

Course E-Syllabus

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|----|---|--|
| 1 | Course title | Bioenergetic and Nutrition |
| 2 | Course number | 0603967 |
| 3 | Credit hours | 3 |
| | Contact hours (theory, practical) | (3,0) |
| 4 | Prerequisites/requisites | |
| 5 | Program title | PhD. In Human Nutrition and Dietetics |
| 6 | Program code | 031 |
| 7 | Awarding institution | The University of Jordan |
| 8 | School | School of Agriculture |
| 9 | Department | Nutrition and Food technology |
| 10 | Level of course | Doctoral level |
| 11 | Year of study and semester (s) | Winter 2021/2022 |
| 12 | Final Qualification | PhD in Human Nutrition and Dietetics |
| 13 | Other department (s) involved in teaching the course | None |
| 14 | Language of Instruction | English/ Arabic |
| 15 | Teaching methodology | Face to face |
| 16 | Electronic platform(s) | <input type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others..... |
| 17 | Date of production/revision | |

18 Course Coordinator:

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20 Course Description:

An advanced level study of substrate and thermodynamics in metabolism; molecular, cellular and whole body energy metabolism and its regulation and methods of measurement; regulatory aspects of energy intake, energy expenditure, and body energy stores; white and brown adipose tissue cellularity and metabolic activity; thermogenic mechanisms and their hormonal regulation; biochemical and physiological aspects of fed-starve cycle and its nutritional interaction and metabolic consequences; homeostasis of body weight regulation; thermogenic defects in obesity and the effect of relevant polymorphism, dieting and exercise.

21 Course aims and outcomes:

A- Aims:

Upon completion of this course, the student will be able to:

1. Understand the aspects of thermodynamics and nutritional bioenergetics in particular.
2. Realize substrate biotransformation in metabolism and its nutritional/physiologic regulation.
3. Understand the concepts of energetic differences in substrate oxidation and metabolic efficiency of body fuel storage and their nutritional application.
4. Understand the aspects of whole body energetic, energy balance and appetite and their nutritional and physiological regulation and methods of assessment/ measurements.
5. Know the energetic events that occur during starve-fed cycles and exercise and their nutritional and metabolic regulation.
6. Appreciate the white and brown adipose tissue cellularity and energetic activity.
7. Identify and define the heat-releasing mechanisms in the body.
8. Relate the concepts of nutritional bioenergetics to clinical conditions of energy imbalance.
9. Develop skills required to construct diets for monitoring body weight and to provide consultation

B- Intended Learning Outcomes (ILOs):

Upon successful completion of this course students will be able to

A. Knowledge and Understanding: Student is expected to

- A1- Realize the concepts of nutritional bioenergetics and substrate biotransformation.
- A2- Know the concept of metabolic efficiency of body fuel storage and its nutritional application.
- A3- Understand the components of whole body energy metabolism and their regulation and methods of assessment.
- A4- Understand the energetic events that occur during starve-fed cycles and exercise and their nutritional and metabolic regulation.
- A5- Know the white and brown adipose tissue cellularity and energetic activity.
- A6- Appreciate the heat-releasing mechanisms in the body.
- A7- Relate the concepts of nutritional bioenergetics to clinical conditions of energy imbalance.
- A8- Construct and formulate diets for monitoring and managing body weight.
- A9- Counsel individuals and groups regarding body weight management.

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

- B1- Relate the concepts of nutritional bioenergetics to clinical conditions of energy imbalance.
- B2- Gain knowledge about the nutrition and metabolism of the obese case.
- B3- Gain knowledge and skills on the nutritional assessment of the body energetic status at both the cell and whole body levels.
- B4- Gain knowledge and skills on diet formulation and counselling regarding body weight management.
- B5- Gain knowledge and skills about scientific research methods of data collection, manipulation, processing and analysis related to nutritional bioenergetics..

C. Subject- Specific Skills: Students is expected to

- C1- Measure and/or calculate energy intakes in terms of calories or ATP equivalents.
- C2- Measure and/or calculate energy expenditure in terms of calories or ATP equivalents.
- C3- Calculate the metabolic efficiency of body fuel storage in terms of calories or ATP equivalents.
- C4- Assess the body energetic status at both the cell and whole body levels.
- C5- Relate the concepts of nutritional bioenergetics to clinical conditions of energy imbalance.

D. Transferable Key Skills: Students is expected to

- D1- Identify, define and diagnose the obese case.

