

BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.

B.Sc. Biotechnology – Course Structure under CBCS

(For the candidates to be admitted from the academic year 2005-2006 onwards)

| Semester | Course Title | Instru. Hours / Week | Credit | Exam Hours | Marks | | Total |
|----------|--|----------------------|--------|------------|-------|-------|-------|
| | | | | | Int. | Extn. | |
| I | Language Course – I (LC) | 6 | 4 | 3 | 25 | 75 | 100 |
| | English Language Course - I (ELC) | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – I (CC) – General Microbiology | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – II (CC) – Practical – Lab in General Microbiology | 3 | - | * | - | - | - |
| | First Allied Course –I (AC) – Biological Chemistry | 5 | 3 | 3 | 25 | 75 | 100 |
| | First Allied Course –II (AC) – Immunology | 2 | - | * | - | - | - |
| | General Interest Course (GIC) – History of Science / Computer Applications | 2 | 2 | 3 | 25 | 75 | 100 |
| | | | | | | | |
| II | Language Course – II (LC) | 6 | 4 | 3 | 25 | 75 | 100 |
| | English Language Course – II (ELC) | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – II (CC) Microbial Physiology | 3 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – III (CC) – Practical – Lab in Microbial Physiology | 6 | 4 | 3 | 25 | 75 | 100 |
| | First Allied Course – II (AC) – Immunology | 3 | 3 | 3 | 25 | 75 | 100 |
| | First Allied Course – III (AC) – Medical Microbiology | 5 | 3 | 3 | 25 | 75 | 100 |
| | | | | | | | |
| III | Language Course – III (LC) | 6 | 4 | 3 | 25 | 75 | 100 |
| | English Language Course - III (ELC) | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – IV (CC) – Microbial Biotechnology | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – V (CC) – Practical - Lab in Microbial Technology | 4 | - | * | - | - | - |
| | Second Allied Course – I (AC) – Bioinformatics | 5 | 3 | 3 | 25 | 75 | 100 |
| | Second Allied Course – II (AC) – Lab in Bioinformatics | 3 | - | * | - | - | - |
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|----|---|---|---|----|----|----|-----|
| IV | Language Course –IV (LC) | 6 | 4 | 3 | 25 | 75 | 100 |
| | English Language Course – IV (ELC) | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – V (CC) – Practical - Lab in Microbial Technology | 2 | 4 | 3 | 25 | 75 | 100 |
| | Core Course - VI (CC) – Molecular Genetics | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – VII (CC) – Industrial Biotechnology | 3 | - | ** | - | - | - |
| | Second Allied Course – II (AC) – Lab in Bioinformatics | 2 | 3 | 3 | 25 | 75 | 100 |
| | Second Allied Course - III (AC) – Bio Statistics | 5 | 3 | 3 | 25 | 75 | 100 |
| V | Core Course – VII (CC) – Industrial Biotechnology | 3 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – VIII (CC) – Development Biology | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – IX (CC) – Plant Biotechnology | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – X (CC) – Lab in Environmental Bio Technology and Recombinant Technology | 3 | - | * | - | - | - |
| | Elective Course – I (EC) | 4 | 3 | 3 | 25 | 75 | 100 |
| | Elective Course – II (EC) | 4 | 3 | 3 | 25 | 75 | 100 |
| | Elective Course – III (EC) | 4 | 3 | 3 | 25 | 75 | 100 |
| VI | Core Course – X (CC) – Lab in Environmental Bio Technology and Recombinant Technology | 3 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XI (CC) – Animal Biotechnology | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XII (CC) – Enzyme Technology | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XIII (CC) – Bio Process Technology | 6 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XIV (CC) – Lab in Plant and Animal Biotechnology | 6 | 4 | 3 | 25 | 75 | 100 |
| | Elective Course – IV (EC) | 4 | 3 | 3 | 25 | 75 | 100 |

The Department of Biotechnology will offer the following Elective Courses (ECs)

Elective Course I. r-DNA Technology } **For B.Sc. Biotechnology students**
 Elective Course II. Plant Tissue Culture }

Elective Course III. Environmental Biotechnology } **For other Department students**
 Elective Course IV. Marine Biotechnology }

* Examination at the end of even semester

** Examination at the end of fifth semester

CORE COURSE I – GENERAL MICROBIOLOGY

UNIT I:

History of Microbiology, Methods of sterilization, Microscopic Principles and applications – Electron microscopy (TEM and SEM) Prokaryotic and Eukaryotic microorganisms. Classification of microorganisms.

