

**MANONMANIAM SUNDARANAR UNIVERSITY**

**TIRUNELVELI**

**UG COURSES – AFFILIATED COLLEGES**

**B.Sc. Bio Chemistry**

(Choice Based Credit System)

(with effect from the academic year 2016-2017 onwards)

Sem	Pt I/II/ III/IV V/VI	Sub No.	Subject status	Subject Title	Hrs/ week	Cre dits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
V	I	33	Core - 7	Immuno chemistry	4	4	25	75	100	30	40
	II	34	Core - 8	Clinical Biochemistry	4	4	25	75	100	30	40
	III	35	Elective - 1 (Select any one )	A) Biostatistics B) Bioinformatics C) Diagnostic Biochemistry	5	5	25	75	100	30	40
		36	Elective - 2 (Select any one )	A) Environmental Biochemistry B) Nutritional Biochemistry C) Microbial Biochemistry	5	5	25	75	100	30	40
		37	Practical -5	Hematology and Microbiology	3	-	50	50	100	20	40
		38	Practical - 6	Enzymes and Kinetics	3	-	50	50	100	20	40
		39	Practical - 7	Clinical Biochemistry	2	-	50	50	100	20	40
	IV	40	Skill Based subject (Common)	Personality Development/ Effective Communication/ Youth Leadership	4	4	25	75	100	30	40
Subtotal					30	22					

VI	I	41	Core - 9	Molecular Biology	6	4	25	75	100	30	40
	II	42	Core – 10	Endocrine Biochemistry	6	4	25	75	100	30	40
	III	43	Core – 11	Plant Biochemistry	5	4	25	75	100	30	40
		44	Elective – 3 (Select any one)	A) Biotechnology B) Genomics and Proteomics C) Drug Biochemistry	5	5	25	75	100	30	40
		45	Practical – V & VI	Hematology and Microbiology	3	4	50	50	100	20	40
		46	Practical – V & VI	Enzymes and Kinetics	3	4	50	50	100	20	40
		47	Practical – 8	Clinical Biochemistry	2	4	50	50	100	20	40
				Subtotal	30	29					

## IMMUNOCHEMISTRY

Total Hours : 64

**Unit-1** 13 Hours

Infection – types, factors influencing infection- pathogenicity. Sources and carriers of infectious agents, Immune system- definition and properties, cells of immune system, Lymphoid organs- structure and function.

Types of immunity- Innate and Acquired immunity.

**Unit-2** 12 Hours

Antigens- definition, properties, antigenicity, immunogenic determinants and haptens. Types of antigens, Immunoglobulins- basic structure classes and distribution of antibodies.

**Unit-3** 12 Hours

Antigen antibody interactions- molecular mechanism of binding, affinity, avidity, valency, cross reactivity and multivalent binding, complement system. Complement components, classical and alternative pathway. Antigen recognition – T & B cell activation. Immunological memory. Lymphokines and cytokines.

**Unit-4** 12 Hours

Transplantation immunology- tissue types, graft rejection and role MHC and T cells. Prevention of graft rejection, Hypersensitivity- immediate and delayed types, mechanisms of reaction. Immunisation practice- Active and Passive immunization.

Tumor immunology- tumor antigens, immunosurveillance and NK cells. Primary and secondary immune deficiency disorders.

**Unit-5** 15 Hours

Immunological techniques, production of monoclonal and polyclonal antibodies. Principles and applications of RIA, ELISA, complement fixation tests, precipitation, Immunodiffusion, immunoelectrophoresis, agglutination test- hemagglutination, latex agglutination (Widal, NDRL).

### References

1. Immunology- 5<sup>th</sup> edition Ivan Roitt, Jonathan Brostoff and David male
2. Immunology- 3<sup>rd</sup> and 4<sup>th</sup> edition, Janis Kuby
3. Immunology- D.N. Weir
4. Immunology- A short course Eli Benjamine and Sidnet Leshkowi
5. Immunology- Stewart

## CLINICAL BIOCHEMISTRY

Total hours : 80

### Unit-1

16 hours

Disorders of carbohydrates metabolism:

Regulation of blood glucose level, hypoglycemia, hyperglycemia, diabetes mellitus-types, Clinical features, diagnostic tests- blood and urine tests, Benedict's method, glucose tolerance test, renal threshold for glucose, glycogen storage diseases, lactosuria, ketonemia and ketonuria.

