



SHREE H. N. SHUKLACOLLEGE OF SCIENCE

(AFFILIATED TO SAURASHTRA UNIVERSITY)

SYLLABUS NEP-2020

B.Sc. Honours/ Honours with Research in Microbiology (First Year)

Semester II

Semester - II
Course Category Major-3
Title of the Course Microbiology -3: Microbial Growth and Control
Course Credit 03
Teaching Hours per Sem. 45
Total Marks CCE- 25+ SEE- 50

Course Content	Hour	Mar
Unit-I: Microbial Growth and Nutrition	9 hrs	10
<ul style="list-style-type: none"> • Introduction and Definition of Growth, Modes of Cell division in prokaryotes • Bacterial Growth Curve • Synchronous culture & Continuous Growth of Bacteria 		
Unit-II: Microbial cultivation and Pure Culture Techniques	9 hrs	10
<ul style="list-style-type: none"> • Types of bacteria based on nutritional requirements • Chemical and Physical requirement of Growth- Bacteriological Media, Air, pH & Temperature • Cultivation of Anaerobes • Natural Microbial Population (Mixed Cultures), Selective methods to obtain Pure Cultures, Cultural Characteristics, Isolation, purification and Preservation of pure cultures 		
Unit-III: Control of Microbes by Physical methods	9 hrs	10
<ul style="list-style-type: none"> • Definitions: Sanitization, Antisepsis, Sterilization, Disinfection, Microbiocidal & Microbiostasis, Thermal Death Time, Thermal Death Point, z-Value & F-value, D-Value • Control by Temperature: <ol style="list-style-type: none"> a) <u>High Temperature</u>: Moist Heat – Autoclave, Boiling, Pasteurization, Fractional, Sterilization Dry Heat – Hot Air Oven, Incineration, b) <u>Control by Desiccation</u> c) <u>Control by Low Temperature</u> • Control by Radiation – UV radiation, x-rays, Gamma rays and Cathode rays • Control by Filtration 		



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Unit-IV: Control of Microbes by Chemical methods	9 hrs	10
<ul style="list-style-type: none">• Characteristics of an Ideal Antimicrobial agent• Halogens – Iodine & Chlorine, Heavy Metals & Dyes• Phenol & Phenolic compounds, Phenol coefficient method, Alcohols		
Unit- V: Control of Microbes by Antibiotics	9 hrs	10
<ul style="list-style-type: none">• Chemotherapeutic agents and Chemotherapy, Characteristics of ideal chemotherapeutic agent• Antibiotics and their mode of action: Inhibition Effect on cell wall synthesis, nucleic acid and protein synthesis, Damage to cytoplasmic		

Text books:

1. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi. (UNIT: 1 & 2)
2. Powar, C.B., Daginawala, J.F. (2010). General Microbiology Vol-I. Mumbai: Himalaya Publishing House. (UNIT: 3,4 &5)

Reference books:

1. Stanier, R.Y. (1987). General Microbiology, 5th Edition: Macmillan publication.



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Course Category Major Practical - 3
Title of the Course Microbiology -3P: Microbial Growth and Control
Course Credit 01
Teaching Hours per Sem. 30
Total Marks CCE- 25

Major Practical-3	
Sr. No. Experiment	
1.	Measurement of size of microorganisms by Micrometry (Demonstration)
2.	Calibrations of microscopic measurements (Ocular & stage micrometers)
3.	Isolation of microorganisms by various methods
4.	Turbidimetric study of growth curve of <i>E.coli</i> and derivation of Growth rate & Generation time.
5.	Enumeration of bacteria by viable count technique.
6.	Enumeration of bacteria by Total Count Technique.
7.	Effect of various chemicals on microbial growth
8.	Effect of antibiotics on microbial growth
Reference Books:	
1.	Patel. R.J., Patel. K.R. (2009). Experimental Microbiology, Vol-I, Ahmedabad: Aditya Publications.
2.	Patel. R.J., Patel. K.R. (2009). Experimental Microbiology, Vol-II, Ahmedabad: Aditya Publications.
3.	Dubey, R.C., Maheshwari, D.K. (2005). Practical Microbiology. New Delhi: S. Chand & Company Limited.
4.	Sharma, K. (2005). Manual of Microbiology – Tools and Techniques. New Delhi: Ane books.
5.	Benson, H.J. (2002). Microbiological Applications – Laboratory Manual in General Microbiology – 8 th edition: MacGrow Hill Company.



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Semester – II

Course Category	Major-4
Title of the Course	Microbiology -4: Microbial Taxonomy and Diversity
Course Credit	03
Teaching Hours per	45
Total Marks	CCE- 25+ SEE- 50

Course Content	Hours
Unit. 1: Introduction to Microbial Diversity	9 hrs
<ul style="list-style-type: none">• Introduction to Biodiversity- Microbial evolution and diversity, Types of diversity• Microbial Taxonomy: Introduction and overview, Taxonomic ranks of microorganisms, Classification systems• Major characteristics used in taxonomy• Assessing Microbial Phylogeny	
Unit. 2: Prokaryotic Diversity	9 hrs
<ul style="list-style-type: none">• <u>Gram negative bacteria</u> – General features of:<ul style="list-style-type: none">• Aerobic/Microaerophilic motile, helical vibroid• Non-motile curved bacteria• Aerobic/Microaerophilic rods and cocci• <u>Gram negative bacteria</u> – General features of:<ul style="list-style-type: none">• Facultative anaerobes – rods, curved and helical bacteria• Dissimilatory Sulphate reducers• <u>Gram negative bacteria</u> – General features of:<ul style="list-style-type: none">• Anaerobic cocci• Phototrophic bacteria• <u>Gram positive bacteria</u> – General features of:<ul style="list-style-type: none">• Endospore forming rods and cocci• Asporogenous rods• Mycobacteria and Actinomycetes	
Unit 3: Diversity of some unusual Prokaryotes	9 hrs



