**Microbial Physiology**

**Course objective:**

The course will cover Microbial Physiology texts topics with print media and internet articles including schematic diagrams, images and movies that deal with the field of microbial physiology that expanded at an incredibly rapid pace since the last edition of this text. To give full measure to the extraordinary advances made in microbial physiology. The development and implementation of new, highly sophisticated, techniques to study the molecular genetics and physiology of an ever broadening range of microbes has prompted to study this field of the science. The lectures consider with the bacterial structures, microbial growth, nutrition requirements, the factors that affecting growth, micro and macronutrient, enzymes and the metabolism pathways of the microorganism, intermediary metabolism; also deals with antibiotics and toxins production by these microbes. One of the benefits of students taking Microbial Physiology course is that they will become more familiar with the microbial metabolism, and to better appreciate the elegant simplicities and the intricate complexities of microbial physiology, while at the same time realizing that there is still much to be learned.

**Forms of Teaching:**

Different forms of teaching will be used to reach objectives of the course: power point presentations for the head titles and definitions and summary of conclusions, metabolisms pathway. The lectures content will be in English language, in addition to discussions and clearing in English, Arabic and Kurdish language if necessary, the lecture will give enough background to translate, solve, and analyze problems sets and different issues discussed throughout the course.

**Grading:**

The students are required to do two closed book **exams** during the academic course, beside the **attendance**, **classroom activities** count 25 marks, and there will be final examination on 60 marks as the followings:

Theory examinations **15%**

Practical examination **35%**

Final examination **50%**

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 **100**

**Course material**

Required book

1. A. G. Moat, J. W. Foster, and M. P. Spector (2002). **Microbial Physiology**, 4th edition.
2. G. N. Cohen (2011). **Microbial Biochemistry**. 2nd Edition, Springer
3. L. M. Prescott, J. P. Harley and D. A. Klein (2005). **Microbiogy**, 6th Edition. Mc Graw-Hill.
4. D. H. Griffin (1981). **Fungal Physiology**.
5. T. D. Brock (1990). **Biology of Microorganisms**, 2nd edition, prentice-Hall, Inc.
6. G. C. Ainsworth and A. S. Sussman (1969). **The Fungi (The Fungal Cell)**, Academic Press
7. R. W. Bauman (2007). **Microbiology with diseases by Taxonomy**, 2nd Edition.

**Course program**

Week 1:

Introduction, course outline of the Science of Microbial Physiology

Microbial Growth

Growth curve

Week 2: Monday:

Factors affecting growth

Physical factors:

Temperature

Osmotic pressure

pH, Radiation

Chemical factors:

CO2, O2, H2O

Fungicides

Antibiotics

Week 3: Monday:

Nutritional requirements

Macronutrient:

Carbon, Nitrogen, Phosphorus,, Sulfur, Potassium, Magnesium

Micronutrient:

Copper, Iron, Manganese, Zinc, Molybdenum

Week 4: Monday

Transport of solutes

Passive diffusion

Facilitated diffusion

Active transport and co-transport

Group translocation

Week 5: Monday

Microbial metabolism

Embden-Meyerhof-Parnas (EMP) pathway

Homofermentative organism

Heterofermentative organism

Respiration

The Tricarboxylic acid cycle (TCA)

The Respiratory chain

Week 6: Monday

Entner- Duodoroff (ED) Pathway

Phosphoketolase Pathway (Warburg-Dickens- Horecker)

Pentose Phosphate Pathway (PPP)

Week 7: Monday

Exam

Week 8: Monday

Energetic of biosynthesis

Gluconeogenesis

Metabolism of Autotrophs

Chemolithitrophy

Photoautotrophy

Week 9: Monday

Fungal toxins

Toxins drived from aminoacids

Ergotamine, Lysergic acid and Ergot alkaloid

Aromatic and Phenolic toxins

Aflatoxins

Trichothecens

Week 10: Monday

Bacterial toxins

Exotoxins

Endotoxins

Week 11: Monday

Mechanism of survival:

Sporulation

Endospores and mutations

Spore dormancy, activation and germination

Week 12: Monday

Interaction between organisms

Neutralism

Commensalism

Mutualism

Synergism

Competition

Parasitism

Week 13: Monday

Microbial pathogenisity

Bacterial virulent factors

Fungal virulent factors

Week 14: Monday

Exam