Department of Microbiology

Revised Syllabus of Advanced Diploma Programme (PG)

Preamble:

This syllabus is framed to give sound knowledge with understanding of entrepreneurship In Microbiology to post-graduate students at first year of two years of certificate 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 vigour 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 and agriculture industries

The units of the syllabus are well defined, taking into consideration the level and capacity of students

Program Objectives of the Course:

1. This course guides such students of Microbiology which are willing to start their own small scale industry.
2. Even those students which will be placed in various Microbiology, Biotechnology related industries will get benefits from this course.
3. This course not only gives knowledge of various industrial processes but also more importantly guides our students about basic essentials of industrialization
4. This course offers understanding of all aspects of entrepreneurship in Microbiology.

Program Outcomes:

1.Students will get thorough knowledge of industry .
2.Students will get knowledge about basics essentials of industrialization.
3.Students will be able to start their own small scale industry.
4.Students will be able to understand all aspects of entrepreneurship in Microbiology.

I Year Advanced Diploma Programme

1. Title: Entrepreneurship in Microbiology
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 (PG)

Year	Semester	Course No.	Course Code	Contact Hours	Credits (1Credit=15 H)	Total Marks
1	I	CT I	ADMIT 101	30	2	75
		CL I	ADMIL101	60	2	150
	II	CT II	ADMIT 202	30	2	75
		CL II	ADMIL202	60	2	150
	Annual	CP I	ADMIP101	60	2	150
			Total	**240**	**10**	**600**
2	III	CT III	ADMIT 303	30	2	75
		CL III	ADMIL303	60	2	150
	IV	CT IV	ADMIT 404	30	2	75
		CL IV	ADMIL404	60	2	150
	Annual	CP II	ADMIP 202	60	2	150
			Industrial and or Incubation and or Research and or Field Training	60	2	-
			Total	**270**	**12**	**600**
			Total	**510**	**22**	**1200**

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

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

Total No. of Papers: 10 (Theory: 04, Practical: 04, Project: 02) Theory and Practical: Semester**,**

Project: Annual

Semester I

ADMIT 101**: Essentials of Food & beverages industry**

(Contact Hrs: 30 Credits: 2)

Learning Objectives:

Students will be able to

1. learn basic knowledge of dairy industry.
2. understand essentials of wine and related beverages production.
3. get information regarding fruit processing.
4. know basics of water processing industry

Unit I: Essentials of Dairy & Wine industry (15)

1. Milk and milk products
   a) Definition, composition, factor affecting composition,
   b) Nutritive value of milk
   c) Uses of milk and fermented milk products
   d) Production of various milk products like curd, flavoured milk, etc...
2. Wine making
   a) Classification of wine- on the basis of chemical constituents
   b) Production of white wine
   c) Production of red wine
   d) Production of fortified wine

Unit II: Essentials of Fruits, vegetable processing and water and aerated drink industry (15)

A) Fruit and vegetable processing:

I) Status and scope of fruits and vegetable industry in India, Composition and nutritive value of fruits and vegetables, Importance of fruit and vegetable in the diet

I) Different types of spoilages in fruits and vegetables, general methods of preservation of whole fruits /vegetables and processed fruits and vegetables

III) Food additives- use of food additives in processing of fruits and vegetables

IV) Definition of preservatives, types of preservative used in fruit and vegetable processing.

V) Fruit beverages- squashes, syrup and crushes etc.

VI) Importance of personal hygine cleaning and sanitary standards in fruit and vegetable processing industry

B) Water and Aerated drinks industry

I) Introduction of water and aerated drink products

II) Drinking water production from surface water

a) Prefiltration
b) addition of chemicals
c) natural filtration

d) disinfection
e) fine filtration
f) preservation and storage.

III) Drinking water standards- WHO's drinking water standards.

IV) Fruit and juice-based drinks: Ingredients, additives and flavoring-Ingredients and additives of soft drink –sweetens, acids, preservatives and colours. Flavoring- flavoring raw materials and substances, developing and processing of flavoring.

Learning Outcomes:

After completion of the unit, Student is able to

1 Acquire knowledge of various processes of dairy industry.
2. know about basics of setting up a winery
3.produce drinking water and aerated drink products from surface water

Reference Books:

1. UNIT 1: Dairy Microbiology by H. A. Modi
Outline of Dairy Technology by Sukumar De
Industrial Microbiology by Casida
Milk & Milk products by Charence
2. UNIT 2: Food Microbiology by Admas & Moss
Manual of Industrial Microbiology & Biotechnology – Edited by Baltz, Demain , Davies
3. UNIT 3: Industrial Microbiology by Casida
Pharmaceutical Microbiology – 6 th edition by Hugo & Russell
4. UNIT 4: Industrial Microbiology by Casida
Pharmaceutical Microbiology – 6 th edition by Hugo & Russell

ADMIL101: **Essentials of Food & beverages industry**

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

Learning Objectives:

Students will be able to

1. perform various primary tests of raw milk collected in dairy and tests used to detect efficiency of pasteurization.
2. carry out test for checking nutritional quality of fermented milk products.
3 know the test for checking potability of drinking water
4. know method for preparation of wine from different sources

List of Practical's (15)

1. Platform tests for milk sample
2. Phosphatase test for milk sample
3. Microbiological assay of amino acid / vitamins in fermented milk sample
4. Wine production from different sources
5. Estimation of yeast and molds in alcohol beverages
6. Microbial profiling of wine
7. Direct microscopic count in tomato puree/ sauce/ paste
8. Determination of aciduric spore former in canned food
9. Detection of fruit surface disinfection quality by using different disinfectants
10. Detection of quality of drinking water using MPN test
11. Detection of saccharophilic microorganisms in soft drinks.
12. Determination of mineral content in packaged water
13. MBRT test
14.Microbiological quality of paneer
15. Evaluation of ice cream for colliforms and *E.Coli*

Learning Outcomes:

After completion of the unit, Student is able to

1. carry out testing potability of drinking water
2. prepare wine from different sources
3. check nutritional quality of fermented milk products.
4. to detect efficiency of pasteurization.

