



The University of Jordan

Accreditation & Quality Assurance Center

COURSE Syllabus

1	Course title	Microbial Physiology
2	Course number	0304942
3	Credit hours (theory)	3
	Contact hours (theory)	3
4	Prerequisites/co-requisites	None
5	Program title	Ph.D. in Biological sciences
6	Program code	0304
7	Awarding institution	University of Jordan
8	School	Sciences
9	Department	Biological sciences
10	Level of course	Ph.D.
11	Year of study and semester (s)	Ph.D. second Semester
12	Final Qualification	Ph.D.
13	Other department (s) involved in teaching the course	None
14	Language of Instruction	English
15	Date of production/revision	2015-2016

16. Course Coordinator:

Office numbers, office hours, phone numbers, and email addresses should be listed.

Office number : 302

Office hours: one hour before the lectures and any time I am in the office.

Phone number : 22236

Email address : hmasoud@ju.edu.jo

17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

none

18. Course Description:

A detailed study of the bacterial cell structure and function, also a brief study of cell structure for other microorganisms (such as archaea, fungi, protozoa and algae). Study the dynamic of bacterial growth in both batched and continuous bacterial cultures. Environmental factors that influence bacterial growth and physiological adaptations of microorganisms to various environmental factors. Microbial cellular metabolism including various pathways for energy production (aerobic- and anaerobic- respiration, fermentation, chemolithoautotrophic and bacterial phototrophic metabolism).

19. Course aims and outcomes:

<p>A- Aims: this course aims at:</p> <p>Detailed study of bacterial cell structure and function. Dynamic of bacterial growth and physiological adaptation of bacteria to various environmental factors. Bacterial metabolism and diversity of energy production pathways used by various microorganisms.</p> <p>B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to ...</p>
1. understand the meaning of the phylogenetic classification of living organisms
2. differentiate between bacteria, archaea and eukaryotes
3. discriminate between morphological characteristics of microorganisms (size, shape and arrangement)
4. distinguish the plasma membrane structures of bacteria, archaea and eukaryotes
5. discriminate between various transport mechanisms across plasma membrane (into and outside the cell)
6. describe the detailed structures of bacterial cell wall components peptidoglycan biosynthesis (Gram positive and Gram negative bacteria)
7. understand the importance of cell wall in osmotic protection
8. list the various inclusion bodies and their function
9. explore the nucleoid region and DNA folding in bacteria
10. classify various types of plasmids based on their role in bacteria
11. list the various extracellular cell components and their function (capsule, slime and S-layer)
12. explain the mechanisms of cell motility and response of microorganisms to various external factors including chemicals, light, magnetic field, temperature etc
13. describe the flagella ultrastructures of Gram negative and Gram positive bacteria
14. understand the role of endospores in bacterial survival under unfavorable conditions
15. describe the endospore structure and determine the role of various parts in heat and chemical resistance
16. describe the various phases of bacterial cell division
17. describe the various phases of bacterial growth in batch culture and physiological adaptation of bacteria in each phase
18. calculate the growth rate of bacteria (generation time and growth rate constant)
19. understand the concept of continuous culture and how to control the growth rate in continuous culture
20. understand the influence of low water activity on microorganisms
21. classify the microorganisms according to their tolerance to low water activity and the physiological adaptation of microorganisms to low water
22. understand the influence of high and low temperature on the growth of microorganisms
23. classify the microorganisms according to their optimal growth temperature and physiological adaptation of microorganisms to low and high growth temperature
24. understand the effect of pH on the growth of microorganisms and classify microorganisms according to their optimal pH for growth
25. distinguish between various pathways of energy production in bacteria (aerobic and anaerobic respiration, fermentation, chemolithotrophic and photosynthetic metabolic pathways)
26. Calculate the free energy produced by different metabolic reactions and pathways
27. contrast the various types of glycolysis (Embden-Meyerhof, pentose phosphate, Entner-Doudoroff, methyl glyoxal pathways)
28. contrast the various types of fermentation in microorganisms (alcoholic, lactic, propionic, butanoic, mixed acid, butanediol, methanogenic bacteria, stickland reaction, etc)
29. prepare and write a proper scientific term paper
30. prepare and present a proper scientific presentation

20. Topic Outline and Schedule:

1.					
Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
2. Introduction	3. 1	4. Hussein Masoud	5. 1-2	6. Lecture discussion	7. Neidhardt: Physiology of bacteria and Atlas: Principle of Microbiology
8. Microbial morphology and Plasma membrane	9. 2	10. =	11. 3-5	12. =	13. Atlas: Principle of Microbiology Brock: Biology of Microorganisms
14. Cell wall	15. 3-4	16. =	17. 6-7	18. =	19. =
20. Internal structures	21. 5	22. =	23. 8-10	24. =	25. =
26. External structure and motility	27. 6	28. =	29. 11-13	30. =	31. =
32. Endospores	33. 7	34. =	35. 14-15	36. Midterm exam	37. =
38. Bacterial growth dynamic	39. 8	40. =	41. 16-19	42. Lecture discussion	43. =
44. Environmental factors affecting bacterial growth	45. 9-10	46. =	47. 20-24	48. =	49. =
50. Energy production pathways	51. 11-12	52. =	53. 25-27	54. =	55. Gottschalk: bacterial metabolism Atlas: Principle of Microbiology Brock: Biology of Microorganisms
56. Fermentation	57. 13	58. =	59. 28	60. =	61. =
62. Term paper presentation	63. 14-15	64. =	65. 29-30	66. =	67. Scientific literatures

21. Teaching Methods and Assignments:

<p>Development of ILOs is promoted through the following <u>teaching and learning methods</u>:</p> <ol style="list-style-type: none"> 1. lecturing 2. discussion 3. exams 4. presentations and term papers
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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:

1. discussion
2. exams
3. presentations and term papers

23. Course Policies:

A- Attendance policies: taking attendance

B- Handing the term papers on time

C- Honesty policy regarding cheating, plagiarism in exams and term papers.

D- Grading policy: Midterm exam, final exam, presentation, term paper: 30%, 40%, 15% and 15%, respectively.

E- Available university services that support achievement in the course: library, internet.

24. Required equipment:

Overhead projector and data show.

25. References:

1. Atlas, R.M. Principle of Microbiology (2nd ed .1997) WCB
2. Madigan, M.T., Martinko, J. M., Stahl, D. A. and Martinko, J.M. Brock: Biology of Microorganisms (13th ed. 2012). Pearson, Prentice Hall.
3. Gottschalk, G. Bacterial Metabolism (2nd ed. 1986) Springer Verlag.
4. Neidhardt, F.C., Ingraham, J.L. and Schaechter, M. Physiology of the Bacterial Cell: A molecular approach. Sinauer.

26. Additional information:

Name of Course Coordinator: Hussein Masoud. Signature: ----- Date: 6/6/2016

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

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

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

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

Copy to:
Head of Department
Assistant Dean for Quality Assurance
Course File