Infectious Diseases
Koch's postulates
Pathogenic attributes and Toxigenicity of bacteria, Molecular mechanism of pathogenesis
Transmission and Control o infectious diseases
Introduction to Epidemiology

Modern diagnostics
Molecular diagnostics using ELISA RIA HLA Typing, Monoclonal antibodies, PCR.Western-blot, DNA finger-printing. RFLP, DNA probes
Diagnosis of human cancer by molecular genetics and Bioinformatics (Oncogene)

Modern Therapeutics
Therapeutic proteins: Stomatostatin, EPO, GCSF, Insulin, HGH, INF, Tissue Plasminogen Activator. Erythropoietin, Clotting factors
Stem-cell therapy
Enzyme replacement therapy
Produce functional tissue lost by disease or accident, ears, nose
Monoclonal antibodies in therapy
Recent trends in Cancer treatment
Treatment by recombinant and DNA vaccines

New challenges
Pathogenesis for AIDS, Hepatitis, TB, Malaria
Pathogenesis of Cancer, SCID, Cystic fibrosis, Thalessemia. Sickle-cell anaemia
Emerging infections, Bioterrorism

Reference:

1. Burns David E, Edward R Ashwood and Carl A Burtis (2007) Fundamentals of Molecular Diagnostics, Saunders (Elsevier)
2. Constance Urciolo Battle (2009) Essential of Public Health Biology A guide for the study of pathophysiology. (Series Ed Richard Riegelman) Jones and Bartlett
3. Greenwood David, Richard Slack, John Peutherer and mike Barer (2007) Medical Microbiology A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory diagnosis and Control (17th Ed) Churchill Livingstone

BTECH-308 Agriculture Biotechnology (40 Hours)

Animal Biotechnology

(A) Commercial cultivation of Sericulture, Apiculture, Aquaculture, Pearl-culture, Culture of finfish and Shellfish, Health management in aquaculture
(B) IVF Technology: Artificial Insemination for cattle, bird: Semen collection; Quality and handling Semen, insemination technique, Somatic cell fusion, *In vitro* fertilization and embryo transfer .
(C) Gene-bank for endangered species: Asiatic Lions, Project Tiger
(0) Animal Cloning
(E) Transgenic animals
(F) Transgenesis by Pronuclear injection, Introduction of recombinant DNA into chicken embryos, Microinjection, Gene transfer in fish.
(G) Transgenic animals as bioreactor through Milk and Blood
(H) Gene knockout technology

Plant Biotechnology

(A) Transformation by Electroporation, Particle gun bombardment, *AgrobacteriumTi*-plasmid vector
(B) Manipulation of Transposons, chloroplast and mitochondrial genome
(C) Transgenic plants: Tobacco, Golden rice, Bt-Cotton, Bt-Maize
(D) Production of secondary metabolites by suspended plant cell culture
(E) Plant as bioreactor for Vaccine
(F) Gene silencing by RNA- and Virus-induced

Food and Agriculture Biotechnology

(A) Fermented food, SCP, Sea food, Probiotics
(B) GM Food: Parameters for improvement with Examples, Approval
(C) Seed bank, Importance, Certification
(D) Oil-seed Biotechnology
(E) Integrated Biological Control: Biofertilizer, Biopesticides, Bioherbicides, Bioinsecticides
(F) Novel Genetic Variation for *B. thuringiensis* delta-endotoxin: Mechanism of action, Expression in tobacco, tomato, cotton, potato and corn, plants to prevent infestation, Tissue specific and Temporal expression

Plant and Animal Viruses

Structure, Genetic system, replication and pathogenesis by
Animal Viruses: HIV, SARS, Polio, Rabies, Kuru, Oncogenic viruses
Plant viruses TMV, Viroids

Reference

1. Chawla HS (2007), Introduction to Plant Biotechnology, (2ndEd), Oxford IBH
2. In Vitro Cultivation of Animal Cells (1994) BIOTOL Series, Butterworth Heinemann
3. Singh BD (2005) Plant and Industrial Biotechnology, Kalyani
4. Freshney RI (2005) Culture of Animal Cells: A Manual of Basics Techniques, (5thEd), Wiley Liss
5. Martin R Adams and Mourice O Moss (2008) Food Microbiology (3rd Ed) RSC Pub
6. Wagner Edward K and Martinez J Hewlett (1999) Basic Virology. Blackwell Science

Industrial Practices

Cultures and Media for Fermentation:

Criteria for selection of industrial organisms, Screening from natural habitat, Strain Improvement, Inoculum development for Bacteria, Yeast and fungi

Raw material: Molasses, CSL, Hydrol, PharmaMedia, Hydrocarbons, WSL, Agriculture waste, and formulation of Media, Antifoams

Sterilization: Bioreactor, Media, Air, Waste and Exhaust

Production of Microbial Biomass

Culture, Medium, Process and Recovery for fermentative Production of SCP, Legume inoculants, Bakers and yeasts, *B. thuringiensis*, Edible Mushroom, *Chaetocerous* algae

Fermentative Production of Primary Metabolites

Product survey

Over production of Amino acid by (1) Physiological manipulation by limiting Biotin (2) Genetic manipulation by Auxotroph and Regulatory (branched and un-branched pathways) mutants

Fermentative Production of Citric acid, Vitamin B 12, Alcohol (Two-stage process), Acetone-butanol