### Unit-2

16 hours

Disorders of lipid metabolism. Plasma lipids and lipoproteins- Hyper lipoproteinemia – types, LCAT deficiency, Hyper and hypo Cholesterolemia, lipodosis, Xanthomatosis, atherosclerosis and fatty liver.

### Unit-3

16 Hours

Disorders of aminoacid metabolism and protein abnormalities: Inborn errors of aminoacid metabolism- cystinuria, phenylketonuria, maple syrup urine disease, albinism, Hartnup's disease, Willson's disease, Gout, hypouricemia

Disorders of protein metabolism- proteinuria, fibrinogen, albumin, globulin and A/G ratio.

### Unit-4

16 Hours

Liver and kidney function tests. Jaundice- types, clinical features, diagnostic tests- Vanderberg, fouchet's, Hay's test, test for urobilinogen. Renal clearance – urea, uric acid and creatinine. Renal blood flow . Pancreatic function test.

### Unit-5

16 Hours

Enzymes in clinical diagnosis, Isoenzymes- LDH, CPK, AST, ALT, Alkaline phosphatase, acid phosphatase, choline esterase, amylase, lipase. Electrophoretic pattern of isoenzymes in myocardial infraction, liver and muscular diseases.

### References

1. Text book of Medical Biochemistry- M.N.Chaterjee and Rane Shinde
2. Biochemistry with clinical correlation – Devlin
3. Clinical Biochemistry – William Hoffman
4. Practical Clinical Biochemistry – Harold Varley
5. Textbook of Medical Biochemistry – S.Ramakrishnan, K.G. Prassanan and R.Rajan
6. Harper's Biochemistry 24<sup>th</sup> edition
7. Clinical chemistry – Teity and Co

**MSU/2016-17/UG-Colleges/ Part IV (B. Sc. Bio chemistry)/Semester - V/  
Ppr.no.35(A)/ Elective -1(A)**

**BIOSATISTICS**

Total Hours: 80

**Unit-1**

16 Hours

Data collection- primary and secondary data; organization of data- Editing, classifying and tabulating. Frequency distribution. Diagrammatic representation of data - Diagrams, graphs and charts.

**Unit-2**

12 Hours

Measures of central tendency: Mean- Arithmetic mean, Geometric mean, Harmonic mean, Median and Mode.

**Unit-3**

16 Hours

Measures of Dispersion: Range, Standard deviation, Mean Deviation, Quartile deviation, Coefficient of variation.

**Unit-4**

16 Hours

Probability: Addition and Multiplication theorems, Theoretical distribution- Binomial poisson and Normal distributions.

**Unit-5**

20 Hours

Sampling theory- Population sample, Sample size, Sampling distribution, Standard error, Types of sampling, students t- Test, ANOVA (elementary level).

**References**

1. Text book of Subsidiary Statistics – K. Ramakrishna Pillai – Published by V.R. Pillai, Srinivas, Arunapuram Palani.
2. Statistical Methods – S.P. Gupta
3. Biostatistics – A foundation for analysis in health science, Daniel
4. Biostatistics analysis ,Zar J.H, 1984, Prentice Hall, New Jersey.

**MSU/2016-17/UG-Colleges/ Part IV (B. Sc. Bio chemistry)/Semester - V /  
Ppr.no.35(B)/ Elective -1(B)**

**BIOINFORMATICS**

Total Hours : 80

**Unit-1** 16 Hours

Basic principles of computing:

Hardware (CPU, monitor, keyboard), Running computer software. Operating systems (Windows, DOS, Unix, Linux), Internet- software downloading and installations, useful packages, Database management, Useful bioinformatics sites on the www.

