

BIOL2011: Fundamentals of Biology and Biochemistry

Ourimbah

Semester 1 - 2024



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description	The diversity of important biological molecules and how their structures relate to their function in relation to living systems is demonstrated. Smaller biomolecules such as amino acids, nucleotides and sugars that were studied in first year chemistry (CHEM1120) are known to have important biological functions of their own, and are also utilised as building blocks for biopolymers such as proteins, nucleic acids and polysaccharides. The metabolic processes that occur in cells to synthesise and degrade these biomolecules and to provide energy for the cell will be presented with a view to showing how biological structures, biochemical reactions and pathways are connected and controlled in living systems. Students will gain competency in laboratory skills.
Academic Progress Requirements	Nil
Requisites	This course has similarities to BIOL2010. If you have successfully completed BIOL2010 you cannot enrol in this course.
Assumed Knowledge	CHEM1110, CHEM1120, HUBS1401 and HUBS1416.
Contact Hours	Ourimbah Laboratory * Face to Face On Campus 3 hour(s) per week(s) for 13 week(s) starting Week 1 Seminars will be incorporated into laboratory sessions. Lecture Face to Face On Campus 2 hour(s) per week(s) for 13 week(s) starting Week 1 Tutorial Face to Face On Campus 1 hour(s) per week(s) for 13 week(s) starting Week 1 * This contact type has a compulsory requirement.
Unit Weighting	10
Workload	Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

www.newcastle.edu.au

CRICOS Provider 00109J

CONTACTS

Course Coordinator	Ourimbah Prof Christopher Scarlett C.Scarlett@newcastle.edu.au (02) 4348 4680 Consultation: By appointment.
Teaching Staff	Other teaching staff will be advised on the course Canvas site.
School Office	School of Environmental and Life Sciences SO-104 Science Offices OURIMBAH CESE-SELS@newcastle.edu.au (02) 4349 4568 / 4348 4115 9am-5pm (Mon-Fri)

SYLLABUS

Course Content	<ol style="list-style-type: none">1. Animal and plant cell structure and function: Cellular processes, Enzyme regulation and kinetics, Vitamins and Coenzymes2. Biomolecules: Sugars and polysaccharides, Amino acids and proteins, Nucleotides and nucleic acids, Fatty acids and complex lipids.3. Metabolism I: Intermediary metabolism, Glycolysis, The pentose phosphate pathway, Glycogenolysis.4. Metabolism II: Gluconeogenesis, Glycogenesis and biosynthesis of disaccharides and polysaccharides, The Krebs Citric Acid Cycle or TCA Cycle, Electron transport and oxidative phosphorylation, Lipid metabolism
Course Learning Outcomes	<p>On successful completion of this course, students will be able to:</p> <ol style="list-style-type: none">1. Explain and describe the cellular structure and function of animal and plant cells;2. Correlate practical activities conducted in the laboratory to key biochemistry concepts;3. Competently operate laboratory equipment, follow protocols and solve practical problems relevant to biochemistry experiments;4. Characterise the diversity of biomolecules, and describe their metabolic and structural roles in cellular function;5. Delineate the sources of energy for cells, and describe how cells utilise this chemical energy for growth and maintenance;6. Define how chemical reactions are mediated, integrated and regulated in the cell;7. Communicate the results of both theoretical and experimental work in written, oral and report formats.
Course Materials	<p>Other Resources:</p> <ul style="list-style-type: none">• Online Resource - Food Biochemistry and Food Processing. Hui, Y.H. (ed) 2006 (Wiley). Links will be made available on Canvas. Canvas site - Students enrolled in the course can login https://canvas.newcastle.edu.au to access the Canvas site used to support this course. You need to visit the Canvas site on a regular basis.

Recommended Reading:

- J.L. Tymoczko, J.M. Berg, L. Stryer. Biochemistry: A Short Course, 1st Ed. (2010) W.H. Freeman and Co.

Recommended Text:

- McKee & McKee, Biochemistry: The Molecular Basis Of Life 6th or 7th Edition, Oxford University Press
- Alternative Text Book - McKee & McKee, Biochemistry: The Molecular Basis Of Life 4th or 5th Edition, Oxford University Press

COMPULSORY REQUIREMENTS

In order to pass this course, each student must complete ALL of the following compulsory requirements:

- Laboratory Induction Requirement - Students must attend and pass the induction requirements before attending these sessions. In order to participate in this course students must complete a compulsory Safety and Risk Assessment induction. These will generally occur in the first week of each course or prior to a placement or field trip. Students will be advised of RA and H & S requirements by the Course Coordinator at the beginning of the semester.
- This course has an essential criterion. As well as an overall passing grade (50%) students must meet the established minimum requirements relating to attendance at laboratories and the submission of laboratory reports.
- Laboratory Reports: This course has a high emphasis on laboratory competency. Students undertaking the course are required to demonstrate practical and theoretical competency in the laboratory by **participating in a minimum of 80% of the scheduled laboratory sessions** and obtaining an overall grade of at least 50% in the laboratory component of the course. A final mark will be determined in the course based on all assessment items and it will be recorded whether the student has satisfied the essential criterion. Students who fail to satisfy the essential criterion (regardless of their final mark) will automatically have a failure recorded against their name.

SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	26 Feb	Module 1 - Cell structure and function Lecture 1: Course outline Lecture 2: Introduction to cell structure and function	Lab Safety Induction *Mandatory No tutorial	Lab Induction Monday 26/2/2024
2	4 Mar	Lecture 3: Cell membranes Lecture 4: Enzymes (activity & enzyme kinetics)	LAB 1: Introduction to practical microscopy & Cellular organisation Tutorial 1	
3	11 Mar	Lecture 5: Enzyme regulation Lecture 6: Vitamins (classification, biological roles)	LAB 2: Spectrophotometry for the qualitative and quantitative measurement of biochemical compounds Tutorial 2	
4	18 Mar	Module 2 - Biomolecules Lecture 7: Carbohydrates (monosaccharides) Lecture 8: Carbohydrates (polysaccharides)	LAB 3: Determination of purity and the hydrolysis of a bovine liver glycogen preparation Tutorial 3	
5	25 Mar	Lecture 9: Amino acids (structures and properties) Lecture 10: Proteins	LAB 4: Experiments on Protein	Lab report 1: Spectrophotometry for the qualitative and

		(primary, secondary, tertiary, quaternary structure)	Tutorial 4	quantitative measurement of biochemical compounds. Due 5pm Monday 25/03/24
6	1 Apr**	Lecture 11: Lipids Lecture 12: Nucleotides & nucleic acids	No lab or tutorial (Easter Monday)	
7	8 Apr	Module 3 - Metabolism I Lectures 13/14: Introduction to intermediary metabolism	LAB 5: Enzyme Kinetics & inhibition Tutorial 5	Tutorial Exercise: Assignment 1 Due 5pm Monday 08/04/24
Mid-Semester Recess				
Mid-Semester Recess				
8	29 Apr	Anaerobic carbohydrate metabolism Lecture 15: Glycolysis Lecture 16: Pentose phosphate pathway	LAB 6: Transaminase Reactions (Day 1) Tutorial 6	Lab report 2: Enzyme Kinetics & inhibition. Due 5pm Monday 29/04/24
9	6 May	Lecture 17: Utilisation of galactose Lecture 18: Glycogenolysis	LAB 6: Transaminase Reactions (Day 2) Tutorial 7	
10	13 May	Module 4 - Metabolism II Lecture 19: Gluconeogenesis Lecture 20: Biosynthesis of disaccharides & polysaccharides (glycogenesis)	Student Presentations Tutorial 8	Student Presentations. Due 1pm Monday 13/05/2024 - Room to be confirmed
11	20 May	Aerobic carbohydrate metabolism Lecture 21: Citric acid cycle Lecture 22: Electron transport chain	Student Presentations Tutorial 9	Lab report 3: Transaminase Reactions. Due 5pm Monday 20/05/24 Student presentations continued Room to be confirmed
12	27 May	Lipid metabolism Lecture 23: Lipolysis (B-oxidation of fatty acids) Lecture 24: Biosynthesis (long chain fatty acids & triacylglycerols)	Student Presentations (if required) Tutorial 10	Student presentations continued (if required) Room to be confirmed Tutorial Exercise: Assignment 2 Due 5pm Friday 31/05/24
13	3 Jun	No lectures	No tutorial	
Examination Period				
Examination Period				

**Note: Week 6 lectures will be recordings due to Easter Monday Public Holiday. No tutorial or lab session in Week 6.

ASSESSMENTS

This course has 4 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Tutorial Exercises - assignments 1 and 2	Week 7 - Due 5pm Monday 08/04/24 (Assignment 1 (5%) - Modules 1 & 2) Week 12 - Due 5pm Friday 31/05/24 (Assignment 2 (5%) - Modules 3 & 4)	Individual	10%	1, 4, 5, 6
2	Formal examination	Formal Exam Period	Individual	35%	1, 4, 5, 6
3	Laboratory Experiments and reports	2 weeks after completion of the laboratory Week 5 (Lab report 1 - 15%); Week 8 (Lab report 2 - 15%); and Week 11 (Lab report 3 - 15%)	Individual	45%	2, 3, 6, 7
4	Presentation, Individual (Oral)	Weeks 10-12	Individual	10%	1, 4, 5, 6, 7