UNIT II:

Ultra structure of algae, bacteria, fungi, viruses and protozoan, sub cellular structures and cell envelope-slime, capsule, cell wall, cell inclusion, biosynthesis of bacterial cell wall – Nutrition – commercial product, reproduction and life cycle pattern.

UNIT III:

Aerobic and anaerobic nutritional requirements – macro nutrients – growth factors – selective / differential media – enrichment media – microbial assay media. A general account of algal photosynthesis – chemo synthesis.

UNIT IV:

Factors influencing and affecting microbial growth – growth determination Growth and death kinetics – pH, temperature and light, Bacteriostatic, disinfections, control of microorganisms – physical and chemical agents, antimicrobial chemo therapy.

UNIT V:

Gene transfer in microbes, conjugation, Transformation, Transduction, Transfection sex factor.

REFERENCES:

1. Microbiology- M.J. Pelczar, Jr., E.C.S. Chang and N.R. Krieg, McGraw Hill Company, Newyork (1986).
2. Microbiology-concepts and applications, M.J. Pelczar, Jr., E.C.S. Chang and N.R. Krieg, McGraw Hill Company (1993).
3. Microbiology – L.M. Prescott, J.P. Hareley D.A. Klein – Wm.c. Brown publishers. Dutique, Jawa, Melbourne. 1993.
4. Modern Microbiology – wayne w. Umbreit – W.H, Freeman and company, son franciscod London (1962).
5. Basic and Practical Microbiology – Ronald M. Atlas, Mac.Milleen Company, Newyork (1986).

CORE COURSE II – PRACTICAL - LAB IN GENERAL MICROBIOLOGY

UNIT I:

Maintenance of hygienic conditions in the laboratory and legal disposal of laboratory wastes.

UNIT II:

Microscope and its functions, preparation of culture media and sterilization methods.

UNIT III:

Staining techniques, simple, grams, spore and capsular.

UNIT IV:

Bacterial culture technique – streaking, pour plate and spread plate method. Fungal culture techniques.

UNIT V:

Motility of bacteria, Growth studies.

UNIT VI:

Isolation of microbes and slide preparation – quantitative estimation of microbes. Characterization biofertilizer microbes.

REFERENCES:

1. Bucker, J.M., Caldwell, C.A., Zachgo, E.A. 1990. A Laboratory course, Academic Press.
2. Harold J. Berson 1994. Microbial Applications. WM.C. Brown Publishers.

FIRST ALLIED COURSE I - BIOLOGICAL CHEMISTRY

UNIT I:

Adjustment of cells to diverse environments like water, temperature salts, acidity, alkalinity and pressure – adaptability of prokaryotic and eukaryotic cells.

UNIT II:

Release of energy to cells, oxidation, reduction, reactions pathways of oxidoreductions, oxidative phosphorylation.

UNIT III:

Conversion of energy in cells, energy storage, energy, exchange role of enzymes.

UNIT IV:

Transport across all membrane, pinocytosis, phagocytosis, Autophagy, permeability of water and salts, salt antagonism, Active transport.

UNIT V:

Cell Cycle – Growth of normal and cancer cells, cell divisions, Synchronized cell division, cytokinesis.

REFERENCE:

1. Cell biology – Arthur, Giese, Saunders co. 1979.
2. L. Stryer 1995 Biochemistry, Freeman company, New York.
3. Lehninger – Biochemistry, Worth Publications inc. 1982 CBS Publication, New Delhi.

FIRST ALLIED COURSE II - IMMUNOLOGY

UNIT I:

Introduction, History and Scope of immunology. Types of immunity, Antigen-Antibody reactions.

UNIT II:

Antigen – types, immunoglobulins – distribution and functions. Lymphoid tissues – ontogeny and physiology and immune system. T & B Cells – receptors – activation and function.

UNIT III:

Cellular interactions in immune response, Hypersensitivity reactions, HCA Tissue typing, transplantation immunity, vaccine production.

UNIT IV:

Immuno diagnostics – precipitation, agglutination, ELISA and FISH.

UNIT V:

Autoimmune disorders and immunology of infectious diseases including AIDS. Introduction to tumour immunology, Immune erasion, Immune suppression, General introduction to monodonal antibodies and vaccines. Structure and functions of cytokines..

REFERENCE:

1. Immunology by I.M. Roitt, J. Brostoff and D.K. Male (1993) Gower medical publishing, London.
2. Immunology by J.Jube (1991) freeman and company.
3. Immunology – A short course by E. Benzamini, G. Sunshine and Leskpwitz, Willy – Liss 1996.