**Unit-2** 15 Hours

Biological databases: Content, structure and annotation, file formats, Types of databases, Network and databases. Annotated sequence databases.

Genome and organism specific databases. Retrieval of biological data. Retrieval with Entrez, DBGET, Sequence retrieval system.

**Unit-3** 16 Hours

Searching sequence data bases. Sequence similarity search tools, Aminoacid substitution. Search tools – FASTA and BLAST, PSI – BLAST.

Multiple sequence alignment and family relationships. Protein families and pattern databases. Protein domain families.

**Unit-4** 12 Hours

Phylogenetics- Building phylogenetic tree, evolution of Macromolecular sequences.

**Unit-5** 20 Hours

Gene prediction Methods: Tools of gene prediction, sequence annotation, Principles of genome annotation, Annotation tools.

Microarray data analysis- Proteomics Data analysis, 2D gel. Metabolic pathway and pathway stimulation. E – cell structural Bioinformatics- Protein structure database and visualization tools, Structural alignment, Protein structure prediction methods, Protein function predictions.

**References**

1. Bioinformatics concepts, skills and applications – S;C. Rastogi, N. Mendirattar and Y. Rastogi, CBS. Publishers, New Delhi.
2. Bioinformatics – Westhead, Parish and Twynan – BioScientific Publishers, Oxford.
3. Introduction to Biinformatics, A. Krawetz
4. Bioinformatics, A theoretical and practical approach – D.D. Womble, Human Press.

**MSU/2016-17/UG-Colleges/ Part IV (B. Sc. Bio chemistry) / Semester - V /  
Ppr.no.35 (C) / Elective -1 (C)**

**DIAGNOSTIC BIOCHEMISTRY**

Total Hours : 80

**Unit-1** 16 Hours

Clinical chemistry tests- Blood group, glycosylated haemoglobin, fructosamine, GTT, uric acid, Ca, P, Fe, Cu, CSF analysis.

**Unit-2** 15 Hours

Enzymes: Acid phosphatases, LDH, CPK, CPK\_MB, Alpha amylase, Hormones- T3, TSH, LH.  
Immunoglobulins- IgA, IgM, IgE.

**Unit-3** 16 Hours

Serodiagnostic procedures- precipitation tests, VDRL test, Vidal test, (Slide and tube method) Brucella agglutination test, ASO test, RA test, CRP test.

Complement fixation test, skin test- Montaux test, Lepramin test.

**Unit-4** 12 Hours

Complete haemogram, complete urine analysis, complete motion analysis, seman analysis.

**Unit-5** 20 Hours

Blood bank, blood group and Rh factor, Coomb's test, Coagulation studies, Prothrombin test (PT), Partial PT, Plasma fibrinogen.

Test for amino acidurias- Test for phenyl ketonuria, DNPH, Test for keto acids, sodium nitroprusside test for Cystinuria and homocysteine.

**References**

1. Varley.H (1985), Practical Clinical Bichemistry, IV Edition
2. Tietz. N (1982), Fundamentals of Clinical Chemistry, W.B. Saunders Company
3. Jacques Wallach (1982), Interpretation of Diagnostic test – A Synopsis, V Edition, Little Brown and Company.
4. Jone Zilva & Pannall.P.R. , Clinical Chemistry, Diagnosis and treatment, PG Publishing Pvt. Ltd.

**MSU/2016-17/UG-Colleges/ Part IV(B. Sc. Bio chemistry)/Semester - V /  
Ppr.no.36 (A) / Elective -II (A)**

**ENVIRONMENTAL BIOCHEMISTRY**

Total Hours : 80

**Unit-1**

16 Hours

Introduction- Concept and scope of Environmental Biochemistry

Nutrient cycling- Hydrogen cycle, Oxygen cycle, Nitrogen cycle, Carbon cycle, Phosphorus cycle, Sulphur cycle and mineral cycle.

**Unit-2**

16 Hours

Hydrological cycle, Water resources, Pathways and rate of waste releases to water Eutrophication, water sanitation, Water purification, Analysis of drinking water, quality of drinking water. Recycling and Reuse of Water- desalination.

