

SEMESTER VI

GBMB-601 Management of Human Microbial Diseases

Course Objectives:

- (i) The student will be able to understand the basic techniques in animal biotechnology to improve yield of the plants.
- (ii) After finishing this course, the student will learn the genetic manipulation technique for crop improvement.
- (iii) The student will understand the application of microbial agents in agrochemical industries.
- (iv) The student will learn the advancement in genetic engineering techniques in agriculture.
- (v) At the end of this course, the student will learn the use of biofertilizers and ethical aspects in agriculture and animal farming.

Course Contents:

Unit 1 Human Diseases

Infectious and non infectious diseases, microbial and non microbial diseases, Deficiency diseases, occupational diseases, Incubation period, mortality rate, nosocomial infections.

Unit 2 Microbial diseases

Respiratory microbial diseases, gastrointestinal microbial diseases, Nervous system diseases, skindiseases, eye diseases, urinary tract diseases, Sexually transmitted diseases: Types, route of infection, clinical systems and general prevention methods, study of recent outbreaks of human diseases (SARS/Swine flu/Ebola) – causes, spread and control, Mosquito borne disease – Types and prevention.

Unit 3 Therapeutics of Microbial diseases

Treatment using antibiotics: beta lactam antibiotics (penicillin, cephalosporins), quinolones, polypeptides and aminoglycosides.

Judicious use of antibiotics, importance of completing antibiotic regimen, Concept of DOTS, emergence of antibiotic resistance, current issues of MDR/XDR microbial strains.

Treatment using antiviral agents: Amantadine, Acyclovir, Azidothymidine. Concept of HAART.

Unit 4 Prevention of Microbial Diseases

General preventive measures, Importance of personal hygiene, environmental sanitation and methods to prevent the spread of infectious agents transmitted by direct contact, food, water and insect vectors.

Unit 5: Vaccines

Importance, types, vaccines available against microbial diseases, vaccination schedule (compulsory and preventive) in the Indian context.

Suggested Readings

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
4. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education
5. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition

GBMB-602 MICROBES IN SUSTAINABLE AGRICULTURE AND DEVELOPMENT

Course Objectives:

- (i) The student will be able to understand the basic techniques in animal biotechnology to improve yield of the plants.
- (ii) After finishing this course, the student will learn the genetic manipulation technique for crop improvement.
- (iii) The student will understand the application of microbial agents in agrochemical industries.
- (iv) The student will learn the advancement in genetic engineering techniques in agriculture.
- (v) At the end of this course, the student will learn the use of biofertilizers and ethical aspects in agriculture and animal farming.

Course Contents

Unit 1 Soil Microbiology

Soil as Microbial Habitat, Soil profile and properties, Soil formation, Diversity and distribution of microorganisms in soil.

Unit 2 Mineralization of Organic & Inorganic Matter in Soil

Mineralization of cellulose, hemicelluloses, lignocelluloses, lignin and humus, phosphate, nitrate, silica, potassium

Unit 3 Microbial Activity in Soil and Green House Gases

Carbon dioxide, methane, nitrous oxide, nitric oxide – production and control

Unit 4 Microbial Control of Soil Borne Plant Pathogens

Biocontrol mechanisms and ways, Microorganisms used as biocontrol agents against Microbial plant pathogens, Insects, Weeds.

Unit 5 Biofertilization, Phytostimulation, Bioinsecticides

Plant growth promoting bacteria, biofertilizers – symbiotic (*Bradyrhizobium*, *Rhizobium*, *Frankia*), Non Symbiotic (*Azospirillum*, *Azotobacter*, Mycorrhizae, MHBs, Phosphate solubilizers, algae), Novel combination of microbes as biofertilizers, PGPRs

Unit 6 Secondary Agriculture Biotechnology

Biotech feed, Silage, Biomanure, biogas, biofuels – advantages and processing parameters

Unit 7 GM crops

Advantages, social and environmental aspects, Bt crops, golden rice, transgenic animals.

