COURSE OUTLINE

MLS211 Medical Biochemistry

School: School of Health - Biomedicine

2024 | Semester 2

UniSC Sunshine Coast
UniSC Moreton Bay

BLENDED LEARNING

Most of your course is on campus but you may be able to do some components of this course online.

Please go to usc.edu.au for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?

1.1. Description

Medical biochemistry is the area of general pathology that performs analyses on human specimens such as blood plasma and serum, urine, cerebrospinal fluid, serous fluids and tissue biopsies. The course describes common biochemical tests used in the diagnosis and treatment of human diseases. On completion of this course, you will be able to demonstrate and evaluate current knowledge in the basic principles and practices of the medical biochemistry laboratory, including disorders of amino acid and carbohydrate metabolism, dyslipidaemias, and routine chemistries for major organ system functions.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – Online Learning Modules (1-hour each week, commencing in week 1)	1hr	Week 1	13 times
Laboratory 1 – Practicals (3-hours each fortnight, commencing in week 1)	3hrs	Week 1	10 times
Tutorial/Workshop 1 – Zoom eWorkshops (1-hour each fortnight, commencing in week 1)	1hr	Week 1	7 times
Tutorial/Workshop 2 – Tutorials (2-hours each fortnight, commencing in week 2)	2hrs	Week 2	6 times

1.3. Course Topics

- Introduction to medical biochemistry and human specimen collection and handling.
- Principles and practices in medical biochemistry.
- Metabolic Syndrome (Part A): Disorders of carbohydrate metabolism.
- Metabolic Syndrome (Part B): Biochemistry of the blood lipids and lipoproteins.
- Metabolic Syndrome (Part C): Blood serum lipid profiles and assessment of cardiovascular disease risk.
- Disorders of amino acid and protein metabolism.
- Enzymes of clinical significance.
- Assessment of renal, cardiac, gastrointestinal and liver function using biochemical diagnostic tests.
- Body water and electrolyte homeostasis.
- Blood gases and acid-base balance.
- The blood gas analyser.
- Diagnostic biochemical testing using spectrophotometry, enzyme immunoassays and electrophoresis.

2. What level is this course?

200 Level (Developing)

Building on and expanding the scope of introductory knowledge and skills, developing breadth or depth and applying knowledge and skills in a new context. May require pre-requisites where discipline specific introductory knowledge or skills is necessary. Normally, undertaken in the second or third full-time year of an undergraduate programs.

3. What is the unit value of this course?

12 units

4. How does this course contribute to my learning?

COURSE LEARNING OUTCOMES On successful completion of this course, you should be able to...		GRADUATE QUALITIES Completing these tasks successfully will contribute to you becoming...
1	Critically analyse and evaluate concepts in medical biochemistry that are relevant to the pathology services industry.	Creative and critical thinker
2	Capably and confidently demonstrate skills and competencies in medical biochemistry.	Empowered
3	Communicate scientifically in the form of individual reports.	Empowered
4	Demonstrate current knowledge of the medical biochemistry discipline of laboratory medicine.	Knowledgeable

5. Am I eligible to enrol in this course?

Refer to the UniSC Glossary of terms for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1. Pre-requisites

LFS251

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

Not applicable

5.4. Specific assumed prior knowledge and skills (where applicable)

It is recommended that students have prior knowledge and skills in chemistry, biochemistry and human physiology.

6. How am I going to be assessed?

6.1. Grading Scale

Standard Grading (GRD)

High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL).

6.2. Details of early feedback on progress

In Week 3, you will be submitting the Basic Laboratory Competencies Report (Task 1a) worth 10% of your final course grade. During Practical 1 (Week 1) and Practical 2 (Week 2), you will complete a set of laboratory competencies commonly used in biochemistry. You will be expected to attempt a set of exercises, including laboratory maths, for the Task 1a Report based on the work you complete during Practicals 1 and 2. The report will be submitted online via Turnitin on Canvas. The feedback provided by your course coordinator on your Task 1a Report will give you confidence in undertaking the remaining practical classes in the MLS211 course.