**Unit-3**

16 Hours

Lithosphere – soil formation, composition of soil, soil air, soil water, micro and macro nutrients. Types of pollutants in soil – classification, characteristics, ill effects, disposal methods. Acid base and ion exchange reactions in soil.

**Unit-4**

16 Hours

Atmosphere structure- composition of atmosphere, chemical and photo chemical reactions in the atmosphere. Types of pollutants in atmosphere – oxides of nitrogen, oxides of sulphur, oxides of carbon, ozone, organic gases with specific reference to Green house effect and ozone depletion, photochemical smog.

**Unit-5**

16 Hours

Chemical toxicology- toxic chemicals present in the environment, impact of toxic chemicals on enzymes. Biochemical effects of pesticides, carcinogens and detergents.

Radiation pollution- causes, ill effects, protection, control of radiation pollution. Safety methods of disposal of radioactive wastes.

Thermal pollution- causes, ill effects, control of thermal pollution

Noise pollution- causes, ill effects, control of noise pollution

## References

1. Hand book of Environmental Biochemistry, VOL-3, by Hutzinger, 1980.
2. The teachers hand book of Environmental studies by Perry 1974, Blandford press
3. Advantages in ecology and Environmental sciences by Mishra
4. Environmental chemistry – Sharma
5. Environmental chemistry – 4<sup>th</sup> Edn. – A. K. De
6. Fundamental Ecology – Eugene P . Odum
7. Fundamentals of Environmental Biology – K. C. Agarwal
8. Water and waste water technology – Mark J. Hammer , – Mark J. Hammer , Jr.
9. Water and waste water analysis – S. N . Kaul and A. Gautam
10. Water studies – M. Sunil Kumar and S. Ravindra Nath.

**MSU/2016-17/UG-Colleges/ Part IV (B. Sc. Bio chemistry)/Semester - V /  
Ppr.no.36(B) / Elective –II (B)**

**NUTRITIONAL BIOCHEMISTRY**

Total Hours :80

**Unit-1** 16 Hours

Introduction and definition of food and nutrition, Function of foods, essential nutrients, analysis of food composition, food groups, food habits.

**Unit-2** 16 Hours

Sources of carbohydrates, fats, proteins, minerals ( calcium, phosphorus, sodium and potassium) and trace elements ( copper, cobalt, zinc, iodine and iron)

Protein mal nutrition (Kwashiorkor) and under nutrition (marasmus)

**Unit-3** 16 Hours

Vitamins- definition, classification, sources, daily requirements, metabolism, nutritional significance and deficiency.

Composition of balanced diet and RDA for infants, children, adolescents (male and female), pregnant and lactating women and old age.

**Unit-4** 16 Hours

Measurement of food stuff by Bomb calorimeter. Calorific values of proteins, carbohydrates and fats. Energy – basal metabolism, measurement of BMR, factors affecting BMR, regulation of body temperature, energy needs, total energy requirements.

**Unit-5** 16 Hours

Nutritional challenges in future: food production, food storages, functional foods, new protein foods, new fat foods and changing food habits. Food adulteration and hygiene.

**References**

1. Principles of nutrition and dietetics – M. Swaminathan
2. Normal and therapeutic nutrition – Corine Robinson
3. Human nutrition and dietetics – Davidson and passmore
4. Food nutrition and diet therapy – Krause and Hunscher
5. Advanced text book on food and nutrition – M. Swaminathan ( vol 1& 2)

**MSU/2016-17/UG-Colleges/ Part IV (B. Sc. Bio chemistry)/Semester-V /  
Ppr.no.36(C)/ Elective –II (C)**

**MICROBIAL BIOCHEMISTRY**

Total Hours : 80

**Unit-1** 16 Hours

General introduction to micro organism- scope and classification of micro organisms- bacteria, archaeobacteria, Algae, fungi, protozoa and viruses. Bacterial cell- structure and morphology. Growth of microorganisms- nutritional requirements and physical conditions. Cultivation of bacteria- types, Bacterial growth curve, growth media- types. Isolation and maintenance of pure culture.

