

## Course Syllabus

1	<b>Course title</b>	Advanced Nutritional Biochemistry (Macronutrients)
2	<b>Course number</b>	0603751
3	<b>Credit hours (theory, practical)</b>	3 theory
	<b>Contact hours (theory, practical)</b>	0 practical
4	<b>Prerequisites/co requisites</b>	Master level
5	<b>Program title</b>	Human Nutrition and Dietetics
6	<b>Program code</b>	036
7	<b>Awarding institution</b>	The University of Jordan
8	<b>School</b>	School of Agriculture
9	<b>Department</b>	Department of Nutrition and Food Technology
10	<b>Level of course</b>	Master level
11	<b>Year of study and semester (s)</b>	Second semester 2019/2020
12	<b>Final Qualification</b>	MSc in Human Nutrition and Dietetics
13	<b>Other department(s) involved in teaching the course</b>	None
14	<b>Language of Instruction</b>	English
15	<b>Date of production/revision</b>	January 2020

### 16. Course Coordinator:

Office numbers, office hours, phone numbers, and email addresses should be listed.

**Prof. Mousa Numan Ahmad**

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Office No. 036

962-6-3550000-22412

Office hours					
Day/Time	Sunday	Monday	Tuesday	Wednesday	Thursday
Day	*	*	*	*	
Time	9-10	9-10	9-10	9-10	

### 17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

### 18. Course Description:

An advanced level study of the biochemical aspects of carbohydrate, lipid, and protein utilization by man, with emphasis on their interrelations and uniqueness of individual organs and tissues in metabolism, as well as their homeostatic regulation.

## 19. Course aims and outcomes:

<b>A- Aims:</b>
<ol style="list-style-type: none"><li>1. Acquire an advanced knowledge of the biochemical transformation of carbohydrates, lipids and proteins in man.</li><li>2. Develop a distinctive understanding of the metabolic interrelations/integration of carbohydrates, lipids and proteins at the cellular level, and of the uniqueness of individual tissues and organs in metabolism.</li><li>3. Develop an advanced understanding of the homeostatic regulation of carbohydrates, lipids and proteins.</li><li>4. Be able to relate the biochemical events at the cellular level to the physiological processes occurring in the whole body.</li><li>5. Be able to relate the nutritional and biochemical concepts of carbohydrates, lipids and proteins to clinical situations</li></ol>
<b>B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to:</b>
<b>A. Knowledge and Understanding:</b> Student is expected to <b>A1-</b> Appreciate the two basic lines of biochemistry; one is concerned primarily with molecules and reactions, the other with biochemical explanations of the physiological and clinical phenomena. <b>A2-</b> Realize the concepts on which all metabolism is based including methods and approaches in metabolism, thermodynamics and kinetics. <b>A3-</b> Describe the oxidative and degradative pathways of carbohydrate, lipid and protein metabolism, how these are controlled and integrated in health and how failures of this integration explain a number of diseases and, hence how they can be treated. <b>A4-</b> Know the metabolism of amino acids and how can be introduced into the metabolic scheme and examined from the standpoint of control and integration in health and disease. <b>A5-</b> Understand the synthetic pathways of carbohydrates, lipids and proteins together with a range of clinical topics such as obesity, diabetes mellitus cardiovascular diseases and selected inborn errors of metabolism. <b>A6-</b> Be familiar with unique metabolic profile of major body organ systems, mainly brain, muscle, liver and adipose tissue. <b>A7-</b> Understand the integration of substrate metabolism in different body organs under normal and disease conditions, and how it is controlled by hormones and neurotransmitters.
<b>B. Intellectual Analytical and Cognitive Skills:</b> Student is expected to <b>B1-</b> Realize the essentials of structure, nomenclature and shorthand conventions for carbohydrates, lipids and proteins. <b>B2-</b> Gain advanced knowledge about nutritional biochemistry, especially those related to main strategies of metabolism – to form ATP, to provide reducing power and supplying building blocks for biosynthesis. <b>B3-</b> Gain knowledge about the thermodynamic relations of the reactions in various metabolic pathways. <b>B4-</b> Gain advanced knowledge of the various motifs in metabolic regulation, including allosteric interaction, enzyme sensitivity, hormones and compartmentation, as well as the general metabolic integration of the catabolic and anabolic pathways and their clinical correlations. <b>B5-</b> Gain detailed knowledge about coupling and uncoupling oxidative phosphorylation and their clinical correlations. <b>B6-</b> Appreciate the uniqueness of individual body organ systems in metabolism.