Reference Books:

1. R.C. Dubey, D.K. Maheshwari: Practical Microbiology 1st edition (2002) published by S.chand and company Ltd.

2. Laboratory fundamentals of Microbiology by Jeffrey C. Pommerville
3. Ronal M. Atlas , Alfred E. Brown, Kenneth W.Dobra , Wonas Miller (1986) Basic experimental Microbiology , Pren- Tice Hall
4. Kanika Sharma: Manual of Microbiology tools and techniques 2nd edition (2009)
5. Methods in Biotechnology by C. D. Swarna Latha and Digumarti Bhaskara Rao published by Discover Publishing House (2007)
6. Laboratory manual of food Microbiology by Neelima garg, K. L. Garg, K. G. Mukerji published by LK International Publishing House (2017)

Semester II

ADMIT 202**: Essentials of pharmaceutical industry**

(Contact Hrs: 30 Credits: 2)

Learning Objectives:

Students will be able to

1.know about principles and practice of Sterilization
2. Various tests to detect microbiological quality of final product of food industry.
3. perform microbiological quality control test of food products
4. know about production of pharmaceuticals by micro organisms

Unit I: Essentials of pharmaceutical industry - I (15)

A) Principles & practice of Sterilization

a. Sensitivity of microorganisms: Survivor curves, D-value, Z-value

b. Sterilization methods: Heat, gaseous, radiation.

B) Formulations

a. Sterile Pharmaceutical products: Injections,

b. Non-injectable sterile fluids,

c. Ophthalmic preparations

C) Quality control

a. Introduction, control of microbial contamination during manufacture- general aspects

b. Sterilization control & sterility assurance – Bioburden determinants, Environmental monitors, Sterilization monitors, sterility testing.

Unit II: Essentials of pharmaceutical industry - II (15)

A) Production

a. Manufacture of sterile products- Clean & aseptic areas- general requirements, Design of premises, internal surfaces, services, air supply, clothing, etc.

b. Pharmaceuticals produced by microorganisms- dextrans, vitamins, amino acids, organic acids, Iron-chelating agents, enzymes.

c. Mammalian cell culture for biopharmaceutical production – Overview, construction & selection of high-producing cell lines, medium development, process development, scale-up & scale-down.

B) GMP

a. Introduction, Guide to Good Manufacturing Practice.

b. GMP manufacturing of biopharmaceuticals- Characteristics of desired manufacturing processes, process validation, raw materials for GMP manufacturing, operation & release, production cost.

Learning Outcomes:

After completion of the unit, Student is able to

After completion of the unit, Student is able to

1. understand essentials of pharmaceutical processing.
2. learn basic processes regarding pharmaceutical processing.
3. produce pharamaceuticals by using micro organisms

4. carry out proper sterilization using standard techniques

Reference Books:

1. UNIT 1: Dairy Microbiology by H. A. Modi
Outline of Dairy Technology by Sukumar De
Industrial Microbiology by Casida
Milk & Milk products by Charence
2. UNIT 2: Food Microbiology by Admas & Moss
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Pharmaceutical Microbiology – 6 th
edition by Hugo & Russell

ADMIP20L: **(Practical):**
(Contact Hrs: 60 Credits: 02)

Learning Objectives:

Students will be able to
1. know how to produce wine from different sources and measure its microbiological quality.
2. carry out various tests to detect microbiological quality of final product of food industry.
3. perform test for carcinogenesity testing of substances
4.perform sterility testing of pharmaceutical products

List of Practical's (15)

1. Qualitative analysis of media before use
2. Microbial limit test of pharmaceutical product
3. Endotoxin testing of pharmaceutical product
4. Environmental monitoring
5. Antibiotic susceptibility testing
6. Microbial testing of non-sterile product

7. Calibration of instruments used in pharmaceutical industry
8. Phenol coefficient test
9. Preparation animal cell culture medium
10. Ames test for detection of carcinogenicity
11. MIC of sulfa drug
12. In-use dilution test for disinfectant
13.Sterility testing of pharmaceutical products
14.Test for sterility of surgical cotton
15. Assay of vitamin B3 using microbial method

Learning Outcomes:

After completion of the unit, Student is able to

1. produce wine from different sources and measure its microbiological quality.
2. carry out various tests to detect microbiological quality of final product of food industry.
3. perform test for carcinogenesity testing of substances
4.perform sterility testing of pharmaceutical products

Reference Books:

1. R.C. Dubey, D.K. Maheshwari: Practical Microbiology 1st edition (2002) published by S.chand and company Ltd.
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ADMIP101 (Project):
(Contact Hrs. 30/60, Credits: 1/2)

BOS Sub-Committee

1. Chairman -Dr. Mrs S.S. Kanase
2. Member –Dr. Mrs P.S. Patil

Expert Committee

1. Name of Academic Expert: Dr.G.R.Pathade
2. Name of Industrial Expert: Mr. Sandip Babar