**Unit-2** 16 hours

Methods of microbiology- Enumeration of micro organisms. Staining methods- types. Microscopy - principles and applications of light, phase contrast, fluorescence and electron microscopy.

**Unit-3** 16 Hours

Viruses and Bacteriophages- general characteristics, structure and classification. Bacteriophages - lytic and lysogenic cycle. Animal viruses of special interest- Retro viruses (eg. HIV), Influenza virus, Tumour viruses. Plant viruses eg. TMV virus.

**Unit-4** 16 hours

Metabolism of micro organisms- Aerobic metabolism – uptake of nutrients into the cell – Active transport, facilitated diffusion and group translocation. Catabolism and Anabolism of hexoses, aminoacids, nucleotides and lipids, Polymerisation and Assembly.

Anaerobic metabolism- fermentation- ATP regeneration, Electron transport, denitrification, nitrate reduction, hydrogen sulphide formation.

**Unit-5** 16Hours

Applications of micro organisms- Alcoholic fermentation by yeast and bacteria, Formation of methane, citrate, succinate, lactate, vinegar, cheese and wine. Anaerobic fermentation - production of acetone, butanol. Aerobic fermentation- production of antibiotics, aminoacids and enzymes.

**References**

1. Microbiology- Prescott
2. Introduction to Microbiology – John. L. Ingraham, Catherine A. Ingraham. 3<sup>rd</sup> edition
3. Microbial Ecology – Atlas and Bartha
4. Microbiology – Pelcar
5. Text book of Microbiology - Jayarman Panicker

**MSU/ 2016-17/ UG-Colleges/Part IV (B. Sc. Bio chemistry)/Semester –  
V & VI / Ppr.no.37 / Major Practical – 5**

**HAEMATOLOGY AND MICROBIOLOGY**

1. Identification of blood group
2. Differential count of leukocytes
3. Enumeration of RBC
4. Enumeration of WBC
5. Enumeration of blood platelets
6. Determination of Erythrocyte sedimentation rate
7. Estimation of haemoglobin by Drabkin's method
8. Compatibility test ( Major and Minor Cross matching)
9. Determination of Packed Cell Volume (PCV)
10. Determination of bleeding time and clotting time
11. Gram staining
12. Acid fast staining
13. Negative staining

**References**

1. Basic Model Laboratory Techniques – Estridge, Reynold and Walter- 4<sup>th</sup> edition
2. Medical Lab Technology- Kanai L Mukherjee
3. Medical Lab Technology – Ramnik Sood
4. Laboratory manual in Biochemistry – T.N. Pattabiraman 3<sup>rd</sup> edition

**MSU/2016-17/UG-Colleges/ Part IV (B.Sc.Biochemistry)/Semester-V&VI /  
Ppr.no.38/ Major Practical – 6**

**ENZYMES AND KINETICS**

Assay of the serum enzyme activity of

- a. Alkaline phosphatase
- b. Acid phosphatase
- c. Aspartate transaminase
- d. Alanine transaminase
- e. Lactate dehydrogenase
- f. Amylase

ASSAY OF AMYLASE –Effect of pH, Temperature, Enzyme concentration and Substrate concentration

3.ASSAY OF ALKALINE PHOSPHATASE - Effect of pH, Temperature, Enzyme concentration and Substrate concentration

**References**

1. Methods in Enzymology, Dixon & Web
2. Modern Experimental Biochemistry
3. Biochemical Methods – S. Sadasivam and A. Manikam

### **CLINICAL BIOCHEMISTRY**

#### **Blood analysis**

1. Estimation of blood sugar by King and Astoor method
2. Estimation of blood urea by DAM method
3. Estimation of serum uric acid by Caraway method
4. Estimation of serum calcium by titrimetric method
5. Estimation of serum iron by Ramsay method
6. Estimation of serum phosphorus by Fiske and Subbarow method
7. Estimation of serum bilirubin by Vanden Berg method
8. Estimation of serum protein and A/G ratio by Biuret method
9. Estimation of serum cholesterol by Zak's method
10. Estimation of serum Creatinine by Jaffey's Alkaline Picrate method.
11. Estimation of phospholipids
12. Estimation of triglycerides

