

## Course Syllabus

1	<b>Course title</b>	Nutritional Genomics
2	<b>Course number</b>	0603955
3	<b>Credit hours (theory, practical)</b>	3 theory
	<b>Contact hours (theory, practical)</b>	0 practical
4	<b>Prerequisites/co requisites</b>	PhD 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>	First Semester 2020/2021
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>	September 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:

The course provides the main concepts of genomics, transcriptomics, proteomics, metabolomics and bioinformatics and their applications to human nutrition; discusses how individual genetic variation can influence nutrient metabolism and how nutrition can affect the expression of certain genes known to be involved in chronic diseases; introduces the latest functional genomic studies that relate to nutrient intake and polymorphisms, and clinical dietary strategies for the prevention of chronic diseases.

## 19. Course aims and outcomes:

<b>A- Aims:</b>
<ol style="list-style-type: none"><li>1. Acquire advanced knowledge of the physiological, molecular, and biochemical concepts involved in how nutrients regulate gene expression (nutrigenomics).</li><li>2. Develop a distinctive understanding of how an individual's genotype influences their nutrient requirements (nutrigenetics).</li><li>3. Develop an advanced understanding of the unique roles that foods, nutrients, and micro-compounds therein play in chronic diseases with a focus on their role in nutritional genomics.</li><li>4. Acquire advanced knowledge of polygenic diseases and be able to relate dietary factors to the prevention of these diseases.</li><li>5. Develop an advanced understanding of the applicability of the science in practice with an emphasis on the current testing that is available, and the ethics and legality involved with nutrigenetic testing.</li><li>6. Acquire a distinctive knowledge of the crucial topics of nutritional epigenomics, especially those closely related to transcriptomics, metabolomics, proteomics, and microbiomics.</li><li>7. Develop an advanced understanding of the role of food in nutritional genomics, including the topics of functional foods, functional genomics, nutraceuticals, modification of food for nutritional genomic purposes, and foodomics.</li><li>8. Be able to relate bioinformatics and its application to human nutrition and disease.</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 basics of nutrigenomics, emphasizing how micro- and macro-nutrients regulate gene expression. <b>A2-</b> Realize the advanced concepts on which all nutrigenomics is based including biochemical mechanisms, methods and approaches. <b>A3-</b> Describe the roles that specific food, micro- or macro-nutrient, and micro-compound therein play in chronic diseases with a focus on their possible function in nutritional genomics. <b>A4-</b> Analyze how an individual's genotype may influence their nutritional requirements and be involved in the development of chronic disease. <b>A5-</b> Synthesize the multiple roles that dietary factors play in the development of chronic disease including their role in nutrigenomics.
<b>B. Intellectual Analytical and Cognitive Skills:</b> Student is expected to <b>B1-</b> Realize the essentials of the science of nutritional genomics differentiating between nutrigenomics and nutrigenetics. <b>B2-</b> Be able to address specific examples of how genotype can affect dietary influence on particular disease processes, and how in turn, diet also affects genetic expression. <b>B3-</b> Gain skills how to examine examples of polygenic diseases and investigate dietary influences on prevention of these diseases. <b>B4-</b> Realize the applicability of the science in practice, examining the current testing that is available. <b>B5-</b> Appreciate and evaluate the ethics and legality involved with of nutrigenetic testing.
<b>C. Subject- Specific Skills:</b> Students is expected to <b>C1-</b> Describe the the crucial topic of nutritional epigenomics and the closely related fields of metabolomics and proteomics, and the emerging field of microbiomics. <b>C2-</b> Identify, define and describe the role of food in nutritional genomics, including the topics of functional foods, nutraceuticals, modification of food for nutritional genomic purposes, and "foodomics" <b>C3-</b> Describe and design experiments that show the relation between dietary factors and molecular biochemical processes, and how these processes can be disturbed by defective nutrigenomics or vice versa.

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

**D1-** Locate research literature related to normal and clinical nutrigenomics, its molecular biochemistry, physiology and pathophysiology, and how to interpret them with the advancement of knowledge in this field.

**D2-** Critically evaluate information both of nutrigenomics, molecular 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 genomics.