6.3. Assessment tasks

DELIVERY MODE	TASK NO.	ASSESSMENT PRODUCT	INDIVIDUAL OR GROUP	WEIGHTING %	WHAT IS THE DURATION / LENGTH?	WHEN SHOULD I SUBMIT?	WHERE SHOULD I SUBMIT IT?
All	1	Practical / Laboratory Skills, and Written Piece	Individual or Group	40%	Completion of laboratory exercises throughout the semester in the form of three short practical reports submitted online via Turnitin on Canvas and a practical problem set completed in-class. Approximately 2500 words in total.	Throughout teaching period (refer to Format)	Online Assignment Submission with plagiarism check
All	2	Quiz/zes	Individual	20%	1-hour duration	Week 6	Online Submission
All	3	Examination - Centrally Scheduled	Individual	40%	2-hour duration	Exam Period	Exam Venue

All - Assessment Task 1: Competency-Based Practical Portfolio (40%)

GOAL:	In this assessment task, you will demonstrate your developing skills and competencies in practical medical biochemistry and analyse and evaluate your practical knowledge achieved by communicating in the format of short practical reports and a practical problem set completed in-class.
PRODUCT:	Practical / Laboratory Skills, and Written Piece
FORMAT:	The competency-based practical portfolio will include: Task 1a. Basic Laboratory Competencies Report (10%; due Week 3). Task 1b. Glucose Tolerance and Blood Serum Lipid Profile Report (10%; due Week 6). Task 1c. Cardiac and Liver Diagnostics Report (10%; due Week 9). Task 1d. Practical Problem Set (10%; completed in-class during Week 12). Refer to the Assessment Information module in the MLS211 Canvas Dashboard for specific details on task description, format and submission instructions. You may submit your practical reports individually or as a pair with another student. The practical problem set will be completed individually in-class.
CRITERIA:	**No.** / **Learning Outcome assessed** 1 — Adhere to the correct format and presentation (e.g. structure, spelling, grammar, referencing, written expression) for a short practical report. — 3 2 — Interpret the individual and class findings obtained during the course practical classes. — 1 3 — Relate the practical findings to peer-reviewed articles and professional internet sites in the medical biochemistry literature. — 2 4
GENERIC SKILLS:	Communication, Problem solving, Organisation, Applying technologies, Information literacy

All - Assessment Task 2: Review Quiz (20%)

GOAL:	In this assessment task, you will be able to demonstrate, apply and evaluate your theoretical and practical knowledge of human specimen collection and handling required for biochemistry analysis; principles and practices in medical biochemistry; Metabolic Syndrome; disorders of carbohydrate metabolism; biochemistry of blood lipids and lipoproteins; assessing cardiovascular disease risk using blood serum lipid profiles; and associated analytical techniques in medical biochemistry.
PRODUCT:	Quiz/zes
FORMAT:	The review quiz will consist of multiple-choice, short answer and problem solving questions, and will be based on the course material covered in the online learning modules, Zoom eWorkshops, tutorials and practicals held during weeks 1 to 5 of semester. The review quiz will be closed book and invigilated during your scheduled practical class in Week 6 of semester.
CRITERIA:	

No.		**Learning Outcome assessed**
1	Demonstrate and apply knowledge of the principles and concepts of medical biochemistry.	1 4
2	Analyse information and explain important elements of the theories which underpin the concepts in medical biochemistry covered during the course.	1 4
3	Use evidence-based reasoning from your knowledge and understanding of medical biochemistry to provide correct answers to the multiple-choice, short answer and problem solving questions.	1

GENERIC SKILLS:	Problem solving, Applying technologies, Information literacy

All - Assessment Task 3: End-of-Semester Exam (40%)

GOAL:	In this assessment task, you will be able to demonstrate, apply and evaluate your theoretical and practical knowledge of disorders of amino acid and protein metabolism; enzymes of clinical significance; assessment of renal, cardiac, gastrointestinal and liver function; body water and electrolyte homeostasis; blood gases, pH and acid-base balance; and associated analytical techniques in medical biochemistry.
PRODUCT:	Examination - Centrally Scheduled
FORMAT:	The exam will consist of multiple-choice, short answer and problem solving questions based on the course material covered in the online learning modules, Zoom eWorkshops, tutorials and practicals held during weeks 6 to 13 of the semester.
CRITERIA:	

