



## Course Specifications

|                      |  |
|----------------------|--|
| <b>Course Title:</b> | Food Metabolism                        |
| <b>Course Code:</b>  | 2063104-3                              |
| <b>Program:</b>      | Bachelor in Food Science and Nutrition |
| <b>Department:</b>   | Food Sciences and Nutrition Department |
| <b>College:</b>      | College of Science                     |
| <b>Institution:</b>  | Taif University                        |

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## A. Course Identification:

|  |  |                                   |  |
|--|--|-----------------------------------|--|
| <b>1. Credit hours: 3 H</b>  |  |                                   |  |
| <b>2. Course type</b>  |  |                                   |  |
| a.   | University <input type="checkbox"/>          | College <input type="checkbox"/>  | Department <input checked="" type="checkbox"/> |
| b.   | Required <input checked="" type="checkbox"/> | Elective <input type="checkbox"/> | Others <input type="checkbox"/>                |
| <b>3. Level/year at which this course is offered:</b> 7 <sup>th</sup> Level/3 <sup>rd</sup> year |  |                                   |  |
| <b>4. Pre-requisites for this course (if any):</b> Chemistry of Food Components (2062203-3)      |  |                                   |  |
| <b>5. Co-requisites for this course (if any):</b>  |  |                                   |  |

### 6. Mode of Instruction (mark all that apply)

| No | Mode of Instruction   | Contact Hours | Percentage |
|----|-----------------------|---------------|------------|
| 1  | Traditional classroom | √             | 100%       |
| 2  | Blended               | ---           | ---        |
| 3  | E-learning            | ---           | ---        |
| 4  | Correspondence        | ---           | ---        |
| 5  | Other                 | ---           | ---        |

### 7. Actual Learning Hours (based on academic semester)

| No                   | Activity          | Learning Hours |
|----------------------|-------------------|----------------|
| <b>Contact Hours</b> |                   |                |
| 1                    | Lecture           | 30             |
| 2                    | Laboratory/Studio | 30             |
| 3                    | Tutorial          | ---            |
| 4                    | Others (specify)  | ---            |
| <b>Total</b>         |                   | <b>60</b>      |

\* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes:

|  |
|--|
| <p><b>1. Course Description</b><br/>Generation of metabolic energy in higher organisms- regulation at the molecular, cellular and organ level- biological oxidation -free radicals and antioxidants. Chemical and mechanisms of enzymatic catalysis.</p>   |
| <p><b>2. Course Main Objective</b></p> <ol style="list-style-type: none"> <li>1) Recognize the major classes of food metabolism like carbohydrates metabolism, lipids metabolism, amino acids (protein) metabolism.</li> <li>2) Show the different metabolic pathways of glucose and other small molecules.</li> <li>3) Show the structure and functions of different enzymes responsible about food metabolism</li> <li>4) Memorize the important and biological effects of different kinds of hormones in metabolic process.</li> <li>5) List the scientific concepts of roles of some vitamins in the regulation of carbohydrate, lipid, and protein metabolism.</li> <li>6) Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web-based reference material, changes in content as a result of new research in the field).</li> <li>7) There are several plans in order to improve the course such as following the recent books and publications in this field to update the knowledge.</li> <li>8) Moreover, increasing the practice time in the laboratory and applied the practical experiments to detected the undesirable substances to evaluate the human health.</li> </ol> |

### 3. Course Learning Outcomes

| CLOs     |   | Aligned PLOs |
|----------|---|--------------|
| <b>1</b> | <b>Knowledge and understanding:</b>   |              |
| 1.1      | Recognize the transfer and utilization of energy in biological systems  | <b>K1</b>    |
| 1.2      | Recognize the types of prooxidants and antioxidants   | <b>K1</b>    |
| 1.3      | List the mechanisms of carbohydrates metabolism including glycolysis, citric acid cycle, gluconeogenesis and glycogenolysis   | <b>K1</b>    |
| <b>2</b> | <b>Skills:</b>  |              |
| 2.1      | Design, skillfully and professionally the solvent of the problems which come from major steps of oxidative phosphorylation and solve problems about mechanism of antioxidants work. | <b>S1</b>    |
| 2.2      | Apply mathematics, biostatistics and data analysis in applied food metabolism and energy production.  | <b>S1</b>    |
| 2.3      | Classify the role of different enzymes in food metabolism and using the different determination methods to evaluate the human health.   | <b>S1</b>    |
| <b>3</b> | <b>Values:</b>  |              |
| 3.1      | Support to communication both oral and written for data presentation and explanation of food metabolism related issues.   | <b>V2</b>    |
| 3.2      | Support both oral and written excellence for data presentation and explanation of food metabolism related issues.   | <b>V3</b>    |

