

## Course Syllabus

1	<b>Course title</b>	Carbohydrates in Nutrition
2	<b>Course number</b>	0603951
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>	031
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>	Doctoral level
11	<b>Year of study and semester (s)</b>	Second semester 2019/2020
12	<b>Final Qualification</b>	PhD 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 physiological, molecular and biochemical aspects of carbohydrates including digestion, absorption and metabolism and their regulatory aspects; as well as the study of certain carbohydrate-related physiological, genetic and biochemical problems.

## 19. Course aims and outcomes:

<b>A- Aims:</b>
<ol style="list-style-type: none"><li>1. Acquire an advanced knowledge of the physiological, molecular and biochemical transformation of the individual carbohydrate molecules in man.</li><li>2. Develop a distinctive understanding of the metabolic interrelations/ integration of carbohydrates and their related compounds 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 the carbohydrate materials.</li><li>4. Be able to relate the biochemical events of carbohydrates 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 to clinical situations.</li><li>6. Be able to identify, define and describe the tools that are available for studying and investigating the various topics of nutritional- carbohydrate biochemistry in health and disease.</li><li>7. Be able to describe and design experiments that show the relation between carbohydrates and related substances and biochemical processes in the body, and how these processes can be disturbed by defective nutritional utilization.</li><li>8. Be able to locate research literature related to normal and clinical carbohydrate nutrition, biochemistry and physiology, and how to interpret them with the advancement of knowledge in these fields.</li><li>9. Be able to critically evaluate information both of carbohydrate nutrition and 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 of carbohydrates and related materials.</li></ol>
<b>B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to:</b>
<p><b>A. Knowledge and Understanding:</b> Student is expected to</p> <p><b>A1-</b> Appreciate the basics of carbohydrate nutrition and biochemistry, emphasizing glycans nutrition and their reactions and interactions and explanations of related physiological and clinical phenomena.</p> <p><b>A2-</b> Realize the concepts on which all metabolism is based including methods and approaches in metabolism, kinetics and thermodynamics.</p> <p><b>A3-</b> Describe the oxidative and degradative metabolic pathways of carbohydrates and related compounds, their control and integration in health and how failures of this integration explain a number of diseases and, hence how they can be treated.</p> <p><b>A4-</b> Know the metabolism of individual carbohydrate and how can be introduced into the metabolic scheme and examined from the standpoint of control and integration in health and disease.</p> <p><b>A5-</b> Understand the synthetic pathways of carbohydrates together with a range of clinical topics such as obesity, diabetes mellitus cardiovascular diseases and selected inborn errors of metabolism.</p> <p><b>A6-</b> Be familiar with unique metabolic profile of major body organ systems, mainly brain, muscle, liver and adipose tissue in relation to carbohydrates.</p> <p><b>A7-</b> Understand the integration of substrate/ glucose metabolism in different body organs under normal and disease conditions, and how it is controlled by hormone.</p>

**B. Intellectual Analytical and Cognitive Skills:** Student is expected to

- B1-** Realize the essentials of structure, nomenclature and shorthand conventions for carbohydrates and related compounds.
- B2-** Gain knowledge about the thermodynamic relations of the reactions in various metabolic pathways.
- B3-** Gain advanced knowledge of the various aspects in carbohydrates and related compounds 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.
- B4-** Appreciate the uniqueness of individual body tissues and organ systems in carbohydrate metabolism.

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

- C1-** Describe the integrated metabolic pathways of carbohydrates particularly monosaccharides, and how to pinpoint the metabolic defect(s) that occur(s) in carbohydrate-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 carbohydrate nutrition, and biochemistry in health and disease.
- C3-** Describe and design experiments that show the relation between dietary carbohydrates and biochemical processes in the body, and how these processes can be disturbed by defective utilization.

