email: studentcomplaints@unsw.edu.au University Counselling and Psychological Services³ Tel: 9385 5418 |
| School Contact | | | | | | | | | |
| John Wilson Grievance Officer School of Biotechnology and Biomolecular Sciences j.e.wilson@unsw.edu.au Tel: 9385 1748 | | | | | | | | | |
| Faculty Contact | | | | | | | | | |
| Dr Gavin Edwards Associate Dean (Academic Programs) g.edwards@unsw.edu.au Tel: 9385 4652 | | | | | | | | | |
| University Contact | | | | | | | | | |
| Student Conduct and Appeals Officer (SCAO) within the Office of the Pro-Vice-Chancellor (Students) and Registrar. Tel: 02 9385 8515, email: studentcomplaints@unsw.edu.au University Counselling and Psychological Services³ Tel: 9385 5418 | | | | | | | | | |

² [UNSW Student Complaint Procedure](#)

³ [University Counselling and Psychological Services](#)

10. UNSW Academic Honesty and Plagiarism

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.

*Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†
- resubmitting work you already submitted for another course at UNSW or another institute.

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

<http://www.lc.unsw.edu.au/academic-integrity-plagiarism>

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne

ACADEMIC MISCONDUCT

Information concerning the University Regulations concerning Academic Misconduct can be found on the UNSW website:

<https://my.unsw.edu.au/student/academiclife/assessment/AcademicMisconduct.html> .

It is essential that all students read this information.

Academic Misconduct may apply to any work or document related to assessment that is submitted to the School; this includes the laboratory work you document/discuss within this manual, the three mid-session tests and the final examinations in June.

All work submitted for assessment must represent a student's own individual efforts. Copying or paraphrasing another person's work and using another student's experimental results are all examples of academic misconduct (see Academic Honesty and Plagiarism).