**C. Subject- Specific Skills:** Students is expected to

- C1-** Describe the overall map of metabolism, i.e. the integrated metabolic pathways of carbohydrates, lipids and proteins, and how to pinpoint the metabolic defect(s) that occur(s) in nutrition related diseases and, hence how they can be treated or managed.
- C2-** Identify, define and describe the tools that are available for studying and investigating the various topics of nutritional biochemistry in health and disease.
- C3-** Describe and design experiments that show the relation between nutrients and biochemical processes in the body, and how these processes can be disturbed by defective nutritional utilization.

**D. Transferable Key Skills:** Students is expected to

- D1-** Locate research literature related to normal and clinical nutrition, biochemistry and physiology, and how to interpret them with the advancement of knowledge in these fields.
- D2-** Critically evaluate information both of nutritional biochemistry and disease, such as evaluating sources of facts, claims, doubts, bias, conflicts and assumption, and how to utilize them to open new avenues of research- develop a research problem or hypothesis for investigating a specific topic in nutritional biochemistry.
- D3-** Gain essential skills to relate the body metabolic status with nutritional status.

**20. Topic Outline and Schedule:**

[Note: Topics usually vary depending on instructors, scientific perspectives, and student needs]

Topic	Reference	Week	Achieved ILO/s	Instructor
<ul style="list-style-type: none"> <li>• Introduction and General Review:</li> <li>- Cellular basis of nutritional biochemistry.</li> <li>- Orientation to cellular nutrition.</li> <li>- Thermodynamics in nutrition and metabolism.</li> <li>- Kinetics and metabolism.</li> </ul>	1, 2	1 <sup>st</sup> - 2 <sup>nd</sup>	A1, A2, B3	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Nutrition and Metabolism of Carbohydrates:</li> <li>- Chemistry, physiology and nutrition.</li> <li>- Glycolysis and fate of pyruvate.</li> <li>- Oxidation of acetyl coenzyme-A.</li> <li>- Glycogenesis and glycogenolysis.</li> <li>- Pentose-phosphate shunt.</li> <li>- Metabolism of other sugars.</li> <li>- Gluconeogenesis and synthesis of sugars.</li> <li>- Regulation of carbohydrate metabolism.</li> <li>- Uniqueness of individual organs and tissues.</li> <li>- Selected nutritional and clinical correlations.</li> </ul>	1- 3	2 <sup>nd</sup> – 6 <sup>th</sup>	A3,A5, B1- B6, C1- C3,D1- D3	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Nutrition and Metabolism of Lipids:</li> <li>- Chemistry, physiology and nutrition.</li> <li>- Fatty acid oxidation spiral.</li> <li>- Ketone body formation and utilization</li> <li>- Biosynthesis of fatty acids and lipids.</li> <li>- Blood lipids and lipoproteins.</li> <li>- Biosynthesis and metabolism of cholesterol.</li> <li>- Metabolism of other steroids.</li> <li>- Essential fatty acids metabolism.</li> <li>- Uniqueness of individual organs and tissues.</li> <li>- Control of lipid metabolism.</li> <li>- Role in membrane structure and function.</li> <li>- Selected nutritional and clinical correlations.</li> </ul>	1- 3	6 <sup>th</sup> – 10 <sup>th</sup>	A3, A5-A7, B4- B6,C1 -C3, D1- D3	Prof. Mousa Ahmad

