

## Department of Microbiology

### Revised Syllabus of Diploma Programme (UG)

#### Preamble:

This syllabus is framed to give sound knowledge with understanding of Microbial Quality Control and Assurance in Pharmaceutical industries to graduate students at first year of three years of diploma course.

The goal of the syllabus is to make setting up an industry related to Microbiology popular, interesting and encouraging to the students. Also this course will help students to be a good employee to various microbiological industries.

The new and updated syllabus is based on a basic and applied approach with vigor and depth. At the same time, precaution is taken to make the syllabus as per the needs of industries.

The syllabus is prepared after discussion at length with number of faculty members of the subject and experts from industries and alumni working in pharmaceutical, food, dairy industries. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

#### Program Objectives of the Course:

- a) This course guides such students of Microbiology which are willing to work in pharmaceutical and food industries.
- b) Even those students which will be placed in various Microbiology, Biotechnology related industries will get benefits from this course.
- c) This course not only gives knowledge of industrial processes but also more importantly guides our students about basic essentials of microbial quality control .
- d) This course gives theoretical and practical skills needed in industries.

#### Program Outcomes:

1. Students will be able to understand all the aspects of microbial quality control in microbiological industries.
2. Students will be able to perform various basic techniques in microbiological industries.
3. Students will be able to understand the basics of microbiological industrial process.
4. Students will be able to acquire broad theoretical and practical skills needed in industries.

**I Year Diploma Programme**

1. Title: Microbial Quality Control
2. Year of Implementation: 2020
3. Duration: One Year
4. Pattern: Semester
5. Medium of Instruction: English
6. Contact hours: 7 hours/week
8. Structure of Course:

**Syllabus Structure (UG)**

Year	Semester	Course No.	Course Code	Contact Hours	Credits (1Credit=15 H)	Total Marks
1	I	CT I	DMIT 101	30	2	75
		CL I	DMIL101	60	2	75
	II	CT II	DMIT 202	30	2	75
		CL II	DMIL202	60	2	75
	Annual	CP I	DMIP101	30	1	50
		<b>Total</b>	<b>210</b>	<b>9</b>	<b>350</b>	
2	III	CT III	DMIT 303	30	2	75
		CL III	DMIL303	60	2	75
	IV	CT IV	DMIT 404	30	2	75
		CL IV	DMIL404	60	2	75
	Annual	CP II	DMIP202	30	1	50
		Industrial and or Incubation and or Research and or Field Training			30	1
		<b>Total</b>	<b>240</b>	<b>10</b>	<b>350</b>	
	V	CT V	DMIT 505	30	2	75
		CLV	DMIL505	60	2	75
	VI	CT VI	DMIT 606	30	2	75
		CL VI	DMIL606	60	2	75
	Annual	CP III	DMIP303	60	2	100
		Industrial and or Incubation and or Research and or Field Training			30	1
		<b>Total</b>	<b>270</b>	<b>11</b>	<b>400</b>	
		<b>Total</b>	<b>720</b>	<b>30</b>	<b>1100</b>	

D: Diploma, \*: Departmental Code (C: Chemistry, MI: Microbiology, CSE: Computer Science (Entire), etc)

C: Course, T: Theory, L: Lab (Practical), P: Project

Total No. of Courses: 10 (Theory: 06, Practical: 06, Project: 03) Theory and Practical: Semester, Project: Annual

## Semester I

**DMIT 101: Microbial Diversity and Basic Microbial techniques Part- I**  
**(Contact Hrs: 30 Credits: 2)**

**Learning Objectives:**

Students will be able to

1. Understand microbial diversity and role of microorganisms in pharmaceutical industries.
2. Study microscopy ,classification of stain and Different types of staining procedure.

**Unit I: Microbial Diversity** (15)

- A) Branches of Microbiology and Role of microbiology in pharma industry.
- B) Study of different types of microorganism with special reference to all related industries
  - General properties of bacteria.
  - General properties of viruses.
  - General properties of fungi.