No.		**Learning Outcome assessed**
1	Demonstrate and apply knowledge of the principles and concepts of medical biochemistry.	1 4
2	Analyse information and explain important elements of the theories which underpin the concepts in medical biochemistry covered during the course.	1 4
3	Use evidence-based reasoning from your knowledge and understanding of medical biochemistry to provide correct answers to the multiple-choice, short answer and problem solving questions.	1

GENERIC SKILLS:	Problem solving, Applying technologies, Information literacy

7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Student workload is calculated at 12.5 learning hours per one unit.

7.1. Schedule

PERIOD AND TOPIC	ACTIVITIES
Introduction to medical biochemistry and human specimen collection.	Overview of the MLS211 course, including teaching staff, online learning modules, tutorial and practical classes, prescribed textbook, useful websites, and assessment tasks. Human specimen collection and handling. Revising important concepts.
Principles and practices in medical biochemistry.	Introduction to the clinical biochemistry section of a pathology laboratory. Overview of instrumentation in medical biochemistry. The importance of standards and controls for laboratory analysis. Analytical performance parameters and decision limits. Reference ranges for diagnostic tests in clinical biochemistry. Quality assurance and quality control in the laboratory. Basic laboratory statistics in medical biochemistry.
Metabolic Syndrome (Part A): Disorders of carbohydrate metabolism.	Overview of metabolic syndrome. Biochemistry of carbohydrates. Diagnostic criteria for prediabetes and diabetes. Glucose tolerance tests. Other carbohydrate-related analytes. Clinical testing for blood glucose.
Metabolic Syndrome (Part B): Biochemistry of the blood lipids and lipoproteins.	Review of lipid biochemistry. Lipoprotein structure and function (chylomicrons, VLDLs, LDLs, HDLs and Lpa). Importance of apolipoproteins.
Metabolic Syndrome (Part C): Blood serum lipid profiles and assessment of cardiovascular disease risk.	Dyslipidaemias and atherosclerosis. Methodologies used to measure blood lipids and lipoproteins. Assessment of cardiovascular disease risk using blood serum lipid profiles.
Disorders of amino acid and protein metabolism.	Basic amino acid and protein chemistry. Aminoacidopathies. Total serum protein and albumin methodologies and clinical interpretations. Serum protein electrophoresis and clinical interpretations.
Enzymes of clinical significance.	Revision on enzyme biochemistry. Enzyme classification, kinetics, cofactors and isoenzymes. Measuring enzyme activity for clinical diagnosis.
Assessment of renal function.	Overview of kidney function and diseases. Nephrotic syndrome; acute and chronic renal failure. Renal replacement therapies. Biochemical tests for kidney function. Blood nonprotein nitrogen, urea, creatinine and uric acid. Biochemical measurements of renal clearance. Microalbuminuria.
Assessment of cardiac function.	Classification of cardiac diseases. Considerations for selecting cardiac biomarkers. Cardiac enzymes and isoenzymes. Cardiac protein biomarkers (troponins, myoglobin). Emerging cardiac biomarkers.
Assessment of liver function.	The liver and bilirubin metabolism. Common disorders of the liver. Jaundice (prehepatic, intrahepatic and posthepatic). Liver function tests. Testing hepatic enzymes in blood serum.

PERIOD AND TOPIC	ACTIVITIES
Assessment of gastrointestinal function.	Overview of the functions of the gastrointestinal tract. Gastrointestinal regulatory peptides. Laboratory assessment of disorders of the gastrointestinal tract. Zollinger-Ellison's Syndrome. Lactose intolerance. Bile salt malabsorption. Coeliac disease. Protein-losing enteropathy.
Body water and electrolyte homeostasis.	Total body water and body fluid composition. Major electrolytes. Anion gap. Osmolarity, osmolality and osmolal gap. Ion-selective electrodes for electrolyte analysis. Clinical importance of sodium potassium and chloride ions.
Blood gases, pH and buffer systems.	Blood gases and acid-base balance – role of lungs and kidneys. The blood bicarbonate buffering system. Metabolic acidosis and alkalosis. Respiratory acidosis and alkalosis. Blood gas analysers. Clinical interpretations of blood acid-base disorders using measurements of blood oxygen saturation, pH, PO2, PCO2 and bicarbonate.