4. Introduction to medical Immunology by Gabriel Virellce, Marcel Dekkar 1993.
5. Donald M. Weir, John Stewart, 1993. Immunology VII edition. ELBS, London.
6. Richard M. Hyde. 1995. Immunology III edition. National Medical series, Williams and Wilkins. Harvard publishing company.

CORE COURSE III - MICROBIAL PHYSIOLOGY

UNIT I:

Introduction of cellular physiology, transportation mechanism, permeability of water. Salts and signal hypothesis.

UNIT II:

Synthesis of carbohydrates – anabolism – Photosynthesis – Oxygenic, an Oxygenic, pentose pathway, TCA cycle, ATP production, Glycolysis, Glycogenesis, Gluconeogenesis.

UNIT III:

Metabolism of proteins, pathways of nitrogen utilization, regulation of protein synthesis, synthesis of amino acids and peptides.

UNIT IV:

Anabolic and catabolic process of lipids and nucleic acids – inborn error of lipid metabolism.

UNIT V:

The role of enzymes and vitamins in the metabolic pathways. Physiology of extremophiles. Some inborn abnormalities / disorders of metabolism.

REFERENCE:

1. Pelczar Jr., M.J., Chang E.C.S., and Treig NR (1993). Microbiology – McGraw Hill Inc., New York.
2. Stainer R.P., Ingraham J.I., Wheelis M.L., and Painter P.R. (1986) General Microbiology, Mac Millan Education Ltd., London.
3. Murray R.K., Granner M.D., Mayes P.A., and Redwell V.W. (1990) Biochemistry – Prentice Hall International Inc., London.
4. Biochemistry by Lehninger – Worth publications inc 1982. CBS publication, New Delhi.

FIRST ALLIED COURSE III – MEDICAL MICROBIOLOGY

UNIT I

Normal human Microflora, Microbes of medical interest – protozoa, fungi, yeast, bacteria and viruses.

UNIT II

Clinical diagnosis – Pattern of disease, indication of disease for Microbial etiology.

UNIT III

Prevention and treatment of human diseases. Avoiding exposure to pathogen. Antibiotics and chemotherapeutic agents – drug resistance and antibiotic policy.

UNIT IV

Diseases of respiratory, gastrointestinal and Urinogenital tract and the prevention measures.

UNIT V

Diseases transmitted through animal bites. rabies,, malaria, diseases transmitted through direct contact – Leprosy, sporotrichosis, HSV infection.

REFERENCE:

1. Chaechter, M. Medoff, G and Ensenstein B C (1993) Mechanism of Microbial diseases. 2nd edition. Williams and Wilkins, Baltimore.
2. David Greefnwood, Richard CD, Slack, John Forrest Peutherer (1992) Medical Microbiology 14th edition ELBS with Churchill Livingstone.
3. Joan Stokes E, Ridgway GL and Wren MWD. (1993) Clinical Microbiology. 7th Edition Edward Arnold. A division of Hodder and Stoughton.
4. Ronald M. Atlas (1989) Microbiology Fundamentals and Applications. 2nd edition. Maxwell Macmillan International editions.

CORE COURSE IV - MICROBIAL BIOTECHNOLOGY

UNIT I:

Definition of Biotechnology – concept – history – achievements and products.

UNIT II:

Industrial Microbiology: Bioreactors Microbial insecticides, Recombinant proteins. Enzyme production – problems, application – immobilization of cells and enzymes. Vaccines and their production, Biofertilizers.

UNIT III:

Biotechnological potential of micro algae – food – fuel production – pharmaceutical valuable compounds of micro algae. SCP, Mycoprotein.

UNIT IV:

Environmental release – monitoring of genetically engineered organisms, Intellectual properties right.

Bioremediation, Biosorption, Environmental clean-up by microbes, degradation of xenobiotics.

UNIT V:

Bio control of insects – microbes as food in feed for plants and animals. Pollution and waste recycling, microbial mining (bioleaching) Environmental protection agencies, Rheosummit.

REFERENCE:

1. Molecular Biotechnology by lick and Pasternack. ASM press. 1994.
2. Desmond, S.T., Nicholl. 1994. AN introduction to Genetic Engineering Cambridge press.
3. Old R.W. and primrose S.B. 1994 Principles of Gene Manipulation. 4th edition. Blackwell scientific publication London.
4. Cresswell RC. Ress TAV and Stah, H 1989. Algal and Cyanobacterial Biotechnology. Longman Scientific and Technical, NewYork.
5. P.Prave, P.Faust, V. Sitting, word sukatasch D. 1987 Fundamentals of Biotechnology. VCH verlasgetell Schafor MBH, Weinhkeim.