**D3-** Gain essential skills to relate the human genetics makeup with the 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>• Nutritional Genomics- Basic Concepts:               <ul style="list-style-type: none"> <li>- Nutrigenetics and nutrigenomics.</li> <li>- Nutrient interactions.</li> <li>- Nutrition-induced diseases- genetic aspects.</li> <li>- Genetic polymorphisms.</li> <li>- Gene expression.</li> <li>- Evolution and nutrition.</li> <li>- Nutrigenomics and personalized Nutrition.</li> </ul> </li> </ul>	1-5	1 <sup>st</sup> - 2 <sup>nd</sup>	A1, A2, B1, B2	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Nutrition and Common Chronic Diseases:               <ul style="list-style-type: none"> <li>- Nutrition and obesity.</li> <li>- Nutrition and diabetes.</li> <li>- Nutrition and cancer.</li> <li>- Nutrition and cardiovascular disease.</li> <li>- Nutrition and role of physical performance.</li> </ul> </li> </ul>	1-5	2 <sup>nd</sup> - 4 <sup>th</sup>	A3-A5, B2- B5, C1- C3, D1- D3	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Human Genomic Variations:               <ul style="list-style-type: none"> <li>- Diversity of human population.</li> <li>- Metabolism, genetics, and environment.</li> <li>- Nutritional implications.</li> <li>- Nutritional requirements.</li> <li>- Genetic variation and physical performance.</li> </ul> </li> </ul>	1-5	4 <sup>th</sup> - 6 <sup>th</sup>	A1-A5, B4, B5, C3, D2, D3	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Molecular Basis of Genetics:               <ul style="list-style-type: none"> <li>- Metabolic control and mechanisms.</li> <li>- Nutrient and gene expression.</li> <li>- Nuclear receptors.</li> <li>- Role of PPARs.</li> <li>- Role of the immune response.</li> <li>- Metabolic-circadian control.</li> </ul> </li> </ul>	1-5	6 <sup>th</sup> - 8 <sup>th</sup>	A3- A6, B2, B4, B5, C1- C3, D1- D3	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Nutrition and Human Genome Adaptation:               <ul style="list-style-type: none"> <li>- Genetic adaption to dietary changes.</li> <li>- Omics analysis in nutrition.</li> <li>- Nutrient-gene interactions.</li> <li>- Genetics and lipid metabolism.</li> <li>- Genetics and CHO metabolism.</li> <li>- Genetics and protein metabolism.</li> <li>- Genetics and vitamin metabolism.</li> <li>- Genetics and mineral metabolism.</li> <li>- Personalized nutrition.</li> </ul> </li> </ul>	1-5	8 <sup>th</sup> - 10 <sup>th</sup>	A6, A5, B5, C3, D3	Prof. Mousa Ahmad
<ul style="list-style-type: none"> <li>• Nutritional Epigenomics:               <ul style="list-style-type: none"> <li>- Mechanisms of epigenetics.</li> <li>- Metabolism and epigenetic signaling.</li> </ul> </li> </ul>	1-5	10 <sup>th</sup> - 12 <sup>th</sup>	A1-A5, B1-B5, C1-C3, D1-D3	Prof. Mousa Ahmad

- Epigenetic programming in humans. - Nutritional signaling and aging. - Inflammation, metabolic stress and genetics.				
• Genetic Links to Main Polygenic Diseases: - Genetics of obesity. - Insulin resistance. - Diabetes. - Hypertension. - Dyslipidaemias. - Atherosclerosis. - Metabolic syndrome. - Cancer. - Thyroid disorders.	1-5	12 <sup>th</sup> - 15 <sup>th</sup>	A1-A5, B1-B5, C1-C3, D1-D3	Prof. Mousa Ahmad
• Beyond Nutritional Genomics and Genetics: - Metabolomics, proteomics, and microbiome. - Nutrigenomics in food safety evaluation. - Ethical and legal considerations. - Bioinformatics and human disease.	1-5	15 <sup>th</sup> – 16 <sup>th</sup>	A1-A5, B1-B5, C1-C3, D1-D3	Prof. Mousa Ahmad
• Discussion and Remarks.	1-9	16 <sup>th</sup>	A1-A5, B1-B5, C1-C3, D1-D3	Prof. Mousa Ahmad

## 21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- Assignments:** 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.
- Learning Resources:** 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).
- Learning/ Teaching Methods:** 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.

## 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-A5)	Lectures, discussions	Exams, assignments, home-works, quizzes,
B. Intellectual Analytical and Cognitive Skills (B1-B5)	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:

### Recommended book (s), assigned reading materials, audio-visuals, and media:

1. Devlin TM. Textbook of Biochemistry with Clinical Correlations. New York: John Wiley, 2016-2018/ Latest edition.
2. Carlberg C., Ulven SM & Molnar F. Nutrigenomics. Springer International Publishing Switzerland 2016.
3. Shils M.C., Olson T.A. & Shike M. Modern Nutrition in Health and Disease. Philadelphia: Lea and Febiger, Latest edition.
4. Most Recent Nutritional Genomics and Molecular Biochemistry Textbooks and Articles.
5. Brody T. Nutritional Biochemistry. New York: Academic Press, Latest edition.
6. Martin O.W. *et. al.* Harper's Review of Biochemistry. California: Lange Medical Publications, Latest edition.
7. Stryer L. Biochemistry. New York: W.H. Freeman, Latest edition.
8. Mahan LK, Escott-stump S & Raymond JL. Food and the Nutrition Care Process. Philadelphia: W.B. Saunders, 2018.

9. Selected Internet Sites:

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|---|---|--|---|
| 1. <a href="http://www.nutrition.org">www.nutrition.org</a> | 2. <a href="http://www.faseb.org/ascn">www.faseb.org/ascn</a> | 3. <a href="http://www.webmed.com">www.webmed.com</a>        | 4. <a href="http://www.fda.gov">www.fda.gov</a>           |
| 5. <a href="http://www.asns.org">www.asns.org</a>           | 6. <a href="http://www.ilsa.org">www.ilsa.org</a>             | 7. <a href="http://www.usda.gov">www.usda.gov</a>            | 8. <a href="http://www.diabetes.org">www.diabetes.org</a> |
| 9. <a href="http://www.dietitians.ca">www.dietitians.ca</a> | 10. <a href="http://www.nas.edu">www.nas.edu</a>              | 11. <a href="http://www.dietetics.com">www.dietetics.com</a> | 12. <a href="http://www.apha.org">www.apha.org</a>        |
| 13. <a href="http://www.bda.uk.com">www.bda.uk.com</a>      | 14. <a href="http://www.nse.org">www.nse.org</a>              | 15. <a href="http://www.fao.org/food">www.fao.org/food</a>   | 16. <a href="http://www.who.int">www.who.int</a>          |

**26. Additional information:**

Name of Course Coordinator: Prof. Mousa Numan Ahmad      Signature:                      Date: 14/9/2020

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

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

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

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