

CORE COURSE II - GENETICS AND MICROBIOLOGY

A. GENETICS

Unit-I

Mechanism of Inheritance and Gene Regulation

Phage – Genetic material, mechanism of recombination and concept of lysogeny.

Bacteria – Genetic material – chromosomal and extra- chromosomal - Mechanism of recombination by transduction, transformation and conjugation- Mapping of bacterial chromosomes.

Eukaryotes – Genetic fine structure – Cistron, muton, recon, exon, intron, transposon and overlapping genes. Mechanism of homologous recombination. Role of recombinase and chromosome mapping.

Regulation of gene expression – *Lac* and tryptophan operon of bacteria. Short term and long term regulation of eukaryotic gene with reference to steroid hormone stimulation of gene, expression of globin gene family.

Unit-II

Population, Mutation and Cancer Genetics

Genes in populations – allelic and gene frequencies – implications of Hardy-Weinberg principle – Factors affecting Hardy-Weinberg equilibrium.

Gene mutations – Chromosomal and point mutations, spontaneous and inducible mutations, reversible and suppressor mutations. Mutagens – Physical, chemical and biological. Teratogens and induced birth defects.

Carcinogens – Genetic basis of cancer – Chromosomal translocations – Role of oncogenes and tumour suppressor genes – RB genes and P₅₃.

Unit-III

Human Genetics

Inborn errors of metabolism: disorders of amino acid metabolism – PKU, alkaptonuria and albinism; disorders of purine metabolism – Lesch-Nyan syndrome and ADA deficiency; disorders of carbohydrate metabolism – galactosemia and G₆PD deficiency; disorders of lipid metabolism – Tay Sachs' disease and Gaucher's disease.

Haemoglobin disorders – Sickle cell anemia and thalassemia.

Human Karyotype preparation and chromosomal syndromes in man – Down, Turner and Klinefelter syndromes.

Gene Therapy – Types, protocol for ADA deficiency and ethical issues.

Human genome project – Salient features, methods adopted, future prospects.

B. MICROBIOLOGY

Univ-IV

General Microbiology

Structure and life cycle of DNA (T₄ Phage) and RNA virus (HIV) and bacteria, bacterial growth curve, sterilization techniques, culture of bacteria – types of media and conditions for culturing.

Microbial control – Physical and chemical methods for the control of microorganisms – Antibiotics and other antimicrobial agents – Mechanism of drug resistance.

Microbiology in everyday life: Microbiology of air, water, soil and sewage.

Unit-V

Applied Microbiology

Medical microbiology: Causative agents, modes of transmission and control of Polio, HIV, HBV A and B, Tuberculosis, Leprosy, Diphtheria, Typhoid, Gonorrhoea and Amoebiasis.

Food Microbiology: Microbes of milk and food – Methods of detection, Pasteurization and Food poisoning.

Agricultural Microbiology: Nitrogen fixing bacteria – symbiotic and asymbiotic. Mechanism of N₂ fixation.

Industrial Microbiology: Fermentation of alcohol, Type of fermentors, Conditions of fermentation.

Recommended Text Books

GENETICS

1. JENKINS, J.B. (1983), Human Genetics, The Benjamin Cummings Publishing Co.
2. URSULA GOODENOUGH (1984), Genetics, Saunders College Publishing Co., London.

MICROBIOLOGY

1. PELCZER, M.J., REID, R.D. and CHAN, E.C.S. (1996), Microbiology, V Ed., Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. ANANTHANARAYANAN, T and JAYARAM PANIKER, C.K. (2000), Text Book of Microbiology, VI Ed., Orient Longman Ltd., Madras.

References

GENETICS

1. BENJAMIN LEWIN (2000), Genes VII, Oxford University Press, New York.
2. DANIEL L. HARTL (1994), Genetics, III Ed., Jones and Bartlett Publishers, Boston.
3. JOHN D. HAWKINS (1996), Gene Structure and Expression, III Ed., Cambridge University Press.
4. ROBERT H. TAMARIN (1996), Principles of Genetics, WCB Publishers. Munro.W. Also,
www.catchword.com
www.fruitfly.org
5. STRICKBERGER MANROE, W. (1996), Genetics, Prentice Hall of India Pvt. Ltd.

MICROBIOLOGY

1. DAVID FREIFELDER (1998), Microbial Genetics, Narosa Publishing House, New Delhi.
2. POWAR, C.B. and DIGINAWALA, H.F. (1982), General Microbiology Volume I & II, Himalaya Publishing House, Bombay.
3. MICHAEL T. MADIGAN, JOHN M. MARTINKL, JACK PARKER (1997), Biology of Microorganisms, VIII Ed., Prentice Hall International Inc., USA.