CORE COURSE V – PRACTICAL - LAB IN MICROBIAL TECHNOLOGY

UNIT I:

Isolation of single colonies of bacteria. Measurement of growth of bacteriophages.

UNIT II:

Biochemical tests for identification of bacteria. Isolation of any Enzyme (amylase, urease, invertase etc) and its purification.

UNIT III:

Isolation of microorganisms from mining and their characterization.

UNIT IV:

Immobilisation of algal cells and enzymes.

UNIT V:

Induced mutagenesis, Ligation, restriction enzymes and determination of activity.

REFERENCE:

1. A short course in bacterial genetics by J.H. Miller (1992). Cold spring Harbor Laboratory.
2. Methods for genetics and molecular Bacteriology by E.D. Murrey, W.A word and N B King (1994) American Society for Microbiology.

SECOND ALLIED COURSE I - BIOINFORMATICS

UNIT I:

Introduction to Bioinformatics – scope and application – Characteristic of hardware and software. Types of computer, Bio-chips, computer network sending and receiving e-mail, Internet- browsing – searching biological articles information in internet.

UNIT II:

Computer application in biology – uses of databases in biology – Analysis of proteins and nucleic acid sequences – molecular modelling.

UNIT III:

Introduction to data processing – files – data collection – preparation – editing – backup – file recovery – procedure – sorting, searching and merging.

UNIT IV:

Fortran Programme, Basic, design control statements – assignment statements – integer and real constants – variable – expression.

UNIT V:

Windows fundamentals, Introduction to FOXPRO – database creation, insertion, deletion and modifications – managing multiple database – memory variables – data, time string and math functions – report generations. Web browsing, downloading. Preparation of files and file transfer.

REFERENCE:

1. Molecular database for protein sequence and structure studies by Sillince, JA and Sillince (1991). Springer verlag.
2. Sequence Analysis primer by M.Gribskov, J. Devereus (1989) Stockton press.
3. Nueleic acid and protein sequence analysis. A Practical approach by M.J. Bishop and C.J.Ramslings (1987) IRL Press.
4. Information theory and living systems by L.I, Garfield (1992) Columbia university press.
5. Illustrated Foxpro – Granillo – BPB pub.
6. Introductin to data processing – N.C.C. pub.
7. Mastering dataprocessing – J. Bingham macmillar master series.
8. Programming in FORTRAN. Rajaraman. Ved. Prentice Hall 1983.
9. Programming with FORTRAN – Seymour Lipschuts and Arthur Poe Schaum Series –1982.
10. Computer today – S.K. Basandra – galgortia publications.

SECOND ALLIED COURSE II
LAB – II - LAB IN BIOINFORMATICS

UNIT I:

Mean and standard deviation using Biological samples.

UNIT II:

Chi square test, students 't' test and correlation coefficient.

UNIT III:

Regression coefficient and regression lines.

UNIT IV:

Creation of Database and multiple database.

UNIT V:

Sorting, Indexing and reports generation

CORE COURSE VI - MOLECULAR GENETICS

UNIT I:

DNA as the genetic material – RNA as a genetic material – genetic code.

UNIT II:

Organization and function of prokaryotic and eukaryotic genetic material, replication of DNA and RNA.

UNIT III:

DNA damage – mechanism of repair – excision repair, recombinational repair, promoter, operator, terminator and attenuator.

UNIT IV:

Organisation of chromosomes, specialized chromosomes, chromosome abnormalities, population genetics, gametic cell genetics, crossing over, Epistasis chromosome mapping, gene linkage, three point cross, tetrad analysis.

UNIT V:

Discovery of types and structure of plasmids natural and artificial plasmid transfer and their applications. Insertion sequence in prokaryotes. Transposable elements – discovery and characterization.

REFERENCE:

1. Microbial genetics by S.R. Maloy, J. Egronan and D. Friefelder (1994) Jones and Bartlett Publishers.
2. Molecular genetics of Bacteria by J.W. Dale (1994) John wiley and sons.
3. Concepts of genetics by W.S. Klug and M.R. Cummings. Prentice Hall, 1997.
4. Introductions to Genetic Analysis by Coriffiths, Freeman and co., 1996.
5. Eckstein F, Lilley DM. 1996. Catalytic RNA. Springer – Verlag.
6. Fried berg EC., Walker CC. Siede W. 1995. DNA repair and mutagenesis. ASM Press.
7. Cardner EJ, Simmons MJ, Squstad DP, 1991. Principles of genetics. John wileyd sons.
8. Singer M, Berg P 1991. Genes and Genomes University science Books.

