



## COURSE OUTLINE

# NUT232 Nutritional Biochemistry

**Course Coordinator:** Mark Holmes (mholmes@usc.edu.au) **School:** School of Health and Behavioural Sciences

2021 | Semester 2

USC Sunshine Coast

**ON CAMPUS**

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

*Please go to the USC website 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

Nutritional biochemistry introduces you to the structural and functional characteristics of macronutrients (carbohydrates, lipids, proteins) and micronutrients (vitamins) in food consumed by humans. You will learn about the biochemical mechanisms associated with the digestion and assimilation of macronutrients, and are introduced to analytical techniques in food biochemistry. In the context of human nutrition assessment, you will also explore the importance of biochemical testing in the diagnosis and management of common metabolic disorders such as diabetes mellitus and dyslipidaemias.

### 1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
<b>ON CAMPUS</b>			
<b>Tutorial/Workshop 1</b> – Tutorials (2-hours per week, commencing in week 1)	2hrs	Week 1	13 times
<b>Laboratory 1</b> – Practicals (3-hours each fortnight, commencing in week 1).	3hrs	Week 1	6 times
<b>Online</b> – Pre-recorded online lecture modules each week.	1hr	Week 1	13 times

### 1.3. Course Topics

- Food macronutrients
- Proteins, lipids and carbohydrates - structure, function, digestion, assimilation
- Fibre - structure, function, properties
- Disorders of carbohydrate, lipid and amino acid metabolism
- Water-soluble and fat-soluble vitamins
- Analytical techniques in nutritional biochemistry
- Evaluation of analytical data and scientific report writing skills
- Biochemical analysis of total serum protein and iron
- Analysis of vitamin C in fruits and vegetables by titration
- Analysis of food allergens using an immunoassay

## 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	GRADUATE QUALITIES
On successful completion of this course, you should be able to...	Completing these tasks successfully will contribute to you becoming...
1 Critically analyse and evaluate concepts in nutritional biochemistry that are important for an understanding of human nutrition.	Creative and critical thinker
2 Capably and confidently demonstrate laboratory skills and competencies in nutritional biochemistry.	Empowered
3 Communicate scientifically in the form of individual reports.	Empowered
4 Demonstrate current knowledge of nutritional biochemistry that is required for advanced studies in human nutrition.	Knowledgeable

## 5. Am I eligible to enrol in this course?

Refer to the [USC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.

### 5.1. Pre-requisites

MBT251 or LFS251

### 5.2. Co-requisites

Not applicable

### 5.3. Anti-requisites

BIM212 or BIM352 or BIM252

### 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 2, you will be submitting the Practical 1 Basic Laboratory Competencies Report (Task 1a) worth 7.5% of your final course grade. During Practical 1 in Week 1, you will complete a set of laboratory competencies commonly used in biochemistry. You will be expected to complete a set of exercises, including laboratory maths, for the Task 1a Report based on the work you complete during Practical 1. The report will be submitted online via Blackboard. The feedback provided by your course coordinator on your Task 1a Report will give you confidence in undertaking the remaining practical classes in the NUT232 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	Portfolio	Individual or Group	40%	Completion of laboratory exercises in short practical reports submitted throughout the semester. 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; 40 multiple-choice questions.	Week 7	Online Test (Quiz)
All	3	Examination - Centrally Scheduled	Individual	40%	2-hour duration; 80 multiple-choice questions	Exam Period	Exam Venue