D2- Construct/ formulate diets for body weight management.
 D3- Counsel individuals and groups regarding body weight management.
 D4- Locate and interpret current research literature related to nutritional bioenergetics.
 D5- Critically evaluate information on nutritional bioenergetics such as evaluating sources of facts, claims, bias, conflict and assumption.

22. Topic Outline and Schedule:

| Week | Lecture | Topic | Instructor | Evaluation Methods** |
|-------|---------|--|------------------------|----------------------------|
| 1-2 | 1.1 | <ul style="list-style-type: none"> - Introduction Nutritional Bioenergetics: - Course description and objectives. - Important concepts and terms in nutritional bioenergetics. - Recent advances in energy in human nutrition. | Dr Hadeel Ali Ghazzawi | A1,B1,A2 |
| | 1.2 | <ul style="list-style-type: none"> - Energy in Foods: Partition in the Body: - In vitro and in vivo aspects of food energy. - Dietary-induced thermogenesis. | Dr Hadeel Ali Ghazzawi | A1,B3,A2 |
| | 1.3 | <ul style="list-style-type: none"> - Energy in Nutrition: Fundamental Principles: - Bioenergetics and oxidative metabolism. - Energy-releasing and energy-utilizing systems. - Thermodynamics in metabolism. - Thermodynamics and the role of ATP. - Bond energy concept and high-energy compounds. - Levels of cellular phosphorylation. | Dr Hadeel Ali Ghazzawi | A1,A2,C3 |
| 3-4 | 2.1 | <ul style="list-style-type: none"> - Metabolic Regulation and Control Mechanisms: - Kinetics and metabolism. - Flux-generating enzymes and key regulators. - Thermodynamic approach of metabolic regulation. | Dr Hadeel Ali Ghazzawi | A1,A2, D2 |
| | 2.2 | <ul style="list-style-type: none"> - How to conduct population-based nutrition research and assess the nutrition needs of a population; | Dr Hadeel Ali Ghazzawi | A2 |
| | 2.3 | <ul style="list-style-type: none"> - Planning, implementing, and evaluating the community nutrition programs and policies using evidence-based practice and taking into consideration cultural, social, and contextual dimensions. | Dr Hadeel Ali Ghazzawi | C2,B3 |
| 5-7 | 3.1 | <ul style="list-style-type: none"> - Substrate and Cellular Energy Metabolism: - Aspects of cellular biochemistry: A bioenergetics approach. - Fuel and substrate biotransformation | Dr Hadeel Ali Ghazzawi | C1,D1 |
| | 3.2 | <ul style="list-style-type: none"> - Catabolism of major fuels: An overview. - Oxidative phosphorylation: Chemiosmotic theory. - Anaerobic metabolism: Cori cycle. | Dr Hadeel Ali Ghazzawi | A1,A2 |
| | 3.3 | <ul style="list-style-type: none"> - Anabolism of the major fuels: A bioenergetics approach. - Energetic differences in substrate oxidation/cellular efficiency of storage. | Dr Hadeel Ali Ghazzawi | A4,C2 |
| 8-9 | 4.1 | <ul style="list-style-type: none"> - Integration of fuel metabolism: Uniqueness of individual organ and tissue - Overall ATP Production in the Body: - ATP turnover in the body. - Effects of diet quality and quantity. | Dr Hadeel Ali Ghazzawi | B3,D2 |
| 10-11 | 5.1 | <ul style="list-style-type: none"> - Whole Body Energy Metabolism: Metabolic Interrelations: | Dr Hadeel Ali Ghazzawi | A2-A9, B1-B3, C3-C5, D3-D5 |