CORE COURSE VII - INDUSTRIAL BIOTECHNOLOGY

UNIT I:

Major classes of commercial products using micro organisms.

UNIT II:

Basic principles of Bio process, media formulation, sterilization. Batch and continuous sterilization system.

UNIT III:

Parts, Designing and types of fermentor, Down stream processing.

UNIT IV:

Bioprocess control and monitoring like temperature, pressure, agitation and pH. Computers in Bioprocess control.

UNIT V:

Industrial process of ethanol – vinegar – amylase – protease – glutamic acid.

REFERENCE:

1. Demain A.L. Solomon, J.J. (1986) Manual of industrial microbiology and Biotechnology. ASM press.
2. Reed C. (1982) Prescott and Dann's, Industrial Microbiology. Macmillan publishers.
3. Prave. P. Faust, V. Sitih. W., Sukatsh, DA (1987) Fundamentals of Biotechnology, ASM press.

SECOND ALLIED COURSE – III

BIostatISTICS

UNIT I:

Use of statistics in biology. Measures of central tendency – mean, median, mode. Measure of dispersion – standard deviation – standard error. Correlation coefficient, probability.

UNIT II:

Marginal, conditional distributions- continuous and discrete distributions, analysis, regression, - T test, chi square test, binomial, normal and exponential distribution. Biostat programme.

UNIT III:

Null hypothesis, level of significance, test of significance for mean / different.

UNIT IV:

Curve fitting – least square method – finite differences – difference operators – newton's forward and backward formula. Basics of the application of SPSS 7.5 window software package.

UNIT V:

MS-Excel for computing data. Newton Raphson method, false position method – Solution of simultaneous algebraic equations.

REFERENCE:

1. Introduction to numerical methods 1990. S.S. Shasta.
2. Computer oriented numerical methods 1971, V. Rajaraman.
3. Numerical methods Goel and Mittal Pragati publications.
4. Statistical methods. S.P. Gupta. S. Chand and Co.
5. High Engineering Mathematics. 1996 Dr. B.S, Agarwal Khanna Publishers.
6. Introduction to Biostatistics by Sokal and Rohif (1973). Toppan Co., Japan.

CORE COURSE VIII - DEVELOPMENTAL BIOLOGY

UNIT I:

Chemical nature and macromolecular nature of cells. Protein structure and function. Membrane architecture subcellular organells – mitochondria, chloroplast cell division – mitosis and meiosis.

UNIT II:

Chromosome architecture – modern concepts of Gene, prokaryotes and eukaryotes. DNA transfection; Replication, Repair, recombination, restriction and modification- Chromosomal abnormalities – Genetic disorders.

UNIT III:

Gene expression; Transcriptions and its expression in prokaryates, translation and its regulation in prokaryotes transcriptional and Translational regulation in prokaryotes. Post transcriptional modification in Eukaryotes.

UNIT IV:

Membrane architecture and assembly, membrane associated process like transport and energy transduction including ATP synthesis and photosynthesis.

UNIT V:

Specialised cells and their architecture. Specialised cell events like cell – cell signalling, Regulation in Eukaryotic cell cycle.

CORE COURSE IX - PLANT BIOTECHNOLOGY

UNIT I:

Plant genome organization. Organisation of chloroplast genome, organization of mitochondrial genome, cytoplasmic male sterility. Genomic interaction – Protoplasmic fusion.

UNIT II:

Genetic engineering in plants, Genetic engineering of plants for pest resistance, Herbicide resistance. Resistance to fungi and Bacteria, Delay of fruit ripening.

UNIT III:

Regulation of gene expression in plant development. Plant hormones and phytohormone. Seed storage proteins.

UNIT IV:

Molecular Biology of plant – pathogen interactions. Importance of RFLP in plant Breeding.

UNIT V:

Biochemistry and molecular biology of Nitrogen fixation in legumes by Rhizobium. Molecular biology of plant stress response. Agrobacterium and crown gall tumour. Synthetic seed, biocontrol.

REFERENCE:

1. Plant molecular Biology by Grierson and S.N. Covey (1988) Blackie.
2. Genetic engineering of crop plants by (Eds) G.W. Lycett and D. Grierson (1990)
3. Plants, Genes and Agriculture by M.J. Chrispeeds and D.F. Sadava (1994) Jones and Bartlett.