#### **Urine analysis**

1. Qualitative analysis of abnormal constituents of urine
2. Determination of the titrable acidity and ammonia in urine
3. Estimation of Chloride in urine

#### **References**

1. Laboratory Manual in Biochemistry – T.N. Pattambiraman- 3<sup>rd</sup> edition
2. Laboratory Manual in Biochemistry – J. Jayaraman, New Age International Publishers
3. Practical clinical Biochemistry – Harold Varley, 4<sup>th</sup> edition

## MOLECULAR BIOLOGY

Total hours : 64

### Unit-1

12Hours

Eukaryotic genome organization (Structure of Chromatin, coding and non coding sequences, satellite DNA), DNA- The genetic material- Experimental evidences of DNA as the genetic material. Bacterial conjugation, transduction, lytic and lysogenic cycle

### Unit-2

13 Hours

DNA replication in prokaryotes- semi conservative replication, enzymology of DNA replication. Discontinuous replication, replication in circular DNA, replication in eukaryotic chromosome. DNA repair- alternation in the DNA molecule and its repair, methylation and mismatch repair, excision, recombination and SOS repair.

### Unit-3

13 Hours

Transcription- RNA types and functions, initiation, elongation and termination of RNA synthesis. RNA Polymerases (eukaryotic and prokaryotic), inhibitions of transcription.

### Unit-4

12 Hours

Genetic code- major features. Wobble hypothesis. Translation- activation of aminoacid, initiation, elongation and termination, inhibitors of translation

### Unit-5

12 Hours

Protein targeting- translocation, post translational modifications, glycosylation. Bacterial signal sequences, mitochondria, chloroplast and nuclear protein transport. Gene expression and regulation in prokaryotes. Operon concept- lac, trp, arabinose operons.

### References

1. Daenell J. et al in 1986. Mlecular Cellbiology, Scientifi American book, USA
2. Lewin. B, 1993, GENES V and VI, Oxford University press, New York.
3. Weaver. R.F and Philip.P.W., 1989, Genetics, WMC Brown Publishing.

## ENDOCRINE BIOCHEMISTRY

Total hours : 80

### Unit-1

16 Hours

Introduction to endocrine system, hormones- definition, classification, biosynthesis, circulation in blood, modification and degradation.

Mechanism of hormone action, class I and Class II hormone receptors- structural features and regulation. Role of second messengers in hormone action. Feed back regulation of hormones.

### Unit-2

16 Hours

Hypothalamus and pituitary hormones- hypothalamic releasing factors, vasopressin and oxytocin. Biosynthesis, secretion, transport, regulation and biological effects of growth hormone, FSH, LH, TSH, ACTH and prolactin. Hyper and hypo activity of pituitary and hypothalamus- acromegaly, dwarfism diabetes insipidus and hypopituitarism

### Unit-3

16 Hours

Biosynthesis, secretion, transport, regulation and biological effects of thyroid hormones. Hypo and hyperthyroidism. Anti thyroid agents.

Role of parathyroid hormones, calcitonin and calcitriol in maintaining calcium and phosphorus homeostasis. Hypo and hyper para thyroidism.

### Unit-4

16 Hours

Hormones of the pancreas, islets of Langerhans- cell types, biosynthesis, mechanism of action and biological effects of insulin and glucagon. Gastro intestinal hormones.

### Unit-5

16 Hours

Adrenal hormones- biosynthesis, secretion, transport, biological effects, mechanism of action and excretion of adrenal cortical and medullary hormones. Pathophysiology of adrenal gland secretions.

Biological effects of androgens and estrogens, ovarian cycle.

### References

1. William textbook of endocrinology- Wilson and Foster 8<sup>th</sup> edition
2. Harper's biochemistry- Murray et al, 25<sup>th</sup> edition.
3. Principles f Biochemistry- Mammalian Biochemistry- Smith-et at.
4. Mechanism f Hormone action- Austin and Short.