**Unit II: Basic Microbial techniques Part- I** (15)

- A) Microscopy: Types, principle, components and its uses, care and maintenance of compound microscope.
- B) Microscopic examination of bacteria.
  - a) Definitions of stain, dye, mordant, chromogen.
  - b) Staining techniques – Smear preparation, simple and differential staining (Gram's staining.)

**Learning Outcomes:**

After completion of the unit, Student is able to

1. know the different types of microorganisms related to industries.
2. Understand various basic techniques in microbiological laboratories.

**Reference Books:**

1. Microbiology by Pelczar , M.J.Jt. , Chan E.C.S. , Krieq, N.R. 5<sup>th</sup> Edition, 1986(McGraw Hills Publication)
2. Fundamental principles of bacteriology by A.J. Salle, Tata McGraw Hill .
3. Fundamental of Microbiology by Frobisher, Hindsdill, Crabtree, Good Heart , W.D.Saunders company, 7<sup>th</sup> edition.
4. General Microbiology by Stanier R,Y. 5<sup>th</sup> edition, McMilan, London.
5. General Microbiology Vol. I & II by Powar & Daginawala , Himalaya Publication.
6. Medical Bacteriology by Dey & Dey- Allied Agency, Calcutta.

7. Basic experimental Microbiology by Ronal M. Atlas , Alfred E. Brown, Kenneth W.Dobra , Wonas Miller ( 1986) Pren- Tice Hall.
8. Biologics guide to principles, techniques of practical Biochemistry by K.Wilson and K.H. Goulding Edward Arnold Publications.
9. Microbiology by Prescott Herley and Klein , 2<sup>nd</sup> Edition.
10. Introduction to Microbial techniques by Gunasekaran.

**DMIL101: (Practical):**  
**(Contact Hrs: 60 Credits: 02)**

**Learning Objectives:**

Students will be able to

1. Know and practice the safety measures while working in the Microbiology laboratory and handling of Microscope and instruments.
2. Learn to basic techniques in microbiological laboratory techniques.
3. Stain bacteria by different staining technique
4. Prepare chemical reagents ,staining solution and bacteriological media.

**(Minimum 4)**  
**List of Practical's (15)**

1. General Laboratory regulations
2. Study of parts and functions of compound microscope.
3. Study of laboratory instruments A) Incubator, Hot air oven , Autoclave
4. Study of laboratory instruments B) Colony counter, pH meter, Centrifuge,
5. Study of laboratory instruments C) Colorimeter, distillation unit , Laminar air flow
6. Preparation of cotton plug, wrapping of pipettes and petriplates and their sterilization by using hot air oven.
7. Use of wire loop and pipette and cleaning of petriplates, pipettes and test tubes.
8. Preparation of standard solution-Normal saline, 1N HCL, 1N NaOH, Alcohol.
9. Preparation of safranin and 10% Nigrosin stain.
10. Preparation of peptone water and nutrient broth and their sterilization by autoclaving.
11. Preparation of bacterial suspensions and smear preparation.
12. Morphological study of bacteria by negative staining.
13. Morphological study of bacteria by monochrome staining.
14. Study of Gram nature of bacteria.
15. Demonstration of bacterial motility

**Learning Outcomes:**

After completion of the unit, Student is able to

1. Know and practice the safety measures while working in the Microbiology laboratory.
2. Handle Microscope and laboratory instruments.
3. Gain basic microbiology skills required in industries.

4. Perform staining techniques .

**Reference Books:**

1. Morella- Mizer- Granato: Laboratory Manual and workbook in Microbiology
2. Sherman Natalie- Microbiology A laboratory Manual 7 th edition –Pearson
3. Prescott M. Lansing- Harley P. John, Kelin A. Donald Laboratory exercise in Microbiology 5 th edition , McGraw –Hill College division

**Semester II**

**DMIT 202 : Basic Microbial techniques Part-II**  
(Contact Hrs: 30 Credits: 2)

**Learning Objectives:**

Students will be able to

1. Understand the concept of Sterilization, disinfection and sanitization and ensure cleanliness in working area.
2. Know the different techniques of isolation of pure cultures and identification of microorganisms.