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

<b>GOAL:</b>	In this assessment task, you will demonstrate your developing competencies in practical nutritional biochemistry and analyse and evaluate your laboratory competencies achieved by communicating in the format of practical reports.									
<b>PRODUCT:</b>	Portfolio									
<b>FORMAT:</b>	<p>The competency-based practical portfolio will include:</p> <p>Task 1a. Practical 1 Basic Laboratory Competencies Report. Individual or Pair - Week 2 (7.5%; 15 marks).</p> <p>Task 1b. Practical 2 Serum Protein Report. Individual or Pair - Week 4 (10%; 20 marks).</p> <p>Task 1c. Practical 3 Serum Iron Report. Individual or Pair - Week 6 (7.5%; 15 marks)</p> <p>Task 1d. Practical 4 Vitamin C Report. Individual or Pair - Week 10 (10%; 20 marks).</p> <p>Task 1e. Practical 5 Protein Allergen Report. Individual or Pair - Week 12 (5%; 10 marks).</p> <p>Please refer to the NUT232 Assessment folder in Blackboard for specific details for task description, format and submission instructions. You may submit your practical reports individually or as a pair of students.</p>									
<b>CRITERIA:</b>	<table border="1"> <thead> <tr> <th>No.</th> <th>Learning Outcome assessed</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Adhere to the correct format and presentation (e.g. structure, spelling, grammar, referencing, written expression) for a short practical report. <b>3</b></td> </tr> <tr> <td>2</td> <td>Interpret the individual and class findings obtained during the course practical classes. <b>1</b></td> </tr> <tr> <td>3</td> <td>Relate the practical findings to peer-reviewed articles and professional internet sites in the nutritional biochemistry literature. <b>2 4</b></td> </tr> </tbody> </table>	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. <b>3</b>	2	Interpret the individual and class findings obtained during the course practical classes. <b>1</b>	3	Relate the practical findings to peer-reviewed articles and professional internet sites in the nutritional biochemistry literature. <b>2 4</b>	
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### All - Assessment Task 2: Review Quiz (20%)

<b>GOAL:</b>	In this assessment task, you will be able to demonstrate, apply and evaluate your theoretical knowledge of foundation principles in nutritional science, pathology diagnostic testing and its importance in nutrition assessment; structure and function of dietary proteins, amino acids, and carbohydrates; digestion and assimilation of dietary proteins, and disorders of amino acid metabolism.	
<b>PRODUCT:</b>	Quiz/zes	
<b>FORMAT:</b>	The review quiz will consist of 40 multiple-choice questions and will be based on the material covered in the lecture modules and tutorials held during weeks 1 to 5 of semester.	
<b>CRITERIA:</b>	<b>No.</b>	<b>Learning Outcome assessed</b>
	1	Demonstrate and apply knowledge of the principles and concepts of nutritional biochemistry. 1 4
	2	Analyse information and explain important elements of the theories which underpin the concepts in nutritional biochemistry covered during the course. 1 4
	3	Use evidence-based reasoning from your knowledge and understanding of nutritional biochemistry to provide correct answers to the multiple choice questions. 1

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

<b>GOAL:</b>	In this assessment task, you will be able to demonstrate, apply and evaluate your theoretical and practical knowledge of basic principles and concepts associated with the structure and function of dietary fibre, lipids and selected vitamins; digestion and assimilation of dietary lipids and carbohydrates; biochemical testing for disorders of lipid and carbohydrate metabolism; alcohol metabolism; and practical techniques in food biochemistry	
<b>PRODUCT:</b>	Examination - Centrally Scheduled	
<b>FORMAT:</b>	The exam will consist of 80 multiple-choice questions based on the material covered in the lecture modules, tutorials and practical classes held during weeks 6 to 13 of the semester.	
<b>CRITERIA:</b>	<b>No.</b>	<b>Learning Outcome assessed</b>
	1	Demonstrate and apply knowledge of the principles and concepts of nutritional biochemistry. 1 4
	2	Analyse information and explain important elements of the theories which underpin the concepts in nutritional biochemistry covered during the course. 1 4
	3	Use evidence-based reasoning from your knowledge and understanding of nutritional biochemistry to provide correct answers to the multiple-choice questions. 1

## 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. Directed study hours may vary by location. Student workload is calculated at 12.5 learning hours per one unit.

### 7.1. Schedule

PERIOD AND TOPIC	ACTIVITIES
Foundation principles in nutritional science.	What is nutritional biochemistry? Classification of the food nutrients. Nutrient reference values (NRVs). Energy content of food; Atwater factors. Gross energy of food and the bomb calorimeter. Digestible energy and metabolizable energy of food.