## PLANT BIOCHEMISTRY

Total Hours 80

### Unit-1

16 Hours

Photosynthesis- Ultra structure of chloroplast- photosynthetic pigments, Light reaction, photo system I & II. Electron transport- photo phosphorylation.

### Unit-2

16 Hours

CO<sub>2</sub> fixation and reduction- C<sub>3</sub> plants (calvin cycle), C<sub>4</sub> plants (Hatch-Slack pathway), CAM plants (crassulacean acid metabolism), photo respiration.

### Unit-3

16 Hours

Nitrogen and Sulphur metabolism- Biochemistry of nitrogen fixation- nitrogenase, nitroreductase, nitrate reductase. NIF genes, nitrate assimilation. Sulphate activation- reduction and sulphite reduction.

### Unit-4

16 Hours

Plant growth regulators- chemistry, synthesis, physiological role of auxin, Gibberlin, Cytokinin, Ethylene and Abcissic acid.

### Unit-5

16 hours

Seed germination and dormancy- physiological and, biochemical changes, factors affecting seed germination and dormancy (water, light, temperature, salinity, stress). Photoperiodism- phytochrome- vernalization.

### References

1. Plant biochemistry- Goodwin and mercer
2. Plant physiology- Devlin
3. Biochemistry for agricultural sciences, B. Thayumanavan et al., 2004
4. Plant physiology- F.B. Salisbury and C.W. Ross (4<sup>th</sup> ed)
5. Plant biochemistry- Geza Doby.

**BIOTECHNOLOGY**

Total Hours : 80

**Unit-1** 16 Hours

Tissue culture- plant tissue culture- Micro propagation and Somoclonal variation, Protoplast culture.  
Animal cell & Tissue culture- Primary culture, cell lines, In vitro fertilization & embryo transfer in humans.

**Unit-2** 16 Hours

rDNA technology – General principles, Salient features of cloning vectors, restriction enzymes. Types of cloning vector, plasmids, cosmids, M-13 phage, Macro & microinjection, particle bombardment, electroporation (Vector less mode).

**Unit-3** 16 Hours

Plant Biotechnology- Vectors for gene transfer (Ti, Ri Plasmids, Co integrate, intermediate & helperplasmids), binary vectors, viruses as vectors: gene transfer techniques using Agrobacterium, Selectable marker, reporter genes & promoters. Transgenic plants, crop improvement, resistance to herbicide, insects, pests & viruses.

**Unit-4** 16 Hours

Animal Biotechnology - Genetic engineering in animals, animal viral vector & yeast vectors.  
Biotechnology of silkworm. Mapping of human genome, genetic engineering approaches for the correction of genetic disorder.

**Unit-5** 16 hours

Microbial Biotechnology - Bioprocess – Basic principles of microbial growth. Types, design and operation of fermentors, Antifoaming devices & agents. Downstream processing, Oil spill clean up by microbes, Biodegradable plastics, Bioleaching.

**References:**

1. Biotechnology- P. K. Gupta
2. Biotechnology – H. D. Kumar
3. Text book of Biotechnology – Dubey
4. Recombinant DNA Technology – Watson
5. Molecular Biotechnology – Glick & Pasternack

## GENOMICS AND PROTEOMICS

Total Hour : 80

### Unit-1 16 Hours

Genome maps: types of Genome maps and their uses: High and low resolution maps – Map elements – Polymorphic markers, line sine, RFLP, SNP.

Types f Maps: Cytogenic - Linkage map, Transcript map, Physical map- Comparative map, integrated map

Practical uses of Genomic maps: Locating Genomic regions, target identification, arrangement of genes, SMP diagnosis, Positional specific cloning, Predicting Gene function, identifying regulatory genes.

### Unit-2 16 Hours

Structural annotations – Locating coding regions and other structural elements of the gene. Various approaches in gene prediction, gene prediction in prokaryotes and eukaryotes. Hiddem markov model.

