

COURSE

Course code: MCB 422
Course title: Industrial Microbiology (3 UNITS)
Course status: Compulsory

COURSE DURATION

Three hours per week for 15 weeks (45hours)

LECTURERS DATA

Name of the lecturer: Dr Abalaka M.E.
Qualifications obtained: BSc, MSc, PhD
Department: Biological Sciences
College: Science and Engineering
E-mail: abalaka.moses@lmu.edu.ng
Office Location: Room
Consultation Hours: 12.00 noon – 2.00 pm daily (Monday-Friday)

Name of the lecturer: Dr Okolie C.E.
Qualifications obtained: BSc, MSc, PhD
Department: Biological Sciences
College: Science and Engineering
E-mail: okolie.charles@lmu.edu.ng
Office Location: Room 55/A311
Consultation Hours: 12.00 noon – 2.00 pm daily (Monday-Friday)

Name of the lecturer: Mr Dahunsi S.O.
Qualifications obtained: BSc, MSc
Department: Biological Sciences
College: Science and Engineering
E-mail: abalaka.moses@lmu.edu.ng
Office Location: Room 51/A304
Consultation Hours: 12.00 noon – 2.00 pm daily (Monday-Friday)

COURSE CONTENT

The following areas are covered in the course: Nature of Industrial Microorganisms; Patents and Invention; Review of biology of microorganisms of industrial importance; Propagation, maintenance and improvement of industrial microorganisms; Optimization of fermentation processes; Study of selected industrial processes involving microorganisms; Bioassay in industrial production and quality control; Microbiological standards and specifications; Shelf-life and spoilage of industrial products.

COURSE DESCRIPTION

The course Industrial Microbiology is an important course in the final year Microbiology Programme as it deals with the real applications of microorganisms and their numerous in industrial processes and product formulation. The course is a build-up on MCB 329 (Industrial training) which earlier exposed the students to industrial experience. MCB 422 is therefore meant to further equip them with the much needed skills for microbial

processes and applications in several relevant industries.

COURSE JUSTIFICATION

Industrial Microbiology is a very important course in the Microbiology Programme because of the major roles industries plays in our daily life. Several industries (Food, Dairy, Cosmetics, Pharmaceuticals, Medical, Brewery, Water processing, Biotechnology etc.) cannot do without microorganisms which serve as the fundamental resources for fermentation and other important processes. The industrial microbiologist therefore occupies a strategic position in industries as his expertise are needed in areas like Quality control/assurance, production line monitoring, fermentation, raw materials and finished product testing and others.

COURSE OBJECTIVES

At the completion of this course, students should have mastery of the following

- (i) Nature, functionality and applications of industrial microorganisms
- (ii) Optimization of several industrial processes using modern technology and mathematical approaches
- (iii) Standard specifications and control measures in industrial processes

Course Requirement – Illustration below:

In order for students to derive maximum benefits from the course and for fast grasping of the content, they must be familiar with MCB 416 (Microbiological Quality Control) already taken in the 400 Level Alpha semester besides bringing their industrial training experience to the fore.

Method of Grading- An example below

S/N	Grading	Score (%)
1.	Test	20
2.	Practical (laboratory work)	10
4.	Final Examination	70
	Total	100

COURSE DELIVERY STRATEGIES

The strategies to be adopted in this course will be a combination of Lectures, assignments and laboratory practical.

LECTURE CONTENTS

Week	Topics	Lecturer
1.	Nature of Industrial Microbiology	Dr Abalaka
2.	Patents and Inventions	Dr Abalaka
3.	Review of biology of microorganisms of industrial importance (I)	Dr Abalaka
4.	Review of biology of microorganisms of industrial importance (II)	Dr Abalaka
5.	Propagation and maintenance of industrial microorganisms	Dr Okolie
6.	Technological improvement of industrial microorganisms	Dr Okolie
7.	Optimization of fermentation processes	Dahunsi SO
8.	Study of selected industrial processes involving microorganisms (I)	Dahunsi SO
9.	Study of selected industrial processes involving microorganisms (II)	Dahunsi SO
10.	Bioassays in industrial production	Dahunsi SO
11.	Quality control in industrial production	Dahunsi SO
12.	Microbiological standards and specifications	Dahunsi SO
13.	Shelf-life and spoilage of industrial products	Dahunsi SO
14.	Revision	All lecturers
15.	Examinations	All lecturers

WEEK 1: Nature of Industrial Microbiology

Objectives

The students at the end of the lectures for the week should be able to understand the basic concepts of industrial microbiology as well as grasping its relevance in industrial processes and product formulation

Description

Students will be taken through the nature, concept, importance and applications of microorganisms and their several products in industrial processes

Study Question:

- What do you understand by Industrial Microbiology?
- What are its relevance to industrial processes and product formulation?
- What are the prospects of an Industrial microbiologist?

WEEK 2: Patents and Inventions

Objectives

The students at the end of the lectures for the week should be able to understand the fundamental and needs for conducting novel researches in Microbiology which will culminate in bagging patent rights. They should be able to explain the procedures for obtaining a patent.

Description

Students will be taken through the procedures of obtaining a patent.

Study Question:

- What do you understand by patent?
- How is a patent different from an invention?
- What are the procedures for obtaining a patent?

