#### Course Title: Microbial taxonomy and fermentation

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| **University** | **Benha** |
| **Faculty** | **Faculty of Agriculture** |
| **COURSE SPECIFICATIONS:** |
| Program of which the course is given | **Agricultural Biotechnology** |
| Major or Minor element of Program | **General course** |
| Departments offering the Program | **Agric. Botany (microbiology branch)**  |
| Department offering the course | **Agric. Botany (microbiology branch)**  |
| Academic year / Level | **First level / Second semester** |
| Date of specification approval |  |

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| **A- BASIC INFORMATION**  |
| Title  | Microbial taxonomy and fermentation  |
| Code |  |
| Credit Hours  | 56 hours |
| Lecture | 2 Hours / week |
| Practical | 2 Hours / week  |
| Total: |  4 Hours/ week |

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| **B- PROFESSIONAL INFORMATION** |
| **1 – OVERALL AIMS OF COURSE** |
| 1. **Knowing the students with the different groups of bacteria.**
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| 1. **Showing the classification schemes of bacteria.**
 |
| 1. **Understanding the importance of each group of bacteria.**
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| 1. **Understanding the essential topics of fermentation aerobic, biofilm and anaerobic fermentation.**
 |
| 1. **Describing the static, submerged and continuous fermentation.**
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| 1. **Providing the students with basic principles of biological substances production.**
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| 1. **Knowing the students with the relationship between biotechnology and microbial fermentation.**
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| **2 – Intended Learning Outcomes of Course (ILOs)** |
| **A. Knowledge and Understanding:** |
| 1. **Know the role of bacteria in human life.**
 |
| 1. **Understand the different taxa of bacteria different.**
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| 1. **Know the relation between bacteria and ecosystem.**
 |
| 1. **Define the essential type of fermentation.**
 |
| 1. **Understand the different between static and submerged cultures.**
 |
| 1. **Understand the application of fermentation in usefulness of industrial wastes.**
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| B. Intellectual Skills: |
| ***Successful completion of this course will allow students to:***  |
| 1. **Recognize the optimal method for taxonomy of bacteria**
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| 1. **– Explain the important categories of bacteria**
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| 1. **choose the best methods of fermentation to produce the important products.**
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| 1. **discuss the different between types of fermentation technique.**
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| 1. **evaluate the fermented products.**
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| C. Professional and Practical Skills: |
| 1. **Know how to identify the bacteria.**
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| 1. **Check up the different groups of bacteria.**
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| 1. **Implement taxonomy tasks under lab conditions.**
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| 1. **draw the fermentation components.**
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| 1. **determine the fermentation type for every raw material.**
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| 1. **analyze experimental data concerning the fermented products requirements.**
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| D. General and Transferable Skills: |
| 1. **work separately or in a team to research and prepare a scientific topic.**
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| 1. **use available presentation aids e.g. Overhead Projectors or data show to present clearly and effectively a scientific topic.**
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| 1. **Present microbial fermentation data in a graphical form.**
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| 1. **Understand how to classify the bacteria.**
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| 1. **Use available presentation aids i.e overhead projector and data show to present clearly and effectively scientific topics.**
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| 1. **Utilize the different references concerning the taxonomy of bacteria.**
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| 3. a- LECTURES CONTENTS |
| **Topic** | **No. of hours** | **Lectures** |
| ***Lectures content:*****Introduction.** | 4 | 2 |
| **Classification of bacteria.** |  |  |
| **Important bacterial groups: Archaebacteria, Gram positive cocci, Gram negative cocci, Endospores forming, Gram positive rods, Gram positive filamentous (Actinobacteria), Gram negative short rods** | 4 | 2 |
| **Biotechnology and microbial fermentation: Fermentation unit strains collection laboratory .Aerobic fermenters. Biofilm reactors. Anaerobic fermentation. Raw materials. Static and submerged cultures. Continuous fermentation.** | 6 | 3 |
| **Alcoholic, vinegar and Pyruvic acid fermentations.** | 4 | 2 |
| **Microbial cell as food and food additives.** | 4 | 2 |
| **Production of acetone, glycerol, citric acid, and amino acids. Single cell protein production.** | 6 | 3 |
| 3. b- PRACTICAL CONTENTS |
| **Topic** | **No. of hours** | **Practical** |
| **Staining and checkup of Micrococci** | 4 | 2 |
| **Staining and checkup of Streptococcus** |  |  |
| **Staining and checkup of Bacilli** | 4 | 2 |
| **Staining and checkup of Lactobacilli** | 6 | 3 |
| **Propagation and checkup of Azotobacter and Rhizobia**  | 4 | 2 |
| **Propagation and checkup of E. coli**  | 4 | 2 |

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| 4. TEACHING AND LEARNING METHODS |
| 1. The main subject areas are covered in the lectures (see syllabus Plan).
2. Several student seminar sessions give the opportunity for students to bring questions or discuss any aspects of the course with the tutor.
3. Students are given a topic to research in small groups which they report as an oral presentation. Collective feedback on the strengths and weaknesses of the presentations are provided.
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| 5. STUDENT ASSESSMENT METHODS |
| ***Students will be evaluated by attendance, fulfillment and effort in exercises and presentations, and examination grades:***1) Laboratory work: to assess the ability of students to understand and perform small laboratory experiments. |

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| 6. ASSESSMENT SCHEDULE |
| No | Assessment | **Week** |
| 1 | Periodical exam  | 4th, 8th and 12th Week |
| 2 | Practical exam | 14th Week |
| 3 | Oral exam | 15th Week |
| 4 | Final exam | 16th Week |

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| 7. WEIGHTING OF ASSESSMENT |
| No | Assessment | **%** |
| 1 | Periodical exam  | 15% |
| 2 | Practical exam | 15% |
| 3 | Oral exam | 10 % |
| 4 | Final exam | 60 % |
| TOTAL | 100 % |

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| 8. LIST OF REFERENCES |
| -Bergey's Mannual of Systematic Bacteriology (2001). Williams & Wilkins, Baltimore, U.S.A.  |

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| 9. FACILITIES REQUIRED FOR TEACHING AND LEARNING |
| 1. Teaching aids/ materials: e.g. boards – overhead projector – data-show projector – stationary.. etc.
2. Teaching room/hall.
3. Computers.
4. Facilities for site visits etc., which are necessary for teaching the course.
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| **Course Coordinators:**  | **Prof. Dr.** **Prof. Dr.**  |
| **Date: / / 2015** |