### Unit-3 16 Hours

Human Genome and Genomic analysis: size, features, composition and characteristics of human genome- Sequence repeats, transposable elements, gene structure and pseudogenes.

Genome analysis – Gene order ( Synteny), Chromosome rearrangement, compositional analysis, clustering of genes and composite genes.

### Unit-4 16 Hours

Proteomics: Structural element and terminology – phi and psi bonds, letter code for amino acids, helix, sheet strand, loop and coil.

Active site, Architecture, blocks, class and domains, fold, motif, PSSM, profile.

Protein structure prediction: Use of sequence pattern- Leucine zipper, coiled coil, transmembrane, signal peptide and cleavage site.

Secondary structure prediction: Chou-Fasman/ GOR method, neutral network, nearest neighbor method, tertiary structure prediction, threading, profile, contact potential and modeling.

### Unit-5

Proteome – analysis: 2D Electrophoresis – Immobilized pH gradient, Sample preparation, first dimension criteria, second dimension criteria, Stabilization.

Data analysis – Mass spectrometry based methods for protein identification and analysis.

## References

1. David W. Mount (2001), Bio-informatics sequence and genome analysis, Cold Spring Harbor Laboratory Press.
2. Ed. Andreas D. Baxewanis and Francis Quelling, Bio-informatics, a practical guide to the analysis of genes and proteins, John Wiley & sons publications
3. Penningtons S.R. and Dunn M.J. (2002), Proteomics, Viva books pvt ltd.

MSU/2016-17/UG-Colleges/ Part III (B. Sc. Bio chemistry)/Semester - VI / Ppr.no.44(C) /  
Elective –III (C)

**DRUG BIOCHEMISTRY**

Total Hours : 80

**Unit-1**

16 Hours

Introduction and receptor concept; Introduction to drugs, Classification of drugs, Passage of drugs across biological membrane; Absorption and distribution of drugs; Binding of drugs to plasma proteins.

Drug receptor interaction, Binding forces in drug receptor interaction, types of receptors, receptor theories, isolation of receptors, consequences of drug receptor interaction.

**Unit-2**

16 hours

Drug metabolism and elimination; Drug metabolism, methods of studying drug metabolism- microsomal drug metabolism, metabolism via hydroxylation, conjugation, deamination, N- oxidation, azo & nitro reduction, non-microsomal oxidation, oxidative deamination, purine oxidation, dehalogenation, hydrolysis, action of choline esterase. Elimination of drugs from the body with reference to renal system.

**Unit-3**

16 Hours

Chemotherapy; mode of action of sulfonamides, anti-metabolites of folate, purines and pyrimidines. Anti-bacterials- mode of action and resistance to penicillin, streptomycin, tetracycline and chloramphenicol. Anti viral, anti malarial and anti-TB drugs.

**Unit-4**

16 Hours

Drugs acting on CNS and Cardio-vascular system.

CNS structure and mode of action of barbiturates, salicylates, MAO inhibitors and drugs for Parkinson's disease.

**Unit-5**

16 Hours

Immunity to bacteria and viruses. Skin test; Montex and penicillin test.

Resistant to tumors; NK cells; Tumour immune therapy; lymphoid tumours.

Vaccination; passive and active immunization; Recombinant vaccines; DNA vaccines. Benefits and adverse effects of vaccination. CD4 cell count in HIV infection.

**References**

1. Immunology- An introduction, Tizzard R Jan, 1995.
2. Immunology- Roitt Ivann, Jonathan Brastoff and David Male. 1993.
3. Text book of microbiology- Ananthanarayanan R and Yayaramman Paniker, 1996.
4. Immunology- Janis Kuby, 3<sup>rd</sup> edition.
5. Text book of pharmaceutical chemistry – Mohammed Ali CBS Publishers and Distributors, New Delhi, 1995
6. Pharmacology, An introduction to Drugs, Prentice Hall Inc, Eaglewood Clif, New Jersey, 1994.
7. Pharmaceutical chemistry- G.R. Chatual, Vol II, 1<sup>st</sup> editin, Himalaya Publishing House, Bombay, 1991.