<ul style="list-style-type: none"> <li>• Nutrition and Metabolism of Proteins: <ul style="list-style-type: none"> <li>- Chemistry, physiology and nutrition.</li> <li>- Amino acid biochemistry and metabolism.</li> <li>- Essential amino acids and metabolism.</li> <li>- Protein quality: Concept and criteria.</li> <li>- Purine and pyrimidine nucleotides</li> <li>- Biosynthesis of nucleic acids and proteins.</li> <li>- Ammonia and nitrogen metabolism.</li> <li>- Uniqueness of individual organs and tissues.</li> <li>- Selected nutritional and clinical correlations.</li> </ul> </li> </ul>	1- 3	10 <sup>th</sup> – 14 <sup>th</sup>	A3- A6, B2, B2, B4- B6, C1- C3, D1- D3	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Homeostatic Regulation and Metabolic Interrelations: <ul style="list-style-type: none"> <li>- Metabolic control-Basic concepts.</li> <li>- Control mechanisms- enzymes and regulators.</li> <li>- Metabolism of individual tissues and/ organs.</li> <li>- Regulation of glucose utilization.</li> <li>- Integration of CHO and lipid metabolism.</li> <li>- Lipolysis-ketogenesis interrelationships.</li> <li>- Energy metabolism in muscles.</li> <li>- Overall metabolic interrelations of glucose, fatty acids and amino acids.- Selected nutritional and clinical correlations.</li> </ul> </li> </ul>	1- 4	14 <sup>th</sup> – 16 <sup>th</sup>	A6, A7, B6, C3, D3	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Overall Review</li> </ul>	1-4	16 <sup>th</sup>	A1-A7, B1-B6, C1-C3, D1-D3	Prof. Mousa Ahmad

## 21. Teaching Methods and Assignments:

<p><u>Development of ILOs is promoted through the following teaching and learning methods:</u></p> <p>a) <b>Assignments:</b> Each student is given several homework exercises in which he/she explores the literature through use of the library or the internet, and then writes a short report.</p> <p>b) <b>Learning Resources:</b> Related published literature, articles, reports of related organizations and institutes and use of documentation systems (e.g. use of journal systems of writing and publishing, and instructions to write course report and prepare oral presentation).</p> <p>c) <b>Learning/ Teaching Methods:</b> Lectures, group discussions and presentations for previously assigned topics, seminars and term papers of assigned topics by individual students (individual skills and self expression development).Teaching tools include: Slides, transparencies, power point, handouts, demonstrations and case study analysis.</p>
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## 22. Evaluation Methods and Course Requirements:

<u>Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:</u>		
ILO/s	Learning Methods	Evaluation Methods
A. Knowledge and Understanding (A1-A7)	Lectures, discussions	Exams, assignments, home works, quizzes,
B. Intellectual Analytical and Cognitive Skills (B1-B6)	Lectures, discussions	Exams, assignments, home works, quizzes
C. Subject Specific Skills (C1-C3)	Lectures, discussions	Exams, assignments, home works, quizzes
D. Transferable Key Skills (D1-D3)	Project, Presentations	Project and presentation evaluation .

<b>Evaluation</b>	<b>Point %</b>	<b>Date</b>
<b>Midterm Exam</b>	30	
<b>1 Assigned Quiz</b>	10	
<b>Course Project/ Presentation</b>	20	
<b>Final Exam</b>	40	

### 23. Course Policies:

#### A- Attendance policies:

Students are expected to attend punctually all lectures and to participate in course assignments and activities as described in the course syllabus. A student's participation in the work of the course is a precondition for receiving credit for the course. However, in the case of absences, the university instructions and regulations will be applied. For only emergency absences accompanied by a written explanation of sickness from a physician (or other pertinent documentation related to the particular situation), a notice should be given to the instructor no later than 48 hours from the absence in order to make reasonable arrangements. A student missing 15% or more of the class meetings will be dropped from the class and will be given a grade of "failure for absences".