**Unit I: Control of microorganisms**

(15)

Definitions of – Sterilization, Pasteurization, Antisepsis, Tantalization, Microbiostatic effect, Microbiocidal effect.

A) Control of microorganisms by physical method.

- a) Sterilization by heat (dry and moist)
- b) Sterilization by filtration.

B) Control of microorganisms by chemicals.

- a) Definition – disinfection.
- b) Properties of ideal disinfectant
- c) Chemical nature, mode of action and application of -Alcohol ,formaldehyde, phenol, halogen,  $\beta$  propiolactone

**Unit II: Pure culture technique and identification of bacteria.**

15

**A) Pure culture technique**

- a) Definition of pure culture.
- b) Methods of isolation of pure culture of bacteria – serial dilution technique, Streak plate technique, spread plate technique and pour plate technique.
- c) Methods of isolation of pure culture of fungi.

**B) Identification of pure culture of bacteria.**

- a) Cultural characteristics.
- b) Morphological characteristics.
- c) Biochemical.
- d) Serological.

**Learning Outcomes:**

After completion of the unit, student is able to

1. Study the mode of action, application and advantages of Chemical and physical sterilizing agents.
2. Learn the different methods for isolation and identification of microorganisms.

**Reference Books:**

1. Biologics guide to principles, techniques of practical Biochemistry by K. Wilson and K.H. Goulding Edward Arnold Publications.
2. Microbiology by Prescott Herley and Klein , 2<sup>nd</sup> Edition.
3. Introduction to Microbial techniques by Gunasekaran
4. Principles of Biochemistry by Nelson & Cox ( Lehninger ) 5<sup>th</sup> Edition.
5. Hand Book of Microbiology Quality Control – Norman A Hodges and Stephen P. Denyer .
6. Pharmaceutical Microbiology 6<sup>th</sup> Edition, W.B. Hugo and A.D. Russell.
7. Fermentation technology -Dr.H.A. Modi Vol. II

**DMI L202: (Practical):**  
**(Contact Hrs: 60 Credits: 02)**

**Learning Objectives:**

Students will be able to

1. Understand the construction ,working and application of laboratory equipments.
2. Determine the efficacy of disinfectant
3. Perform aseptic transfer technique
4. Isolate and identify microorganisms

**List of Practical's (15)**

1. Preparation and use of disinfectant.
2. Determination of efficacy of Autoclave
3. Determination of efficacy of disinfectants.

4. Checking of efficiency of chemical disinfectant: Phenol coefficient by Rideal -Walker method
5. Sterilization of solutions of sugar, amino acid by membrane filtration
6. Aseptic transfer technique
7. Serial dilution of given sample.
8. Study of streak plate technique.
9. Study of pour plate technique.
10. Study of spread plate technique.
11. Isolation and identification of bacteria from soil (colony and cultural characteristics)
12. Isolation of fungi from given sample.
13. Isolation of yeast from given sample and its microscopic observation.
14. Microscopic observation of fungi.
15. Detection of bacterial endospores.

### Learning Outcomes:

After completion of the unit, Student is able to

1. Observe microorganisms under microscope.
2. Determine efficacy of disinfectant
3. Learn to critically observe and record the observations of all experiments.
4. Isolate and identify microorganisms.

### Reference Books:

1. Morella- Mizer- Granato: Laboratory Manual and workbook in Microbiology
2. Sherman Natalie- Microbiology A laboratory Manual 7 th edition –Pearson
3. Prescott M. Lansing- Harley P. John, Kelin A. Donald Laboratory exercise in Microbiology 5 th edition , McGraw –Hill College division

**DMIP101 (Project):**  
**(Contact Hrs. 30/60, Credits: 1/2 )**

#### BOS Sub-Committee

1. Dr.Mrs.S.S.Kanase , Chairman
2. Ms.N.S.Joshi, Member

#### Expert Committee

1. Dr.Mrs.S.S.Ahiwale, Academic Expert
2. Mr.Sanjay Chavan, Industrial Expert