WEEK 3: Review of biology of microorganisms of industrial importance (I)**Objectives**

The students at the end of the lectures for the week should be able to understand the biology of specific microorganisms which have found useful application in the various industries covered in industrial microbiology

Description

Students will be taken through the biology (physiology and morphology) of specific industrially relevant microorganisms

Study Question:

- Mention five microorganisms relevant in industrial processes
- What are the functions of the above named organisms

WEEK 4: Review of biology of microorganisms of industrial importance (II)**Objectives**

The students at the end of the lectures for the week should be able to specifically state the roles of all the important microorganisms and their functions in industrial processes

Description

As a continuation of week 4 module, students will be taken through the biology (physiology and morphology) of specific industrially relevant microorganisms

Study Question:

- What do you understand by microbial metabolites?
- What is the usefulness of the metabolites?

WEEK 5: Propagation and maintenance of industrial microorganisms**Objectives**

The students at the end of the lectures for the week should be able to understand the various methods for propagating and maintaining industrially relevant microorganisms

Description

Students will be taught the various methods for culturing and maintaining industrial organisms. The concept of 'starter culture' and 'inoculum' will be thoroughly dealt with

Study Question:

- Mention the various methods of culturing industrial organisms
- Explain two of the mentioned methods
- What is the usefulness of starter culture in the food and dairy industries?

WEEK 6: Technological improvement of industrial microorganisms**Objectives**

The students at the end of the lectures for the week should be able to understand the methods for improving the efficiency of industrial organisms

Description

Students will be taken through the various modern technologies used for improving the efficiency of industrial organisms. Emphasis will be placed on molecular biology/biotechnological methods that are geared towards improved product yield in the long run

Study Question:

- Describe the method for the technological improvements of industrial organisms
- What are the advantages of molecular biology methods?

WEEK 7: Optimization of fermentation processes**Objectives**

The students at the end of the lectures for the week should be able to understand the fundamentals of optimization in industrial fermentation processes. They will also be able to explain the processes surrounding large/industrial scale production.

Description

Students will be taken through the usage of mathematical models used in microbiological optimizations.

Study Question:

- Justify the importance of optimization in industrial processes
- Describe the operating principles of one optimization tool in Microbiology

WEEK 8: Study of selected industrial processes involving microorganisms (I)**Objectives**

The students at the end of the lectures for the week should be able to understand some selected industrial processes involving microorganisms. They should also be able to discuss the functionality of the relevant microorganisms involved in such processes

Description

Students will be taken through the importance and applications of microorganisms in selected industrial processes e.g. production of ethanol, biogas, fermented foods, condiments etc.

Study Question:

- Explain biogas and bioethanol production processes
- What are the important microorganisms and their functions in such products?

WEEK 9: Study of selected industrial processes involving microorganisms (II)

Objectives

As a sequel to last week's module, the students at the end of the lectures for the week should be able to understand the processes of producing varieties of important products using microorganisms

Description

Students will be taken through the production and usage of microorganisms in the production of more industrial products of microbial origin

Study Question:

- Explain the industrial production processes for Yoghurt and Beer
- What are the functional microorganisms relevant in the production?

WEEK 10: Bioassays in industrial production

Objectives

The students at the end of the lectures for the week should be able to understand the necessities and methodologies for carrying out bioassays on raw materials, intermediate and finished products in industrial processes

Description

Students will be taken through the several methods for carrying out assays and testing on industrial materials and products. Emphasis will be placed on microbiological assays as a means of ensuring compliance with prescribed standards for productions

Study Question:

- What do you understand by the term 'assay'?
- Describe the methods for carrying out assay for two important microbial products

WEEK 11: Quality control in industrial production

Objectives

The students at the end of the lectures for the week should be able to understand the basic concepts of quality control and assurance in industrial processes as well as grasping the

various standards protocols for carrying out quality assurance for specific microbial products and their validations

Description

Students will be taken through the concept, importance and applications of quality assurance procedures into manufacturing process of industrial products

Study Question:

- What do you understand by Microbiological quality control?
- What are its relevance to industrial processes and product formulation?
- What are the prospects of Quality assurance personnel in Industrial microbiology?

WEEK 12: Microbiological standards and specifications

Objectives

The students at the end of the lectures for the week should be able to understand the various microbiological standards and specifications that are applicable to industrial processes and product formulation

Description

Students will be taken through the importance and applications of microbiological standards and specifications in industrial processes and product formulations

Study Question:

- Mention three standard organizations that provides Microbiological standards and specifications
- What are the relevance of such specifications to industrial processes and product formulation?

WEEK 13: Shelf-life and spoilage of industrial products

Objectives

The students at the end of the lectures for the week should be able to understand the basic concepts and factors contributing to spoilage of industrial products and the various methods of preventing spoilage

Description

Students will be taken through the causes and factors encouraging spoilage of industrial products. Emphasis will be placed on microbiologically-induced spoilage and the various methods enhancing the shelf-life of products

Study Question:

- What do you understand by Spoilage of industrial products?
- What is its relevance in industrial processes?

WEEK 14: Revision

Objectives

The students at the end of the lectures for the week should be able to understand the basic concepts of all the topics treated for the past thirteen weeks of this course

Description

Students will be taken through the revision of all earlier treated topics in Industrial microbiology

WEEK 15

Topic: Examination

Objectives:

To examine the students on all that has been taught during the semester.