### C. Course Content:

| No | List of Topics   | Contact Hours |
|----|--|---------------|
| 1  | <b>I - Biological oxidation</b><br>- Bioenergetics (Biochemical Thermodynamics).<br>- Biologic oxidation: Enzymes and co-enzymes involved in biological oxidation.<br>- Electron transport chain and oxidative phosphorylation.                                    | 3             |
| 2  | <b>II- Pro-oxidants and antioxidants</b><br>- Pro-oxidants<br>- Reactive oxygen species<br>- Reactive nitrogen species<br>- Transition metals<br>- Antioxidant<br>- Oxidative stress<br>- Physiological roles and pathological effects of Pro-oxidants.            | 3             |
| 3  | <b>III- Carbohydrates metabolism</b><br>- Metabolic pathways of glucose:<br>- Glycolysis, Oxidative decarboxylation of pyruvate to acetyl CoA, Citric acid cycle, Gluconeogenesis, Glycogenesis, Glycogenolysis, Hexose monophosphate shunt & Uronic acid pathway. | 6             |
| 4  | - Regulation of blood glucose levels   | 3             |
| 5  | <b>V-Lipids metabolism:</b><br>- Digestion and absorption.<br>- Types of body lipids   | 3             |
| 6  | - Fatty acid synthesis and elongation & Synthesis of triglycerides.<br>- Metabolism of adipose tissue  | 3             |
| 7  | - Metabolism of ketone bodies.<br>- Cholesterol metabolism.<br>- Metabolism of phospholipids.<br>- Prostaglandins and related compound   | 3             |
| 8  | <b>IV- Protein metabolism</b><br>- Metabolic fate of amino acids (deamination – transamination - trans-deamination).<br>- Metabolism of Ammonia & ammonia toxicity.  | 3             |
| 9  | - Urea cycle.  | 3             |

|                         |  |           |
|-------------------------|--|-----------|
|                         | <ul style="list-style-type: none"> <li>- Metabolism of individual amino acids &amp; their biological role: Glycine; serine Sulphur-containing amino acids (cysteine &amp; methionine) Aromatic amino acids (phenylalanine-tyrosine – tryptophan)</li> <li>- Basic amino acids (lysine- arginine- histidine)</li> <li>- Acidic amino acids (aspartic – glutamic)</li> </ul> |           |
| <b>Total</b>            |  | <b>30</b> |
| <b>Practical Topics</b> |  |           |
| 1                       | - Guidelines for working in food metabolism laboratory - Laboratory safety precautions - Practical guidelines.   | 3         |
| 2                       | - Determination of blood glucose level chemical and enzymatic methods  | 6         |
| 3                       | - Lipids and lipoproteins:<br>- Determination of serum triglycerides   | 3         |
| 4                       | - Determination of total cholesterol<br>- Determination of heart enzymes (LDH,CPK)   | 3         |
| 5                       | - Lipids and lipoproteins (continued):<br>- Determination of HDL- cholesterol  | 3         |
| 6                       | - Determination of LDL-cholesterol   | 3         |
| 7                       | - Tests for evaluation of liver function (continued)   | 6         |
| 8                       | - Kidney function tests  | 3         |
| <b>Total</b>            |  | <b>30</b> |

