

## ***Course specifications***

**Programme(s) on which the course is given: Master degree of microbiology**

**Major or minor element of programmes: Major**

**Department offering the Programme: Botany**

**Department offering the course: Botany**

**Academic year / Level One year**

**Date of specification approval: 2010**

### **A- Basic Information**

**Title: Actinomycetes and its activities Code: B687 and B587**

**Credit Houre:3h**

**Lecture: 2h**

**Tutorial: 0**

**Practical: 2h**

**Total: 4h**

### **B- Professional Information**

#### **1- Overall aims of course**

**At the end of this course, the student should be able to know the relation of actinomycetes to bacteria and fungi, morphology, cell structure, isolation, ecology of actinomycetes, classification of actinomycetes, and identification of different species of actinomycetes.**

#### **2- Intended learning outcomes of course (ILOs)**

***a- Knowledge and understanding:***

**The student should be able to:**

- 1-Understanding the necessary elements for actinomycetes isolation.**
- 2- Have the knowledge about the ecology and role of actinomycetes in the production of antibiotics and enzymes.**
- 3-Have the knowledge about the role of actinomycetes as human, animal and plant pathogens.**
- 4- Have the knowledge about the different genera and species of actinomycetes.**

***b- Intellectual skills***

**The student should be able to**

- 1- Differentiate between the morphology of bacteria, fungi and actinomycetes.**
- 2- Differentiate between the cell wall structure between the bacteria, fungi and actinomycetes.**
- 3-Differentiate between the different genera and species of actinomycetes groups.**

***c- Professional and practical skills***

**The student should be able to**

- 1- Prepare cultural media for actinomycetes growth**
- 2- Differentiate between the colonies of bacteria, fungi and actinomycetes.**
- 3- Identify the different pigments produced by actinomycetes**
- 4- Define the antimicrobial activities of actinomycetes**
- 5- Define the hydrolytic enzymes produced by actinomycetes.**
- 6- Differentiate between the different types of actinomycetes cell wall chemotypes.**

7- Differentiate between the different types of actinomycetes amino acids.

8-Differentiate between the different types of actinomycete lipids.

9- Define the genotypic characterization to each genus of actinomycetes.

*d-General and transferable skills*

1-Scientific writing and oral communication.

2-Practical dealing with microorganisms.

3-Providing a protocol for identification of actinomycetes.

**3-Contents**

| <b>Topic</b>                                                                                                                                  | <b>No.<br/>of<br/>hours</b> | <b>Lecture</b> | <b>Practical</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------|------------------|
| <b><i>Introduction:</i></b><br>Relation of actinomycetes to fungi.<br>Relation of actinomycetes to bacteria.<br>Actinomycetes cell structure. | <b>8</b>                    | <b>4</b>       | <b>4</b>         |
| <b><i>-Morphology of actinomycetes:</i></b><br>Substrate mycelium.<br>Aerial mycelium<br>Special structure( sclerotia, cromia,                | <b>4</b>                    | <b>2</b>       | <b>2</b>         |

|                                                                                                                                                                                                                                                                                                                                                                    |          |          |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|
| <b>synnemata and clubs).</b>                                                                                                                                                                                                                                                                                                                                       |          |          |          |
| <b>Clinical significane of actinomycetes</b>                                                                                                                                                                                                                                                                                                                       | <b>4</b> | <b>2</b> | <b>2</b> |
| <b>Ecology of actionomycetes.</b>                                                                                                                                                                                                                                                                                                                                  | <b>4</b> | <b>2</b> | <b>2</b> |
| <b>Classification of actinomycetes</b><br><b>A-Morphological characterization</b><br><b>1-Cell morphology.</b><br><b>2-Fragmentation of the substrate mycelium and aerial mycelium.</b><br><b>3-Branching of the aerial mycelium.</b><br><b>4-Morphology of spore bearing organs</b><br><b>5- Morphology of spores.</b><br><b>6- Morphology of spores surface.</b> |          |          |          |
| <b>B-Cultural characterization</b><br><b>1-Growth temperature and heat tolerance.</b><br><b>2-Oxygen and carbon dioxide requirements.</b><br><b>3- Nutritional</b>                                                                                                                                                                                                 | <b>4</b> | <b>2</b> | <b>2</b> |