Late Submissions

The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Tutorial Exercises - assignments 1 and 2

Assessment Type	Tutorial / Laboratory Exercises
Purpose	The purpose and benefit of the tutorial assignments is to provide the students with feedback on student learning.
Description	Tutorial Assignment on Modules 1 & 2 (5%) and Modules 3 & 4 (5%)
Weighting	10%
Due Date	Week 7 - Due 5pm Monday 08/04/24 (Assignment 1 (5%) - Modules 1 & 2) Week 12 - Due 5pm Friday 31/05/24 (Assignment 2 (5%) - Modules 3 & 4)
Submission Method	Online
Assessment Criteria	Online submission to Turnitin via the BIOL2011 Canvas site. These assignments assess the individual student's knowledge of the course material and highlights potential areas of concern, which may stimulate discussion with tutors and lecturers. Assessment criteria will be made available on Canvas.
Return Method	Online
Feedback Provided	Returned Work - .
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 2 - Formal examination

Assessment Type	Formal Examination
Description	The final formal examination is designed to test the individual student's knowledge of the course material and their ability to describe, analyse and hypothesise from this material.
Weighting	35%
Due Date	Formal Exam Period
Submission Method	Formal Exam
Assessment Criteria	Marks will be awarded according to the exam script, with each question clearly specifying the expectation of the response.
Return Method	Not Returned
Feedback Provided	No Feedback
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 3 - Laboratory Experiments and reports

Assessment Type	Report
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Purpose	The purpose of group laboratory activity is to enable peer-to-peer learning; develop oral communication skills and the ability to record data, synthesise an opinion and convey this clearly in a well-presented scientific and articulate manner.
Description	Full lab reports for three (3) laboratory practicals will be prepared. Students will be advised of labs to be reported on. Weighting is 45% (3 x laboratory practical reports worth 15% each)
Weighting	45%
Due Date	2 weeks after completion of the laboratory Week 5 (Lab report 1 - 15%); Week 8 (Lab report 2 - 15%); and Week 11 (Lab report 3 - 15%)
Submission Method	Online Online submission to Turnitin via the BIOL2011 Canvas site.
Assessment Criteria	Lab reports meet the course objectives of knowledge acquisition and demonstrated assimilation of data, upon reflection and analysis, to produce articulate and concise reports, which convey evidence-based understanding of the concepts and topics. Assessment criteria and marking rubric will be made available on Canvas.
Return Method	Online
Feedback Provided	Returned Work
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 4 - Presentation, Individual (Oral)

Assessment Type	Presentation
Purpose	The purpose of an oral presentation assessment is to provide the students with an opportunity to research a topic of interest, relevant to the course, and present this in an articulate, concise and well researched manner.
Description	Students will be advised of topics related to the course.
Weighting	10%
Due Date	Weeks 10-12
Submission Method	In Class
Assessment Criteria	The student's understanding of concepts and topics and presenting this in an articulate, concise and well researched manner. Assessment criteria and marking rubric will be made available on Canvas.
Return Method	Not Returned
Feedback Provided	In Class - General feedback will provide directly after the presentation in class.
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail	Failure to satisfactorily achieve learning outcomes. If all

	(FF)	compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.
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Attendance

*Skills are those identified for the purposes of assessment task(s).
Attendance/participation will be recorded in the following components:

- Laboratory (Method of recording: By signing your attendance)

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.
- Face to Face: Communication will be provided via face to face meetings or supervision.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to <https://policies.newcastle.edu.au/document/view-current.php?id=35>.

Adverse Circumstances

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course coordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at <https://policies.newcastle.edu.au/document/view-current.php?id=236>

Important Policy Information

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at <https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.

Other Information

Laboratory Safety, Risk Assessment and Health & Safety Requirements

The issue of safety for staff and students is taken very seriously by the University. Students studying courses requiring completion of a Risk Assessment Safety Induction or other Health & Safety requirement MUST complete all safety components.

These will generally occur at the beginning of the semester. Students will be advised of Risk Assessment and Health & Safety requirements by the Course Coordinator at the beginning of the semester.

- Induction sessions generally occur in the first week of each course. Students should contact their Course Coordinator to find out more about sessions relevant to this course.
- Admittance to the labs will only be allowed to students who have attended the safety inductions and completed the safety questionnaires.
- Safety and Risk Assessment documents will be available on Canvas throughout the semester.
- Before proceeding with laboratory activities students will be required to confirm that they have read and understood the Safety issues associated with the course and specific laboratory sessions in particular.

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

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