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code       | Course Learning Outcomes  | Teaching Strategies          | Assessment Methods   |
|------------|---|------------------------------|--|
| <b>1.0</b> | <b>Knowledge and understanding</b>  |                              |  |
| 1.1        | Recognize the transfer and utilization of energy in biological systems  | Lecture                      | Written exam   |
| 1.2        | Recognize the types of prooxidants and antioxidants   | Lecture                      | Written exam   |
| 1.3        | List the mechanisms of carbohydrates metabolism including glycolysis, citric acid cycle, gluconeogenesis and glycogenolysis.  | Lecture- - practical         | Oral evaluation<br>Lab reports                             |
| <b>2.0</b> | <b>Skills</b>   |                              |  |
| 2.1        | Design, skillfully and professionally the solvent of the problems which come from major steps of oxidative phosphorylation and solve problems about mechanism of antioxidants work. | Discussion                   | Written exam<br>Lab reports                                |
| 2.2        | Apply mathematics, biostatistics and data analysis in applied food metabolism and energy production..   | Creative problem solving     | Worksheets   |
| 2.3        | Explain the role of different enzymes in food metabolism and using the different determination methods to evaluated the human health.   | Assignment and Self-learning | Continuous evaluation<br>Discussion and opinion evaluation |
| <b>3.0</b> | <b>Values</b>   |                              |  |
| 3.1        | Support to communication both oral and written for data presentation and explanation of food metabolism related issues.   | Project                      | Observation, discussion                                    |
| 3.2        | Response to suitable audiovisual media in presentation of the data of the different practical biochemistry and body fluids analysis.  | Work in groups               | Evaluation of the results of each group.                   |

## 2. Assessment Tasks for Students

| # | Assessment task*                           | Week Due  | Percentage of Total Assessment Score |
|---|--|-----------|--------------------------------------|
| 1 | Assignment and Interaction during lectures | Continues | 10%                                  |
| 2 | Midterm exam                               | 5-6       | 20%                                  |
| 3 | Weekly Lab. Reports                        | Continues | 20%                                  |
| 4 | Practical exam                             | 11        | 10%                                  |
| 5 | Final exam                                 | 12        | 40%                                  |

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support:

### Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

There are 5 h per week for this purpose and the students know these hours according to the time of professor who teach the course.

## F. Learning Resources and Facilities

### 1. Learning Resources

|                                       |   |
|---------------------------------------|---|
| <b>Required Textbooks</b>             | - Principles of Medical Biochemistry, 3th ed., G. Meisenberg, W. H. Simmons, Elsevier Inc., 2012. ISBN 13: 978-0-323-07155-0<br>- Lecture notes of Biochemistry II prepared by instructors. 1. Lippincott's illustrated Reviews of Biochemistry 5th ed., R. Harvey and D. Ferrier, 2011, Lippincott's, ISBN:978-1-60913-998-8 |
| <b>Essential References Materials</b> | - Biochemistry 7th Ed., Campbell and Farrell, Brookscole, Cengage Learning, 2012<br>- Biochemistry 6th Ed., J.M. Berg, J.L. Tymoczko, and L. Stryer, W.H. Freeman Company.  |
| <b>Electronic Materials</b>           | - Journal of food metabolism<br>- Journal of antioxidants   |
| <b>Other Learning Materials</b>       | - None  |

### 2. Facilities Required

| Item   | Resources  |
|--|--|
| <b>Accommodation</b><br>(Classrooms, laboratories, demonstration rooms/labs, etc.)   | - One Lecture hall with comfortable seats (about 50 m <sup>2</sup> )                           |
| <b>Technology Resources</b><br>(AV, data show, Smart Board, software, etc.)  | - Laptop and Data show   |
| <b>Other Resources</b><br>(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | - specify, e.g. if specific laboratory equipment is required, list requirements or attach list |

## G. Course Quality Evaluation

| Evaluation Areas/Issues                                     | Evaluators  | Evaluation Methods     |
|---|---|------------------------|
| Student evaluation by students<br>Organized every semester. | Students  | - Direct<br>- indirect |
| Learning resources  | - Program leaders<br>- Staff member<br>- Students | - indirect             |
| Effectiveness of teaching and<br>assessment                 | - Students  | - indirect             |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data:

|                     |   |               |
|---------------------|---|---------------|
| Council / Committee | Department council - Academic Development Committee |               |
| Reference No.       | Department council NO: 2                            | Subject NO: 1 |
| Date                | 30 /02 /1444 H                                      |               |