Production of Secondary Metabolites

Secondary metabolism and its control, Product survey

Over production of Antibiotics by Strain improvement program, Polyketide biosynthetic pathway

Fermentative Production of Cephalosporin, Rifamycin, Amphoteracin B, Xanthan gum, Polyester, Sterols, Ergot Alkaloid

Reference

1. E. M. T. EI-Mansi, C. F. A. Bryce, A. L Demain, A. R. Allman Editors (2007) Fermentation Microbiology and Biotechnology, (2ndEd), CRC Taylor and Francis
2. Glazer Alexander N and Hiroshi Nikaido (2007) Microbial Biotechnology: Fundamentals of Applied Microbiology, (2ndEd), Cambridge Univ Press
3. Trevan, MD (1987) Biotechnology: The Biological Principles, Tata McGrow Hill
4. Alan Wiseman (1983) Principles of Biotechnology, Surrey University Press
5. Waites MJ, Morgan NL, Rockey JS and G Higton (2001) Industrial Microbiology: An introduction, Blackwell Science
6. Nduka Okafor (2007) Modern Industrial Microbiology and Biotechnology, Science Publishers l
7. Peppler HJ and D Perlman (1979) Microbial technology: (2ndEd), Vol I Microbial Processes and Vol II Fermentation Technology, Academic Press
8. Richard H Baltz, Arnold L Demain and Julian E Davies (2010) Manual of Industrial microbiology and Biotechnology (3rd Ed) ASM Press
9. Stephanopoulos Gregory N, Aristos A Aristo and Jens Nielsen (1998) Metabolic Engineering Principles and Technologies, Elsevier

Water and Waste-water Management,
(A) Standards and Testing for drinking water,
(B) Treatment of Solid waste: Landfill, Composting
(C) Treatment of Liquid wastes: Oxygen demand, Treatment systems by Fixed film, Suspended cell, Activated sludge, Safety in final disposal

Abatement and Control of Hazardous waste
(A) Concept of Biodeterioration, Biomagnification, Recalcitrant and Xenobiotic
(B) Relation between Structure and biodegradability: Contaminant structure, toxicity, Bioavailability and Genetic potential
(C) Bioremediation
(D) Approaches: Bioreactor, solid-phase, Bioventing, Bioslurping, Biopiling
(E) Bioremediation of Air pollutants, Heavy Metals, Dyes, Marine oil, Contaminated soil

Mineral and Fuels Resource Management
(A) Assimilation and Leaching of Metals
(B) Design for biometallurgy: Heap-percholation, Bore holes, Continuous reactor
(C) Recovery of Copper, Gold, Phosphate and Uranium
(D) Desulfurization of coal
(E) Microbially Enhanced Recovery of Oil
(F) Production of Fuels: Ethanol, Methane, hydrocarbons, Hydrogen
(G) Utilization of Cellulose and Lignin

Environmental Assessment and Control
(A) Impact and Risk Assessment: Environmental impacts, Elements and Process of Risk assessment, Microbial risk assessment
(B) Microbial Control: Microbial Control of Insect pest, other animal pest, Sea-weeds, Algal bloom and Integrated Pest Management
(C) Global Environmental Problems: Green-house gases Emission, Global warming, Acid-rain, Stratospheric Ozone Depletion, Sustainability and Conservation of Biodiversity

Reference

1. Maier Rainna, Pepler IL, and C P Gerber (2000) Environmental Microbiology, Academic Press
2. Atlas RM and Richard Bartha (1998) Microbial Ecology: Fundamentals and Applications, (4thEd). Pearson Education
3. Agarwal SK (2007) Environmental Biotechnology, ABH Pubs
4. Wise DL Editor (1997) Global Environmental Biotechnology, Studies in Environmental Science 66, Elsevier.
5. APHA (1995) AWWA Standard Methods for the Examination of Water and Waste-water, (16thEd), American Public Health Association, Washington DC
6. Garg VK, Bishnoi MS and CP Malik (2002) Introductory Text of Environmental Policies and Laws, Kalyani
7. Lawrence K Wang, Ivanov, Tay and Hung (2010) Environmental Biotechnology, Series Handbook of Environmental Engineering Vol 10, Humana Press

Practical I, II Health Biotechnol, Agric Biotechnol, Microbial Biotechnol, Env Biotechnol (307-310)

1. Thin sectioning and Staining of Plant tissue
2. Preparation, sectioning and staining of animal tissue
3. Extraction of Lipid from Jojoba seeds and determination of saponification value
4. Determination of antibiotic sensitivity of Bacterial culture using multidisc method
5. Extraction and Purification of Citric acid / Antibiotic from fermented broth
6. Cultivation of Human WBCs
7. Evaluation of commercial Biofertilizer for Viability and Growth promotion parameters
8. Diagnosis of Thalessemia by Western-blot technique
9. Measurement of decolorization of dyed affluent by microbial activity
10. Determination of Biological Oxygen Demand
11. Physico-chemical analysis of waste-water (select parameters TS, TDS, Hardness and Colour, Turbidity, pH, Hardness, N and P)
12. Fermentation kinetics for Amylase production by *B. subtilis* using shake-flask study
13. Optimization studies for microbial fermentation process using bioreactor
14. Determination of Chemical Oxygen Demand