#### B- Absences from exams and handing in assignments on time:

Generally, in the case of absences, the university instructions and regulations will be applied. For only medically explained absences, a notice should be given to the instructor no later than the last class before the anticipated absence in order to make reasonable arrangements. In this case, a make-up assignments or presentation or exam will be arranged according to the university regulations.

#### C- Health and safety procedures:

The University of Jordan is committed to providing safe, healthy and supportive learning environments for all students which address their educational needs.

#### D- Honesty policy regarding cheating, plagiarism, misbehaviour:

Students are expected to be honest and forthright in their academic endeavours. To falsify the results of one's work, to steal the words or ideas of another, to cheat on an examination, to allow another person to commit, or assist another in committing an act of academic dishonesty, corrupts the essential process by which knowledge is advanced. In the case of dishonesty, cheating, plagiarism, and misbehaviour, the university of Jordan's instructions and regulations will be strictly applied.

#### E- Available university services that support achievement in the course:

The University of Jordan Library and Computer and Information Technology Centre.

### 24. Required equipment: (Facilities, Tools, Labs, Training....)

Lecture room, electronic facilities, audiovisual aids, smart boards, and library facilities.

**25. References:**

Required book (s), assigned reading and audio-visuals:

1. Devlin T.M. Textbook of Biochemistry with Clinical Correlations. New York: John Wiley, 2016-2018/ Latest edition.

Recommended books, materials, and media:

2. Gropper SS, Smith JL & Groff JL. Advanced Nutrition and Human Metabolism. Wadsworth, Cengage Learning. Belmont, CA, USA, Latest edition..
3. Brody T. Nutritional Biochemistry. New York: Academic Press, Latest edition.
4. Shils M.C., Olson T.A. & Shike M. Modern Nutrition in Health and Disease. Philadelphia: Lea and Febiger, Latest edition.
5. Stryer L. Biochemistry. New York: W.H. Freeman, Latest edition.
6. Martin O.W. *et. al.*, Harper’s Review of Biochemistry. California: Lange Medical Publications, Latest edition.
7. Rolfes S.R, Pinna K. and Whitney E. Understanding Normal and Clinical Nutrition. U.S.A: Thomson-Wadsworth, Latest edition..
8. Mahan LK, Escott-stump S & Raymond JL. Food and the Nutrition Care Process. Philadelphia: W.B. Saunders, 2018.
9. Bender DA. Introduction to Nutrition and Metabolism. London: Taylor and Francis, Latest edition.
10. Most Recent Nutritional Biochemistry Textbooks and Articles.
11. Selected Internet Sites :
  1. [www.nutrition.org](http://www.nutrition.org)
  2. [www.faseb.org/ascn](http://www.faseb.org/ascn)
  3. [www.webmed.com](http://www.webmed.com)
  4. [www.fda.gov](http://www.fda.gov)
  5. [www.asns.org](http://www.asns.org)
  6. [www.ilsa.org](http://www.ilsa.org)
  7. [www.usda.gov](http://www.usda.gov)
  8. [www.diabetes.org](http://www.diabetes.org)
  9. [www.dietitians.ca](http://www.dietitians.ca)
  10. [www.nas.edu](http://www.nas.edu)
  11. [www.dietetics.com](http://www.dietetics.com)
  12. [www.apha.org](http://www.apha.org)
  13. [www.bda.uk.com](http://www.bda.uk.com)
  14. [www.nse.org](http://www.nse.org)
  15. [www.fao.org/food](http://www.fao.org/food)
  16. [www.who.int](http://www.who.int)

**26. Additional information:**

Name of Course Coordinator: Prof. Mousa Numan Ahmad      Signature:                      Date: 2/2/2020

Head of curriculum committee/Department: ----- Signature: -----

Head of Department: ----- Signature: -----

Head of curriculum committee/Faculty: ----- Signature: -----

Dean: ----- -Signature: -----