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<ul style="list-style-type: none">• <u>General Features of Bacteria with unusual morphology:</u><ul style="list-style-type: none">a) Budding and appendaged bacteriab) Sheathed Bacteriac) Mycoplasma• Bacteria with gliding motility,• Rickettsia and Chlamydia• Introduction to Archaea<ul style="list-style-type: none">ThermophilesHalophilesAcidophilesBarophilesMethanogensPsychrophiles	
Unit. 4: Eukaryotic Diversity	9 hrs
<ul style="list-style-type: none">• Fungi: General characteristics – Definition, occurrence, structure and Economic importance of fungi• Algae: General Characteristics – Definition, Occurrence, Ultra- Structure, Reproduction• General Characteristics – Definition, Occurrence, Ultra-Structure, Reproduction and Economic importance of Protozoa	
Unit. 5: Akaryotic Diversity - Viruses	9
<ul style="list-style-type: none">• Introduction to Viruses: Definition, General features of viruses: Size, Capsids symmetry, Chemical Nature, Life cycle• Overview of Bacterial Virus: T4 and Lambda• Overview of plant Virus: TMV• Overview of Animal viruses; HIV	

Text Books:

- Pelczar, M.J., Chan, E.C.S., Kreig, N.R. (1993). Microbiology, 5th Edition. New Delhi: Tata McGraw Hill Publishing Company Ltd.
- Prescott, M.J., Harley, J.P., Klein, D.A. (2002). Microbiology, 5th Edition, New York: WCB McGrawHill publication.



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Semester - II
Course Category Major Practical - 4
Title of the Course Microbiology -4P: Microbial Taxonomy and Diversity
Course Credit 01
Teaching Hours per Sem. 30
Total Marks CCE- 25

Major Practical-4: Experiment
1 Isolation of Gram negative bacteria from the given sample.
2 Identification of Gram negative bacteria from the given pure culture using biochemical media (<i>E.coli</i> , <i>Enterobacter aerogens</i> , <i>Proteus</i> , <i>Salmonella</i>)
3 Isolation of Gram positive bacteria from the given sample. media (<i>Bacillus megaterium</i> , <i>Bacillus subtilis</i> , <i>Staphylococcus aureus</i>)
5 Identification of Fungi on the basis of Morphological Characteristics.
6 Cultivation of yeast from different natural samples and its morphological characterization using microscopic observation.
7 Microscopic observation of different algae from the given samples.
8 Microscopic observation of different protozoa from the given sample.
9 Isolation and cultivation of bacteriophage of <i>E.coli</i> from the given sewage sample.

Reference Books:

1. Jayaraman, J. (2011). Laboratory Manual in Biochemistry: New Age International Private Limited. India
2. Sawhney S.K., Singh, R. (2005). Introductory Practical Biochemistry: Alpha Science International.
3. Cappuccino, J.G., Sherman, N. (2004). International student edition: Microbiology- A laboratory Manual 4th edition: Benjamin Cummings publications

Semester – II
Course Category: Skill Enhancement Course (SEC)-2
Skill based Practical Course-2;
In addition to courses mentioned in SOP basket
Title of the Course Mushroom Cultivation
Course Credit 02
Teaching Hours per Sem. 60
Total Marks CCE-25 + SEE-25

Course Content	Hour
UNITS – 1: Introduction	12hrs
<ul style="list-style-type: none"> • General History, edible mushrooms, mushrooms with medicinal importance and poisonous mushrooms. • Common Indian mushrooms and morphology, distribution, structure and life cycle of <i>Agaricus</i>, Microscopic observations of mushrooms • Nutritional value, medicinal value and advantages. • Identification of Edible and poisonous mushrooms 	
UNIT – 2: Basics of Mushroom Cultivation	12hrs
<ul style="list-style-type: none"> • Fundamentals of cultivation system- small village unit & larger commercial unit. • Principles of mushroom farm layout- location of building plot, design of farm, bulk chamber, composting platform, equipments & facilities , pasteurization room & growing rooms. • Cultivation: Paddy straw mushroom – substrate, spawn making. 	
UNITS –3: Methods of Mushroom Cultivation	16hrs
<ul style="list-style-type: none"> • Cultivation of mushrooms at laboratory level - Bed method, polythene bag method, field cultivation. • Oyster mushroom cultivation –Substrate, spawning, pre-treatment of substrate. • Maintenance and Storage of mushroom – short term and long term storage. • Diseases- Common pests, disease prevention and control measures. Processing - Blanching, steeping, sun drying, canning, pickling, freeze drying. 	

Text Books

1. Harander Singh. 1991. Mushrooms- The Art of Cultivation- Sterling Publishers.
 2. Kaul, T.N. (1997). Introduction to Mushroom Science (Systematics). Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi & Calcutta, India.
 3. Vijaya Khader (1998). Mushrooms for Livelihood. Kalyani Publishers, Ludhiana, India.
- Reference books

1. Mushroom Production and Processing Technology, Pathak Yadav Gour (2010) Published by

Agrobios (India).

2. Singh, Reeti and Singh, V.C. (2005). Modern Mushroom Cultivation. Agrobios, India.
3. Suman, B.C. and Sharma, V.P. (2005). Mushroom Cultivation and Uses. Agrobios, India