M.PHIL/PH.D. MICROBIOLOGY

PART – I SYLLABUS

Paper – III: 1. Molecular Biology
2. Bioremediation
3. Recombinant DNA Technology
4. Immunotechnology
5. Bioprocess Technology
6. Agriculture Microbiology
7. Vaccine Biotechnology
8. Medical Microbiology
9. Industrial and Pharmaceutical Microbiology
PAPER–III  1. MOLECULAR BIOLOGY

**Unit-I:** Molecular nature of gene-gene function. Nucleic acids-Physical and Chemical structures of DNA-forms of DNA helix- size.Denaturation-Renaturation. Circular and superhelical DNA.

**Unit-II:** DNA the genetic material .DNA replication-Repair-Mutagenesis ,mutations and mutants.

**Unit-III:** Transcription in prokaryotes-transcription apparatus-operons: time control-major shifts in prokaryotic transcription. DNA-protein interactions.

**Unit-IV:** Transcription in Eukaryotes-RNA polymerases- promoters-Transcription factors-Transcription activators. Chromatin structure and its effects on transcription. Post transcriptional events-Splicing-Capping and polyadenylation and other events.

**Unit-V:** Translation- Initiation- Elongation and termination. Ribosomes and transfer RNA. Recombination- Transcription.

**Reference:**


2. BIOREMEDIATION


Unit-V: Composting of organic wastes- substrates suitable for composting-properties of compostable wastes- microbial characteristics of the composting process- progression-compost systems-Batch, continuous. Vermicomposting. Waste water use in farming

Reference:

3. RECOMBINANT DNA TECHNOLOGY

Unit –I: Principles of genetic engineering for *E.coli*: Basic cloning techniques – generation of DNA fragments – Restriction enzymes – joining DNA molecules. Vector systems for *E.coli* – plasmids (general and specific purpose), Bacteriophages, lamda, M13 Cosmids. DNA transfer system.

Unit- II: Construction of genomic libraries and cDNA libraries – identification of specific genes selection for an expressed phenotype- Hybridization-Techniques with nucleic acid probes- Immunological Techniques.

Unit- III: Molecular characterization of cloned genes– Restriction analysis- DNA Sequencing- Analysis of transcripts. Site specific mutagenesis. Overexpression of genes in *E.coli*.


Reference:

4. IMMUNO TECHNOLOGY


Reference:


5. BIOPROCESS TECHNOLOGY

Unit I: Isolation of cultures- screening of new products from microorganisms – inoculum development – scale up of microbial, mammalian and plant cell processes – selection of scaleup criteria – strain improvement – screening and selection for strain improvement – protoplast fusion and mutagenesis.


References:

6. AGRICULTURAL MICROBIOLOGY


References:
UNIT- I: Immune system – recognition of nonself and self; Humoral Immunity – immunoglobulins, basic structure, classes and subclasses; Cellular Immunity- lymphocytes, lymphokines, cytokines and interleukins; Antigen Recognition-membrane receptors for antigens, MHC classification and functions, superantigen.

UNIT- II: Recombinant vaccines; polynucleotide as vaccines; vector vaccines; naked DNA vaccines; biosynthetic and chemically synthesized vaccines; subunit vaccine; anti idiotypic vaccines; fusion vaccines; mixed particle vaccines; human mucosal vaccines; Combination vaccines; Edible vaccines produced in transgenic plants and microencapsulation.

UNIT- III: EPI vaccines – production and testing of tetanus toxoid, diphtheria toxoid, pertussis vaccine, BCG vaccines; preparation of Hepatitis B vaccine and tissue culture derived rabies vaccine and AIDS vaccine.

UNIT- IV: Adjuvants – classification and properties; carriers – types and functions – vehicles – types, functions and mode of action; biodegradable polymers- microspheres, liposomes and ISCOM; immunostimulators (IS) – classification and mechanism of action of IS.

UNIT- V: Germ free, Axenic, Monoxenic, dixenic, Gnotobiotic, conventional, xylo xenic, SPF; isolators, Gnotobiotic technique, gene knockout mice; transgenic and SCID mouse; Athynic nude mouse; animal models of human diseases and techniques of experimentation.

References:

8. Medical Microbiology


Unit – II: Bacteriology: gram-positive – morphology culture characteristics, phathogenicity and laboratory diagnosis of *Staphylococcus aureus*, *Streptococcus pyogenes*, *Pneumococcus*, *Bacillus anthracis*, *Corynobacterium diphtheriae*, *Clostridium welchii*, *Cl., tetani*, *Clostridium botulinum*, *mycobacteria*, *Spirochaetes– Treponema pallidum*, and *Leptospira lacterohaemorrhagiae* and elementary knowledge on *Chlamydiae*, *Rickettsiae* and *Mycoplasma*.

Unit –III: Bacteriology gram negative organisms: morphology culture characteristics, phathogenicity and laboratory diagnosis of *E.coli*, *Klepsiella spp*, *Enterococcus sp*, *Salmonella sp*, *Shigella sp*, *pseudomonas sp*, *Vibriochalerae*, *Aeromonas* hydrophila, *Bordetella pertusis*, *Yersinia pestis*, *Bacteroides* and *Neiseria spp*.


References:
Textbook of microbiology- Ananthanarayanan and Jayaram panikar.
Essential of Diagnostic microbiology- Lisa Anne Shimeld, anne T.Rodgers
Manual of Clinical microbiology – Lenetle,E,Balowah.H.
Textbook of Medical Parasitology- Subash.C.Parija.
Medical microbilology – Geo. F.Brooks.S
Medical mycology – Jagadesh Chander.
9. Industrial and Pharmaceutical Microbiology

Unit – I: History and chronological development of industrial microbiology. Industrially important strains – Isolation and preservation. Inoculum development for various fermentation process. Strain development – mutation, recombinant DNA technology and plasmid fusion.


Unit – IV: Clinical uses of antimicrobial drugs, Microbial spoilage and preservation of pharmaceutical products, Sterization of pharmaceutical products, Applications of microorganism in the pharmaceutical sciences.

Unit – V: Role of precursors and steering agents in production of antibiotics, vitamins and enzymes. Antiseptics-disinfectants their standardization and Quality control of Pharmaceutical products – Indictable, IV fluids and pyrogen testing.

References:
1. Michael J Waites. 2007 “Industrial microbiology”, Blackwell publishing, UK

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