

LEVEL IV COURSES

4262- GENERAL MICROBIOLOGY										
Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)					
Lectures	Practical	Credits			Theory		Practical Ex.		Total	
2	3	5	25	25	3hrs	100	50		200	
Pre-requisite		Source	Semester		Theory	Test	Total	TW	PR	Gr Total
Nil		POD			75	25	100	25	50	175

Rational: Knowledge of General Microbiology is an essential prerequisite for the subject such as Food Microbiology, Quality Control analysis, etc. The subject of General Microbiology is the study of different types of micro-organisms, their classification and activities including the effects, either detrimental or beneficial caused by them in various environments. The theory as well as practical course is aimed at developing the basic knowledge and skills in Microscopy, sterilisation methods, ~~distillation~~ techniques, use of different media as well as the study of Morphological and cultural characteristics of different micro-organisms commonly encountered in Food Microbiology. These skills also form the basis for microbiological studies in different subjects and for technology such as Dairy Technology, Marine Product Technology, Fruit & Veg. Technology etc.

COURSE CONTENT		Hrs	Mks
1. HISTORY OF MICROBIOLOGY & MICRO-ORGANISMS		4	12
History of microbiology: Place of microorganisms in living world: Protists, Monera, Prokaryotes, Definition of eucaryotic and prokaryotic cells. Discoveries of the scientist: Antony Van Leeuwenhoek, Louis Pasteur, John Tyndell, Robert Koch, Joseph Lister, and Edward Jenner.			
Microorganism as allies and foes: Distribution of micro organism in nature. Applied areas of microbiology; Medical, Aquatic, Domestic water and sewage, Air, Milk, Food, Soil, Industrial, Insects, Space, Geo-chemical transformation.			
2. CLASSIFICATION OF MICROORGANISMS.		6	12
Differentiating characteristics of Eucaryotes and prokaryotes.			
Examples of eucaryotic and prokaryotic cells.			
Characteristics of individual groups: Yeast: Importance, Distinguishing characteristics, Morphological and cultural characteristics, Reproduction, Physiology and nutrition, Cultivation. Types of yeasts: Bakers, yeast, and Brewers yeast. Fungi: Importance of fungi, Distinguishing characteristics, Morphological and culture characteristics, Reproduction, Physiology and nutrition, Cultivation. Important fungi: Mucor, Rhizopus, Aspergillus, Penicillium, Trichoderma, Fusarium. Algae: Economic importance of algae, soil fertility, vitamin synthesis, algae and disease. Occurrence of algae, Morphological and cultural characteristics, Algal pigments, photosynthesis, Motility, Reproduction, Important algae. Protozoa: Morphology; circular structure, loco motor organelles. Reproduction; Sexual, Asexual, Regeneration. Important Protozoa; Amoeba, Paramecium, Euglena, Plasmodium. Viruses: History – living / non-living, Characteristics – animal virus, plant virus, bacterial virus. Cultivation – isolation, chick embryo, plasma clots, tissue culture. Important viruses, Small pox, TVM Yellow fever virus.			
3. MORPHOLOGY AND CULTURAL CHARACTERISTICS.		2	5
Morphology: Size, Shape, Arrangement of cell. Colonies on agar plate: Size, Shape, Margin, Elevation, Opacity, Pigmentation, and Consistency. Growth of agar slant: Amount of growth, Margin, Consistency, Pigmentation. Growth in Broth: Amount of growth, Distribution of growth, Odour.			