PERIOD AND TOPIC	ACTIVITIES
Pathology testing and nutrition assessment.	<p>The modern pathology laboratory and sub-disciplines.  Clinical biochemistry and biochemical laboratory tests in pathology.  Types of human specimens.  Diagnostic tests and reference ranges.  Impact of biological and laboratory factors on pathology testing.  Introduction to blood collection.  Blood plasma, blood serum and capillary blood.  Urine collection techniques.</p>
Dietary proteins and amino acids.	<p>Amino acids, peptides, polypeptides and proteins.  Classification and essentiality of dietary amino acids.  Metabolic disorders of amino acid metabolism; aminoacidopathies.  Dietary protein quality and limiting amino acids.  Nitrogen balance in humans.  Recommended dietary protein intakes.  Measuring total serum protein.</p>
Digestion and absorption of dietary proteins.	<p>Digestion of dietary proteins in the stomach and small intestine.  Digestive enzymes (zymogens, endopeptidases, exopeptidases).  Regulatory peptides in the small intestine.  Amino acid and peptide transport in the mucosal cells of the small intestine.</p>
Dietary carbohydrates.	<p>Classification of dietary carbohydrates.  Free sugars in food: monosaccharides, disaccharides and sugar alcohols.  The short-chain carbohydrates (oligosaccharides) in food.  Food polysaccharides: types of starch (RDS, SDS, RS)  The glycaemic index</p>
Dietary fibre.	<p>Definition of dietary fibre and functional fibre.  Non-starch polysaccharides (NSP).  Cellulose, beta-glucans, pectin, hemicelluloses, lignin  Galactose oligosaccharides, fructans.  Resistant starch (RS) as dietary fibre.  Physiological and metabolic effects of dietary fibre.  Dietary fibre in disease prevention.  Recommended dietary intakes of dietary fibre.</p>
Digestion and absorption of dietary carbohydrates.	<p>Digestion of dietary carbohydrates in the mouth and small intestine.  Salivary and pancreatic alpha-amylases.  Role of brush border enzymes in the small intestine.  Lactose and sucrose intolerances.  Absorption of glucose, galactose and fructose.  Liver (hepatic) metabolism of glucose and other monosaccharides.</p>
Disorders of carbohydrate metabolism. Diabetes mellitus and prediabetes.	<p>Hormonal control of blood glucose.  Hypoglycaemia.  Overview of diabetes mellitus and associated complications.  Metabolism in Type 1 diabetes mellitus.  Criteria for the diagnosis of prediabetes and diabetes.  Other carbohydrate-related diagnostic tests.</p>
Biochemistry of the dietary lipids.	<p>Classification of dietary lipids.  Common fatty acids in the human diet.  Food triglycerides (fats and oils).  Saponification and hydrogenation of food triglycerides.  Food sterols, steroids, phospholipids and glycolipids.</p>

PERIOD AND TOPIC	ACTIVITIES
Digestion of dietary lipids. Alcohol absorption and metabolism.	Biochemical processes associated with the digestion of food lipids. Role of digestive enzymes (esterases) and bile acids in food lipid digestion. Formation of lipid-containing micelles. Absorption of alcohol (ethanol) in the human gastrointestinal tract. Ethanol oxidation pathways in the human body. Alcohol dehydrogenase and acetaldehyde pathway. Microsomal ethanol oxidising system (MEOS). Catalase in peroxisomes.
Transport of dietary lipids and disorders of lipid metabolism.	Absorption of digestion derived lipids in the small intestine. Formation of chylomicrons in the small intestine. Structural characteristics of blood lipoproteins. Role of blood lipoproteins in transporting lipids throughout the human body. Lipoprotein(a). Hyperlipidaemia and cardiovascular disease risk. The blood serum lipid profile.
Overview of the vitamins.	Properties of water-soluble and fat-soluble vitamins. Biochemistry of the water soluble vitamins. Thiamin (vitamin B1). Riboflavin (vitamin B2). Niacin (vitamin B3). Folic acid (folate).
Biochemistry of two fat-soluble vitamins.	Vitamin D (cholecalciferol). Vitamin E (tocopherols).

## 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 Blackboard 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	PUBLISHER
Required	Sareen S. Gropper, Jack L. Smith, Timothy P. Carr	2021	Advanced Nutrition and Human Metabolism	Cengage Learning

### 8.2. Specific requirements

You will be required to purchase the NUT232 Course Manual from the USC MyPrint Shop. In addition, you will be required to bring along a laboratory coat, safety glasses and closed non-slip footwear to 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 Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

## 10.2. Assessment: Additional Requirements

Eligibility for Supplementary Assessment.

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:

- 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. 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](mailto:studentcentral@usc.edu.au).

## 10.5. 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](mailto:studentwellbeing@usc.edu.au) or call 07 5430 1226.

## 10.6. 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](mailto:AccessAbility@usc.edu.au) or call 07 5430 2890.

## 10.7. 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
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website: <http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

## 10.8. General Enquiries

### In person:

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

**Tel:** +61 7 5430 2890

**Email:** [studentcentral@usc.edu.au](mailto:studentcentral@usc.edu.au)