CORE COURSE X - LAB IN ENVIRONMENTAL BIOTECHNOLOGY AND RECOMBINANT TECHNOLOGY

UNIT I:

Soil analysis pH, chloride, nitrate, calcium, Magnesium and phosphorus.

UNIT II:

Rhizobium isolation, isolation of Blue green algae.

UNIT III:

Microbial assessment of air quality (open plate and air sample)

UNIT IV:

Pathogen identification – indol test, methyl red test, citrate utilization, voges – prokauer.

UNIT V:

Potability test of water.

REFERENCE:

1. Wetzel et.al and Likens, C.E. 1979. Limnological analysis. W.B. Saunders company.
2. Schachter, M.Medoff, c and Eisenstin B.C (1993). Mechanism of microbial diseases 2nd ed. Williams and Wilkins Baltimore.
3. Hume and Russell A.D. (1999). Pharmaceutical microbiology IV ed. Blackwell scientific publication of oxford.

CORE COURSE XI - ANIMAL BIOTECHNOLOGY

UNIT I:

Transformation of animal cells. Cloning vectors and expression vectors – yeast vectors and animal viral vectors.

UNIT II:

Production of useful proteins in transgenic animals. Genetic engineering as applied to production of vaccines and hormones.

UNIT III:

In vitro fertilizations and embryo transfer, Transgenic animals – Merits and demerits.

UNIT IV:

Gene therapy, mapping of human genome. RFLP and applications. DNA finger printing – Forensic Science.

UNIT V:

Ethical issues in animal biotechnology use of antibodies and nucleic acid, problem in clinical diagnosis. Molecular diagnosis of Genetic disorders.

REFERENCE:

1. Gene transfer and expression protocols – methods in molecular Biology Vol.7 by (Ed) E.9. Murray (1991) Humana press.
2. Molecular biology of gene by J.D. Watson N.H.Hopkins, T. Co Roberts, J.A. Steitz and A.M. Weiner (1987) Benjamin / Cummings 4th ed. Vol 1. & 2.
3. Recombinant DNA and 2nd (Ed) by J.D. Watson M. Gilman, J. Withnousti and M.Zoller (1992) scientific American Books.
4. Genetic engineering of animals by (Ed) A. Publisher (1993) VCH Publishers weintem. FRG.

CORE COURSE XII - ENZYME TECHNOLOGY

UNIT I:

General properties of enzymes. Enzyme classification and nomenclature Assay and purification of Enzymes.

UNIT II:

Mechanism of enzyme action (Lysozyme, DNA polymerase, chymotrypsin RNase), Membrane bound enzymes – assay extraction.

UNIT III:

Clinical and industrial application of enzymes. Immobilisation of Enzymes and their uses. Enzyme engineering.

UNIT IV:

Different types of inhibitors – presteady state kinetics, steady state kinetics. Allosteric enzymes.

UNIT V:

A general account co-enzymes and their functions. Metallo enzymes, Reconstitution of enzymes. – General introduction to Biosensors.

REFERENCE:

1. Biological chemistry by H.r. Mabler and E. Corder (1986)
2. Enzyme by Dixon and Webb.
3. Molecular Biotechnology by Glick and Pasternack. ASM press 1994.

CORE COURSE XIII – BIOPROCESS TECHNOLOGY

UNIT I

Introduction – Scope of Biotechnology in bioprocess engineering.

UNIT II

Enzyme kinetics – Introduction – Mechanistic models for simple enzyme kinetics – Michaelis – Mendel type type kinetics – effect of P^H on enzyme kinetics.

UNIT III

Bioprocess consideration in using plant and animal cell cultures.

UNIT IV

Genetically engineering organisms – Introduction E.coli – Lower eukaryotic cells – metabolic and protein engineering.

UNIT V

Applications of bioprocess engineering – Introduction – tissue engineering – gene therapy – bioreactors.

REFERENCE:

1. Michael L. Shuler and Fikret Kargi (2003). Bioprocess engineering basic concepts. (2nd edition). Prentice Hall of India Pvt. Ltd. India.
2. Biochemical engineering, Aiba, S., Humphrey, A.E. and Mills, N.F. University of Tokyo Press, Tokyo.
3. Bioprocess technology : Fundamentals and applications, KTH Stockholm.
4. Process engineering in Biotechnology. Jackson, AT. Prentice Hall, Engelwood Cliffs.