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|-------|-----|---|------------------------|----------------------------|
| | | <ul style="list-style-type: none"> - Starve-fed cycles. - Effects of various nutritional, hormonal and physical states. - Regulation and control mechanisms. | | |
| 12 | 6.1 | <ul style="list-style-type: none"> - Whole Body Energy Balance: Concepts and Measurements: - The energy balance equation. - Thermodynamics and energy balance in man. - Direct and indirect calorimetry. - Non-calorimetric techniques. - Body composition and energy stores. | Dr Hadeel Ali Ghazzawi | A2-A9, B1-B3, C3-C5, D3-D5 |
| 13-14 | 7.1 | <ul style="list-style-type: none"> - Whole Body Energy Balance: Regulatory Mechanisms: - Regulation and control systems of appetite. - Theories of appetite control. - Components of energy expenditure. - Thermogenesis and energy balance. - Cellular mechanisms of thermogenesis. - Effects of nutritional/ physical status on energy balance. - Control mechanisms of thermogenesis. - Effect of dieting on body composition and energy stores | Dr Hadeel Ali Ghazzawi | A2-A9, B1-B3, C3-C5, D3-D5 |
| 15-16 | 8.1 | <ul style="list-style-type: none"> - White and Brown Adipose Tissues: Bioenergetics Concepts: - Structure, body distribution and metabolism. - Cellularity and metabolic activity. - Thermogenic mechanisms. - Distinctive features of white and brown adipose tissues. - Nutritional and hormonal influences.. | Dr Hadeel Ali Ghazzawi | A1-A9, B1-B5, C1-C5, D1-D5 |
| 17 | 9.1 | <ul style="list-style-type: none"> - Energy in Nutrition: Selected Clinical Correlations: - Obesity and overweight. - Thyroid dysfunction. - Burns and injuries. - Fever and Hyperthermia. - Disorders of white and brown adipose tissues. | Dr Hadeel Ali Ghazzawi | A1-A9, B1-B5, C1-C5, D3,D4 |

- Teaching methods include: Synchronous lecturing/meeting; Asynchronous lecturing/meeting
- Evaluation methods include: Homework, Quiz, Exam, pre-lab quiz...etc
- **21. Teaching Methods and Assignments:**

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

a) 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.

b) 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).

c) 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.

23 Evaluation Methods:

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

| Evaluation Activity | Mark | Topic(s) | Period (Week) | Platform |
|----------------------------|-------------|---------------------------|----------------------|-----------------|
| Mid Exam | 30 | Lectures and Discussions. | | |
| Project exam | 15 | Lectures and Discussions. | | |
| Student participation | 5 | Lectures and Discussions. | | |
| Final Exam | 50 | Lectures and Discussions. | | |

24 Course Requirements (e.g: students should have a computer, internet connection, webcam, account on a specific software/platform...etc):

Software

Lectures, group discussion and student critical reading and presentation of research papers. Teaching tools include the use of the board, transparencies, PowerPoint presentation and handouts.

25 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.

26 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. Blaxter K. Energy Metabolism in Animal and Man. Cambridge: Cambridge University Press, Latest edition.
3. Brody T. Nutritional Biochemistry. New York: Academic Press, Latest edition.
4. Rodwell V.W., Bender D.A., Botham K.M., Weil P.A. Harper's Illustrated Bio-chemistry. California: McGraw Hill Education; Lange Medical Publications, 30th edition, 2017.
5. Gropper S.S., Smith J.L., Groff J.L. Advanced Nutrition and Human Metabolism. 6th Edition, Wadsworth, Cengage Learning. Belmont, CA, USA, 2016.

Recommended books, materials, and media:

6. Shils M.C., Olson T.A. & Shike M. Modern Nutrition in Health and Disease. Philadelphia: Lea and Febiger, Latest edition.
7. Stryer L. Biochemistry. New York: W.H. Freeman, Latest edition.
8. Rolfes S.R, Pinna K. and Whitney E. Understanding Normal and Clinical Nutrition. U.S.A: Thomson-Wadsworth, Latest edition.
9. Mahan LK, Escott-stump S & Raymond JL. Food and the Nutrition Care Process. Philadelphia: W.B. Saunders, 2018.
10. Bender DA. Introduction to Nutrition and Metabolism. London: Taylor and Francis, Latest edition.
11. Most Recent Nutritional Biochemistry Textbooks and Articles.
12. Selected Internet Sites :
 1. www.nutrition.org
 2. www.faseb.org/ascn
 3. www.webmed.com
 4. www.fda.gov
 5. www.asns.org
 6. www.ilsa.org
 7. www.usda.gov
 8. www.diabetes.org
 9. www.dietitians.ca
 10. www.nas.edu
 11. www.dietetics.com
 12. www.apha.org
 13. www.bda.uk.com
 14. www.nse.org
 15. www.fao.org/food
 16. www.who.int

27 Additional information:

Name of Course Coordinator: Hadeel Ali Ghazzawi Signature: Date: 10/10/2021

Head of Curriculum Committee/Department: ----- Signature: -----

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

Head of Curriculum Committee/Faculty: ----- Signature: -----

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