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

- D1-** Locate research literature related to normal and clinical carbohydrate nutrition, biochemistry and physiology, and how to interpret them with the advancement of knowledge in these fields.
- D2-** Critically evaluate information both of carbohydrate nutrition, 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 protein nutrition and biochemistry.
- D3-** Gain essential skills to relate the body metabolic status with carbohydrate 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:<ul style="list-style-type: none"><li>- Carbohydrates nutrition an metabolism</li><li>- Carbohydrates in nutrition and health.</li></ul></li></ul>	1, 2	1 <sup>st</sup> - 2 <sup>nd</sup>	A1, A2, B1, B2	Prof. Mousa Ahmad
<ul style="list-style-type: none"><li>• Nutrition and Metabolism of Carbohydrates:<ul style="list-style-type: none"><li>- Chemistry, physiology and nutrition of carbohy</li><li>- Overview of metabolism of metabolic fuels.</li><li>- Carbohydrates of physiological significance.</li><li>- Glycolysis and fate of pyruvate.</li><li>- Oxidation of acetyl coenzyme-A.</li><li>- Glycogenesis and glycogenolysis.</li><li>- Gluconeogenesis and control of blood glucose</li><li>- Pentose-phosphate pathway.</li><li>- Metabolism of other hexoses.</li><li>- Nutrition and metabolism of ethanol.</li><li>- Uniqueness of individual organs and tissues.</li><li>- Selected nutritional and clinical correlations.</li></ul></li></ul>	1- 4	2 <sup>nd</sup> – 6 <sup>th</sup>	A3-A5, B2- B5, C1- C3,D1- D3	Prof. Mousa Ahmad

<ul style="list-style-type: none"> <li>• Regulation of Carbohydrates Metabolism:</li> <li>- Metabolic control: basic concepts and mechanisms.</li> <li>- Regulatory aspects of carbohydrate metabolism.</li> <li>- Metabolism of individual tissues and/ organs.</li> <li>- Energy metabolism-regulation of glucose oxidation.</li> <li>- Selected nutritional and clinical correlations.</li> </ul>	1- 4	6 <sup>th</sup> – 9 <sup>th</sup>	A3- A6, B2, B4, B5, C1- C3, D1-D3	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Carbohydrates in Nutrition, Health, and Disease:</li> <li>- The carbohydrate diversity.</li> <li>- Glycemic and non-glycemic carbohydrates.</li> <li>- Linking carbohydrate structure and function.</li> <li>- Selected carbohydrate reactions of nutritional interests.</li> <li>- Selected carbohydrate compounds of nutritional interests.</li> <li>- Glycans in nutrition and acquired human diseases.</li> <li>- Carbohydrates and the cell surface.</li> <li>- Insulin resistance and type 2 diabetes mellitus.</li> <li>- Diabetes mellitus as a liver disease.</li> <li>- Metabolic effects of low-carbohydrate diets.</li> <li>- Developments in blood glucose sensors.</li> <li>- Carbohydrate-related inherited human diseases.</li> </ul>	1- 5	9 <sup>th</sup> – 15 <sup>th</sup>	A6, A7, B5, C3, D3	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Overall Review and Presentations</li> </ul>	1-5	15 <sup>th</sup> - 16 <sup>th</sup>	A1-A7, B1-B5, C1-C3, D1-D3	Prof. Mousa Ahmad

## 21. Teaching Methods and Assignments:

<p>Development of ILOs is promoted through the following teaching and learning methods:</p> <ol style="list-style-type: none"> <li>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.</li> <li>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).</li> <li>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.</li> </ol>
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## 22. Evaluation Methods and Course Requirements:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:		
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-B4)	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.

Evaluation	Point %	Date
Midterm Exam	30	
1 Assigned Quiz	10	
Course Project/ Presentation	20	
Final Exam	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.
2. Brody T. Nutritional Biochemistry. New York: Academic Press, Latest edition.
3. Rodwell V.W., Bender D.A., Botham K.M., Weil P.A. Harper’s Illustrated Bio-chemistry. California: McGraw Hill Education; Lange Medical Publications, 30<sup>th</sup> edition, 2017.
4. Gropper S.S., Smith J.L., Groff J.L. Advanced Nutrition and Human Metabolism. 6<sup>th</sup> Edition, Wadsworth, Cengage Learning. Belmont, CA, USA, 2016.

Recommended books, materials, and media:

5. Shils M.C., Olson T.A. & Shike M. Modern Nutrition in Health and Disease. Philadelphia: Lea and Febiger, Latest edition.
6. Stryer L. Biochemistry. New York: W.H. Freeman, 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: -----