8. What resources do I need to undertake this course?

Please note: Course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Canvas site– Please log in as soon as possible.

8.1. Prescribed text(s) or course reader

Please note that you need to have regular access to the resource(s) listed below. Resources may be required or recommended.

REQUIRED?	AUTHOR	YEAR	TITLE	EDITION	PUBLISHER
Required	Robert Sunheimer and Linda Graves	2018	Clinical Laboratory Chemistry	2nd edition	Pearson
Recommended	John W. Baynes and Marek H. Dominiczak	2018	Medical Biochemistry	Fifth edition	Elsevier

8.2. Specific requirements

You will be expected to purchase the MLS211 Course Manual from the My Print Shop at UniSC. You will require a laboratory coat, safety glasses and closed non-slip footwear for the course practical classes.

9. How are risks managed in this course?

Risk assessments have been performed for all laboratory classes and a moderate level of health and safety risk exists. Moderate risks are those associated with laboratory work such as working with chemicals and hazardous substances. You will be required to undertake laboratory induction training and it is also your responsibility to review course material, search online, discuss with lecturers and peers and understand the health and safety risks associated with your specific course of study and to familiarise yourself with the University's general health and safety principles by reviewing the online induction training for students, and following the instructions of the University staff

10. What administrative information is relevant to this course?

10.1. Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Canvas, are electronically checked through Turnitin. This software allows for text comparisons to be made between your submitted assessment item and all other work to which Turnitin has access.

10.2. Assessment: Additional Requirements

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

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

10.3. Assessment: Submission penalties

Late submission of assessment tasks may be penalised at the following maximum rate (the rates are cumulative):
- 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task.
- 10% (of the assessment task's identified value) for the third day
- 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.
- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task.

Weekdays and weekends are included in the calculation of days late.
To request an extension you must contact your course coordinator to negotiate an outcome.

10.4. SafeUniSC

UniSC is committed to a culture of respect and providing a safe and supportive environment for all members of our community. For immediate assistance on campus contact SafeUniSC by phone: 07 5430 1168 or using the SafeZone app. For general enquires contact the SafeUniSC team by phone 07 5456 3864 or email safe@usc.edu.au.

The SafeUniSC Specialist Service is a Student Wellbeing service that provides free and confidential support to students who may have experienced or observed behaviour that could cause fear, offence or trauma. To contact the service call 07 5430 1226 or email studentwellbeing@usc.edu.au.

10.5. Study help

For help with course-specific advice, for example what information to include in your assessment, you should first contact your tutor, then your course coordinator, if needed.

If you require additional assistance, the Learning Advisers are trained professionals who are ready to help you develop a wide range of academic skills. Visit the Learning Advisers web page for more information, or contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au.

10.6. Wellbeing Services

Student Wellbeing provide free and confidential counselling on a wide range of personal, academic, social and psychological matters, to foster positive mental health and wellbeing for your academic success.

To book a confidential appointment go to Student Hub, email studentwellbeing@usc.edu.au or call 07 5430 1226.

10.7. AccessAbility Services

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, learning disorder mental health issue, injury or illness, or you are a primary carer for someone with a disability or who is considered frail and aged, AccessAbility Services can provide access to appropriate reasonable adjustments and practical advice about the support and facilities available to you throughout the University.

To book a confidential appointment go to Student Hub, email AccessAbility@usc.edu.au or call 07 5430 2890.

10.8. Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Central Examinations
- Deferred Examinations
- Student Conduct
- Students with a Disability

For more information, visit https://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching

10.9. Student Charter

UniSC is committed to excellence in teaching, research and engagement in an environment that is inclusive, inspiring, safe and respectful. The Student Charter sets out what students can expect from the University, and what in turn is expected of students, to achieve these outcomes.

10.10. General Enquiries

In person:

- **UniSC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **UniSC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **UniSC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **UniSC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **UniSC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **UniSC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au