Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Microbiology	04	02	00	02	Class XII with Science	NIL

Learning Objectives

The course aims to trace the history of development of the discipline of Microbiology and to emphasize the existence of the immense diversity in the microbial world and maintenance of microbes under laboratory conditions. Through this course students will be introduced to the concept of different modes of gene transfer in bacteria. Further, students will be made aware about the applications of microorganisms in food and industry.

Learning outcomes

On successful completion of the course students will be able to:

- Identify different types of microbes
- Perform routine microbiological practices including sterilization, media preparation, maintenance of microbial culture, microbial growth etc.
- Carry out basic research using microbes
- Describe varied applications of microbes

2.2 Course

Contents Theory

Unit I: History and Diversity of Microbial world (8 Hours)

Spontaneous generation versus biogenesis, contributions of Anton von Leeuwenhoek, Joseph Lister, Paul Ehrlich, Richard Petri, Charles Chamberland, Edward Jenner, Louis Pasteur, Robert Koch, Martinus W. Beijerinck, Sergei Winogradsky, Alexander Fleming, Elie Metchnikoff and Emil von Behring. General characteristics of different groups:

Acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Bacteria, Archaea, Algae, Fungi and Protozoa. Cell-wall: Composition and detailed structure of Gram positive and Gram-negative cell walls, mechanism of Gram staining

Unit II: Microbial Nutrition, Growth and Control (6 Hours)

Nutritional types of microorganisms, growth factors, culture media- synthetic and complex, types of media; isolation of pure cultures, growth curves, mean growth rate constant, generation time; influence of environmental factors on growth of microbes: effect of pH,

temperature, solute, oxygen concentration, pressure and radiations. Sterilization, disinfection and antiseptics.

Unit III: Microbial Genetics (6 Hours)

Conjugation, Transformation and Transduction. Gene mapping in Bacteria

Unit IV: Application of Microbes (10 Hours)

Basic design of fermenter, continuous and discontinuous culture. Preparation of fermented food products such as curd and cheese. Preparation of alcoholic beverages like wine and beer. Treatment of waste-water (Municipal treatment plant) and sewage. Bioremediation and biodegradation. Human microbiome: Role in health and disease**.** Soil Microbiome: Role in plant health

2.3 Practical: 60 Hours

1. To prepare and sterilize the culture media for the growth of microorganisms
2. To perform various culture transfer techniques: Solid to solid (streaking), liquid to solid (spreading), liquid to liquid, solid to liquid and determine CFU/ml
3. To study growth curve of bacteria
4. To study the effect of pH/temperature on the growth of bacteria
5. To perform gram staining
6. To determine the effect of antibiotics using disc diffusion test
7. Study of different shapes of bacteria, fungi, algae, protozoa using permanent slides/pictographs

2.4 Essential readings:

1. Willey, J., Sherwood, L., Woolverton, C. (2017). Prescott's Microbiology (10th ed.). McGraw Hill international. ISBN 13: 9781259657573.
2. Chan, M. J., Krieg E. C. S., Pelczar, N. R. (2004) Microbiology (5th ed.). McGraw Hill International. ISBN 13: 9780094623206.
3. Pierce, B.A. (2012) Genetics - A Conceptual Approach, (6thed.), W.H. Freeman & Co. (New York), ISBN:13:978-1-4292-7606-1 / ISBN:10:1-4292-7606-1
4. Cappuccin, and Sherman N., Microbiology: A Laboratory manual (10th ed.). Benajamin/ Cummings. ISBN 1o J. G.3: 9780321840226. 86

Suggested readings:

1. Madigan, M. T., Martinko J. M., & Stahl D. A., (2010) Brock Biology of Microorganisms (13th ed.). Pearson Education International. ISBN 13: 9780321649638.
2. Snustad, D.P. and Simmons, M.J. (2012) Genetics (6th ed.), John Wiley & Sons. (Singapore), ISBN: 978-1-118-09242-2

3. Keywords

Microbiological Techniques, Media, Sterilization, Growth curve

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.