SUGGESTED READINGS

1. Agrios GN. (2006). Plant Pathology. 5th edition. Academic press, San Diego, 2. Singh RS. (1998). Plant Diseases Management. 7th edition. Oxford & IBH, New Delhi.
3. Glick BR, Pasternak JJ, and Patten CL (2010) Molecular Biotechnology 4th edition, ASM Press,
4. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
5. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press
6. Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, Wiley Blackwell, USA
7. Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.
8. Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.
9. Altman A (1998). Agriculture Biotechnology, 1st edition, Marcel decker Inc.
10. Mahendra K. Rai (2005). Hand Book of Microbial Biofertilizers, The Haworth Press, Inc. New York.
11. Reddy, S.M. et. al. (2002). Bioinoculants for Sustainable Agriculture and Forestry, Scientific Publishers.
12. Saleem F and Shakoori AR (2012) Development of Bioinsecticide, Lap Lambert Academic Publishing GmbH KG

GBMB-603 ADVANCES IN MICROBIOLOGY

Course Objectives:

"(i) The student will be able to understand the basic techniques in microbiology to improve yield of the microbes etc.

Course Contents:

Unit 1 Evolution of Microbial Genomes

Salient features of sequenced microbial genomes, core genome pool, flexible genome pool and concept of pan genome, Horizontal gene transfer (HGT), Evolution of bacterial virulence – Genomic islands, Pathogenicity islands (PAI) and their characteristics

Unit 2 Metagenomics

Brief history and development of metagenomics, Understanding bacterial diversity using metagenomics approach, Prospecting genes of biotechnological importance using metagenomics. Basic knowledge of viral metagenome, metatranscriptomics, metaproteomics and metabolomics.

Unit 3 Molecular Basis of Host-Microbe Interactions

Epiphytic fitness and its mechanism in plant pathogens, Hypersensitive response (HR) to plant pathogens and its mechanism, Type three secretion systems (TTSS) of plant and animal pathogens, Biofilms: types of microorganisms, molecular aspects and significance in environment, health care, virulence and antimicrobial resistance

Unit 4 Systems and Synthetic Biology

Networking in biological systems, Quorum sensing in bacteria, Co-ordinated regulation of bacterial virulence factors, Basics of synthesis of poliovirus in laboratory, Future implications of synthetic biology with respect to bacteria and viruses

SUGGESTED READING

1. Fraser CM, Read TD and Nelson KE. Microbial Genomes, 2004, Humana Press
2. Miller RV and Day MJ. Microbial Evolution- Gene establishment, survival and exchange, 2004, ASM Press
3. Bull AT. Microbial Diversity and Bioprospecting, 2004, ASM Press
4. Sangdun C. Introduction to Systems Biology, 2007, Humana Press
5. Klipp E, Liebermeister W. Systems Biology – A Textbook, 2009, Wiley –VCH Verlag
6. Caetano-Anolles G. Evolutionary Genomics and Systems Biology, 2010, John Wiley and Sons
7. Madigan MT, Martink JM, Dunlap PV and Clark DP (2014) Brock's Biology of Microorganisms, 14th edition, Pearson-Bejamin Cummings
8. Wilson BA, Salyers AA Whitt DD and Winkler ME (2011) Bacterial Pathogenesis- A molecular Approach, 3rd edition, ASM Press,
9. Bouarab K, Brisson and Daayf F (2009) Molecular Plant-Microbe interaction CAB International
10. Voit EO (2012) A First Course in Systems Biology, 1st edition, Garland Science

GBBT-604 DISSERTATION

The dissertation/project work must be accompanied by suitable lab techniques and should not only comprise of simple surveys or documentation. It will be monitored for its progress every month till the completion of the work (Total minimum period for the project will be 6 months). After the completion of the work, bound form of thesis should be submitted to the School of Life & Allied Health Sciences for evaluation. The evaluation will be based on the seminar presentation, viva voce and other suitable methods/modifications time to time.