5. Bioprocess engineering – Kinetics, Mass transport, Reactors and Gene expression, Vieth, W.F. John Wiley & Sons, Inc.

CORE COURSE XIV - LAB IN PLANT AND ANIMAL BIOTECHNOLOGY

UNIT I:

Surface sterilization of field grown tissues, Determination of chlorophyllase, chloroplast and anthocyanin determinations. Determination of globulins and albumins.

UNIT II:

Determination and Isolation of protoplast, viability test for protoplast. VAM infection, Demonstration of bio fertilizer microbes.

UNIT III:

Antigen – antibody reactions – Agglutination – precipitation ring test, immunodiffusion, immuno electrophoresis.

UNIT IV:

Demonstration of Western Blot.

UNIT V:

Demonstration of monoclonal antibody production., RFLP

REFERENCE:

1. DNA cloning use of expression vectors.
2. Northern blotting and western Blotting
3. Hand book of Experimental immunology vol I & II by weir D.M. (1986) Blackwell Scientific publications.
4. Practical immunology by hudian, L and Hay, H.C (1980) Blackwell scientific publications.

ELECTIVE COURSE – I - R-DNA TECHNOLOGY

UNIT I:

Gene cloning principles: vectors- general characters, replication mechanism, plasmids, phages, cosmids, cutting and joining of DNA.

UNIT II:

Transfer of DNA into cells transformation, transduction, electroporation and microinjection – Particle bombardment technique etc.

UNIT III:

Construction of genomic libraries and (DNA) probe construction, cloning in E.Coli, Bacilli and yeast.

UNIT IV:

Application of PCR, concept of PCR, concept of PCR, Analysis of amplified products, LCR.

UNIT V:

Application of R-DNA technology in medicine, agriculture and Industry. Safety aspects of R-DNA technology.

REFERENCES:

1. Levin B 1994. Genes V Oxford University Press.
2. RN.Old and SB. Primrose 1994. Principles of gene manipulation IV edition, Blackwell pub. Ny.
3. Molecular cloning – A Laboratory manual 1993. sambrook etal.
4. R-DNA – W.H. Ereeman & co. NY. 1992 – by Woston JD, M. Gilman J. Witkowski and M.Zoller.

ELECTIVE COURSE – II – PLANT TISSUE CULTURE

UNIT I:

Introduction to cell biology, structure and functions of prokaryotes and Eukaryotic cell. Morphology and history of different types of cells.

UNIT II:

Membrane structure and function, the prokaryotic and eucaaryotic cell walls, plasma membrane, lipid bilayer, membrane protein.

UNIT III:

Isolation and characterisation of nuclei and nucleoli, isolation and functional analysis of mitochondria, chloroplast. Preparation and analysis of genetic material cell autoradiography, asptic technique and media preparation of primary cultures, maintenance of secondary culture cell line propogation of cell in suspension.

UNIT IV:

Analysis of biosynthesis of cellular components by radioactive labelling cultured cells. Plant cell structure and organisation of cell groups in tissue system. Mass culture of plant cell suspension, somaclones, mericloneing, micropropagation.

UNIT V:

Regeneration of plants through clonal propogation. Enzymes involved in cell wall digestion, macrozymes, pectinase, cellular source – catalytic properties. Methods of

isolation of protoplast directly from plant organs, cultured cells, selection of somatic hybrids – Gene expressions, regeneration of protoplast into whole plants.

REFERENCE:

1. Tissue culture, methods and applications, Hurse P.I. and patterson., M.K.
2. Hardbook of cell and organ culture (2nd ed) Marcent et.al.
3. Animal cell culture course manual – cold spring warbor laboratory, Newyork.
4. Laboratory manuel of cell biology – Shanmugam, Macmillan.
5. Plant cell culture – A practical approach L.A. Dixon, RL Press.

ELECTIVE COURSE III – ENVIRONMENTAL BIOTECHNOLOGY

UNIT I:

Deterioration of Leather, wood, Textiles, metal corrosion – mode of deteriorasation – organisms involved – mode of prevention.

UNIT II:

Liquid waste treatment. Methods of primary, secondary – involved organisms.

UNIT III:

Types of water, microbial living system, potability of water, microbial assessment of water, quality, water born diseases. Utilization distillery wastes, cement exhaust dust effects on plants.

UNIT IV:

Account of air born transmission of microbes and diseases. Biomonitoring of Environmental pollution.

UNIT V:

Solid waste treatment – saccharifica`tion, compositive – utilization of solid waste food (SCP, mushroom) fuel, (ethanol), fertilizers.