|                                                                                                                                                                                                                                                                                                                                                                                                                              |          |          |          |
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| <b>requirements and growth factors.</b><br><b>4-Pigment production.</b><br><b>5-Use of selective media in identification.</b><br><b>6-Growth inhibition testes.</b>                                                                                                                                                                                                                                                          |          |          |          |
| <b>C-Biochemical characterization</b><br><b>1-Respiratory-enzymes tests.</b><br><b>2-Metabolism of nitrogenous substances.</b><br><b>3-Carbohydrates metabolism.</b><br><b>4- Sulphur metabolism</b><br><b>5-Amino acid decarboxylase.</b><br><b>6- Casein hydrolysis.</b><br><b>7- Esterase and lipase activities.</b><br><b>8- Gelatine hydrolysis.</b><br><b>9- Nitrate reduction.</b><br><b>10-Pectinase activities.</b> | <b>8</b> | <b>4</b> | <b>4</b> |
| <b>D-Antimicrobial susceptibility.</b><br><br><b>E-Chemotaxonomic studies</b><br><b>1- Microbial</b>                                                                                                                                                                                                                                                                                                                         | <b>8</b> | <b>4</b> | <b>4</b> |

|                                                                                                                                                                                                      |          |          |          |
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| <b>metabolites and cellular constituents.</b><br><b>a-Lipids analysis</b><br><b>1- Cellular fatty acids</b><br><b>2-Polar lipids.</b><br><b>3-Mycolic acids.</b><br><b>4- Isoprenoid quinones</b>    |          |          |          |
| <b>b-Cell-wall analysis</b><br><b>1- Diaminopimelic acids (DAP) isomers.</b><br><b>2-Amino acids composition of peptidoglycan.</b><br><b>3-Cell wall acyle type.</b><br><b>4- Whole-cell sugars.</b> | <b>4</b> | <b>2</b> | <b>2</b> |
| <b>F- Genetic relatedness</b><br><b>1-DNA base composition.</b><br><b>2- DNA:DNA hybridization.</b><br><b>3-16 S r RNA sequencing.</b>                                                               | <b>8</b> | <b>4</b> | <b>4</b> |

#### **4- Teaching and learning methods**

**1- Lectures**

**2- Writing Reports**

**3- Practical demonstration**

## **5- Students assessment methods**

**1-Written Exam to assess understanding c ompetencies and comprehension.**

**2-Practical Exam to assess laboratory performance and professionalism.**

**3- Class activities to assess attendance and interesting.**

### **Assessment schedule**

**Assessment 1 Mid term**

**Week 7**

**Assessment 2 Semester activities**

**Week 5 and**

**8**

**Assessment 3 Final term practical exam**

**Week 13**

**Assessment 4 Final term written exam**

**Week 14**

### **Weighting of assessments**

**Mid Term Examination (written + practical)  
20%**

**Final Term Examination (written + practical  
60%**

**Oral Examination  
5%**

**Semester Work (written + practical)  
15%**

**Total  
100%**

## **6- List of references**

### ***1- Course notes***

**Prepared notes describe the outline of the lectures  
are handed out to the students**

## ***2- Essential books ( text books)***

**Text books under the title (Actinomycetes)**

## ***3-Recommended books***

**Goodfellow, M., Mordarski, M. and Willams,S.T.1983. The biology of the actinomycetes. Academic press Inc. (London) LTD.**

**Stanely, T. W., Elisabeth, M. S. and John, G. H. 1989. Bergey's Manual of Systematic Bacteriology. Willams and Wilkns. Baltimore, /mD 21202, USA.**

## ***4-Periodicals, Web sites,..... etc***

**Journal of microbiology**

**Journal of systematic bacteriology.**

**7- Facilities required for teaching and learning  
overhead and slide projectors, fresh specimens,  
microscopes, TV-demonstrating system**

**Course coordinator: Sabha Mahmoud El-Sabbagh**

**Head of Department: Mohamed Al Afify El-Hefnawy.**

**Date: 26 /9 / 2010**