4. VEGETATIVE CELLS AND SPORES	4	12
Vegetative cell structure: Cell wall. External to cell wall: Flagella, Fimbriae, and Capsule. Internal to cell wall: Cytoplasm, Cytoplasmic membrane, Cytoplasmic inclusions, and Nuclear material. Endospore: Fine structure, Factors responsible for spore formation. Germination, Comparison of spores and vegetative cells.		
5. MICROSCOPE, METHODS OF MICROSCOPIC EXAMINATION.	4	15
Microscope: Compound microscope; Construction, Working, Maintenance. Definition of: Resolving power, Numerical aperture. Principles of: Dark field microscopy, Phase contrast microscopy, Electron microscopy. Methods of microscopy: Wet mount, Hanging drop preparation, Stained smears. Staining procedures: Chemistry of dyes, Monochrome staining, Gram staining, Negative staining, Differential staining procedure: Spore staining, Acid fast staining, Capsule staining, Flagella staining.		
6. ISOLATION OF PURE CULTURE, CULTURING TECHNIQUES & MAINTENANCE.	3	10
Isolation and culturing techniques: Streak plate method; Perpendicular method, Parallel method. Pour plate method, Surface plate method, Single cell isolation, Serial dilution method, Enrichment culture technique; Selective media, Differential media. Maintenance of culture: Periodic transfer, Mineral oil, Lyophilization, Storage at low temperature. Maintenance of media: Bacteria – Nutrient agar, Yeast – Wickerham's media, Fungi – Sabouraud's media.		
7. ASEPSTS AND STERILIZATION.	5	14
Importance of microbial control. Definitions of: Sterilization, Disinfectant, Antiseptic, Sanitizer, Germicide, Bactericide, Bacteriostasis, Antimicrobial agents. Patterns of microbial growth. Condition influencing antimicrobial action. Control by physical agents: Temperature; High temperature, Low temperature, Moist heat, Definitions of TDT, TDP, DRT. Radiation, Osmotic pressure – desiccation, Filtration. Control by chemical agents: Characteristics of an ideal disinfectant, Selection of antimicrobial chemical agent, Major groups of chemical agents; Phenol and Phenolic compounds, Alcohol, Halogens, Heavy metals and their compounds, Dyes, Synthetic detergents, Acids / alkalines, Gaseous chemosterilizers.		
8. PHYSIOLOGY OF MICRO – ORGANISMS.	5	
Oxygen requirement: Obligate aerobes, Obligate anaerobes, Facultative aerobes / anaerobes, Microaerophilic. Carbon source requirement: Autotrophs, Heterotrophs. Source of energy: Chemotrophs, Phototrophs. Saprophytes. Parasites. Temperature requirement: Mesophilic, Psychrophilic, Thermophilic.		
9. GROWTH OF MICRO – ORGANISMS.	3	15
Growth curve: Phases of growth, Synchronous growth, Growth rate and generation time, and cell fission. Measurement of growth: Direct methods; Cell count – counting chamber, Smear count, and Membrane filter count. Indirect methods: Turbidity, Dry weight, Total volume, and Chemical methods. Dilution methods: Serial dilution method (colony count), Roller tube methods. Factors affecting growth: Temperature, Ph, Nutritional requirements, and Oxygen requirement.		
TOTAL	32	100

PRACTICALS

1. Microscope: Construction, Working, and Maintenance.
2. Microscopy of standard cultures for morphology: *Bacillus subtilis*, *E. Coli*, *Staphylococcus aureus*, *Salmonella*, *Saccharomyces cerevisiae*, *Aspergillus*, *Penicillium*, *Mucor*, *Rhizopus*.
3. Motility of Micro-organisms: Hanging drop preparation.
4. Preparation of media: Nutrient broth, Nutrient agar.

5. Sterilisation of pure culture from water, milk, fruit, juice, fish & meat: Streak plate methods; Pour plate method, Surface plate method.
6. Cultural characteristics of standard culture: Colonies on nutrient agar plate.
7. Staining procedure: Monochrome staining, Gram staining, Negative staining, Spore staining, Acid fast staining, Capsule staining.
8. Viable count of micro - organisms: Serial dilution method; Surface plate method, Pour plate method.
9. Total count of micro - organisms: Counting chamber method (Haemocytometer), Smear count.
10. Growth kinetics: Turbidimetry method, Determination of growth rate and generation time.

REFERENCE BOOKS:

1. Fundamental of Microbiology by M. Frohisher.
2. Microbiology by M. J. Pelozar, and R. D. Reid.
3. Microbes in action by Harry W. Seeley and Paul J. VanDemaark.
4. Microbiological methods by C. H. Collein and P. M. Lyne.
5. Microbiology by Salle.

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