REFERENCE

1. Ec. Eldoconey, S. hardman, D. Jand Waite, S. 1993. Pollution: Ecology and Bio-treatment Longman scientific technical.
2. Baaker, KH and Herson D.S. 1994. Bioremidation, Mc.GrawHill Inc, NewYork.
3. W.C. Earnest, (1982). The environment of the deep sea vol. II J.C. Morin Rubery.
4. C.R. Leinleimer (1977) Microbial ecology of brakish water environment ecological Berlin – Heidelberg. New York.
5. William M. Lewis. Jr, James F. Saunders, David w. Crampacker Sr. and Chaarles Brendecke., (1984) Ecological studies – 46

ELECTIVE COURSE IV – MARINE BIOTECHNOLOGY

UNIT I

Marine Ecosystem : Characters of Marine habitat, classification of Marine habitat.

UNIT II

Importance of Marine biological diversity : species, ecosystem, genetic biodiversity.

UNIT III

Identification of Marine bioactive compounds containing organisms : Mangroves, sea weeds, sea grasses, sponges, mollusks, Echinoderms – associated microbes.

UNIT IV

Anticancer – antiviral – antibacterial – antifungal compounds, Biopesticides, herbicides from Marine Microbes.

UNIT V

Marine conservation : Factors creating diversity in the sea; area of diversity, area to be protected, risk factors for population and species.

REFERENCE:

1. Pharmaceutical and the sea (1988) Carles W. Jerffored, Kenneth L.Rinehart.
2. Recent advances in Marine Biotechnology, M.Fingermann, R.Nagabushanam and Mary Frances Thompson.
3. Trends in Marine Biotechnology Dr.S.Lazarus and Dr.S.G.Prakash Vincent.
4. Nutrients and Bioactive substances and aquatic organisms – K.Devadasan and M.K.Mukundan.

ALLIED COURSE I – BIOMOLECULES

UNIT I

Chemical foundations of Biology - P^H , P^k , acids, bases, buffers, weak bonds and covalent bonds.

UNIT II

Structure and classification of carbohydrates – Mono sauharides, Oligosauharides.

UNIT III

Aminoacids and Peptides – classification, chemical reactions and physical properties – Protein hierarchy in structure.

UNIT IV

Lipids – classification and reactions, fatty acids : Saturated and unsaturated fatty acids.

UNIT V

Nucleic acids : Types of DNA, RNA – A, B, Z form of DNA, mRNA, tRNA, hnRNA, ScRNA and SnRNA.

REFERENCE:

1. General Chemistry, Linus Pauling, W.H. Freeman & Company.
2. Organic Chemistry, DJ Gnam and GS Hammond McGraw Hill
3. Biochemistry, D voet and JG voet, J. Wiley and Sons.
4. Physical Biochemistry, D Fredilder, W.H. Freeman & Company.

ALLIED PRACTICAL I – LAB COURSE IN BIOMOLECULES AND IMMUNOLOGY

Biomolecules

1. Quantification of aminoacids, sugars and lipids.
2. UV, visible and fluorescence spectroscopy.
3. Separation techniques – Centrifugation, Chromatography and Electrophoresis.

Immunology

1. Blood film Preparation and identification of cells.
2. Lymphoid organ and their Organization.

References:

1. Laboratory techniques in Biochemistry and Molecular Biology, Work and Work.

2. A biologist's guide to Principle and techniques of practical Biochemistry Wilson & KH Goulding, ELBS edition, 1986.
3. Laboratory Manual of Biochemistry by J. Jayaraman (1996) Wiley Eastern.
4. Principles of Instrumental Analysis by DA Skoog (1985), Holf – Saunders.
5. Practical Immunology by Hudson, Land Hay, HC (1980). Blackwell Scientific Publications.
6. Laboratory Immunology by L.T. Bradsha, Saunders College Publishing Company.

ALLIED PRACTICAL II – LAB COURSE IN MEDICAL MICROBIOLOGY AND BIOINFORMATICS

Medical Microbiology :

1. Collection and transport of pathological specimens for Microbiological examinations.
2. Antimicrobial assay – Sensitivity test (MIC).
3. Agglutination – WIDAL – tube and slide test.
4. Serum assay for antimicrobial test.
5. Isolation and Identification of the pathogen – culture and biochemical test.

Bioinformatics

1. Mean and standard deviation using Biological samples
2. Chi square test, student 't' test and correlation coefficient.
3. Regression coefficient and regression lines
4. Creation of database and multiple data base.
5. Sorting, Indexing and reports generation.
