

MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI
PG - COURSES – AFFILIATED COLLEGES
 Course Structure for M.Sc. Biochemistry
 (Choice Based Credit System)
 (with effect from the academic year 2017- 2018 onwards)

Sem. (1)	Sub. No. (2)	Subject Status (3)	Subject Title (4)	Contact Hrs./ Week (5)	Credits (6)
III	14	Core - 14	Immunology and immunotechniques	6	4
	15	Core - 15	Nutritional Biochemistry	6	4
	16	Core - 16	Biotechnology	5	4
	17	Core - 17	Research Methodology	5	4
	18	Core - 18 Practical - 5	Immunology, Microbial and molecular Techniques	4	2
	19	Core - 19 Practical - 6	Clinical analysis - I	4	2
	Subtotal				30
IV	20	Core - 20	Molecular Endocrinology	4	4
	21	Core - 21	Clinical Biochemistry	4	4
	22	Core - 22	Molecular Biology	4	4
	23	Core - 23 Practical - 7	Clinical analysis - II	4	2
	24	Core - 24 Practical - 8	Clinical Enzymology	4	2
	25	Elective - 1	Field Work / Study Tour	3	3
	26	Core - 25	Project	7+	8
	Subtotal				30
Total				60	47

1. Objectives of the course

The important objectives of the course M.Sc., Biochemistry are focused:

- (i) To impart an advanced and current knowledge prevailing in different branches of Biochemistry
- (ii) To enable the students with deeper knowledge in various field of applications in industries, clinical laboratories and research organizations
- (iii) To imbibe and infuse the radiance of self confidence in independent research work and ensure a fair knowledge on the current technological developments so as to enable them from employment view point in the newly emerging fields of research and industrial advancements and for the betterment of society at large.

2. Credits

The term credit is used to describe the quantum of syllabus for various programmes in terms of study. It indicates differential weightage given according to the contents and duration of the courses in the curriculum design. The total number of credits for M.Sc.Biochemistry is 90.

3. Core and other courses

Every students admitted to M.Sc.Biochemistry shall undertake 24 courses, of which 15 courses will be theory papers, 1 course will be project and 8 practical courses.

4. Eligibility for admission to the course and examination.

Candidates shall be admitted to the course provided if he/she has obtained a bachelor's degree in science in biochemistry/Microbiology/Biotechnology/Advanced zoologyandAnimalbiotechnology/PlantScienceandBiotechnology/Zoology/Botany/Chemistry/B.ScNursing/Biology/LifeScience/Nutrition and&Dietetics/B.S.M.S/B.A.M.S/B.U.M.S/Genetics/Agriculture/IndustrialMicrobiology/Environmental Science/Bioinformatics or any other degree that may be considered as equivalent

he M.S University.

5. Medium of instruction and examination

The medium of instruction as well as examination will be in English.

6. Theory Examination

The external evaluation will be based on the examination to be conducted by the university at the end of each semester.

7. Practical Examination.

Practical examination will be conducted at the end of each semester

8.Evaluation

A.Each paper carries an internal component

B.There is a pass minimum of 50% for P.G. External and overall components

Theory

External: Internal Assessment=75:25

Practical

External : Internal Assessment = 50:50

C. Internal Assessment

Regarding the internal assessment, 25 marks are allocated in the following manner

The average of the best two tests from three compulsory tests	15 Marks
Assignment	04 Marks
Seminar	06 Marks
Total	25 Marks

Note: Each test will be of one hour duration

D. Practical

Internal marks for practical shall be allotted in the following manner.

Model test	40 Marks
Record	10 Marks
Total	50 Marks

E. Project Work

Components	Marks
Project Report	75 Marks
Viva -Voce	25 Marks
Total	100 Marks

Note:

- i) Students should carry out individual project only.
- ii) Project report will be evaluated by central valuation and viva-voce will be conducted by both the external examiner and the guide at the end of the Third semester itself.

9. The question paper pattern for all theory papers shall be as follows

Section	Type of question	Mark
Part-A	Short answer(Two questions from each unit compulsory)	1×10=10 Marks
Part B	Internal Choice questions(One question from each unit:either/or)5*1	5×5=25 marks
Part C	Internal Choice questions(One question from each unit:either/or)5*1	8×5=40 marks
	Total	75 marks

10. The question paper pattern for all practical papers shall be as follows.

Practical Time: 7 hours

Max.Marks:50

1	Major experiment	25 Marks
2	Minor Experiment	15 Marks
3	Viva – Voce	10 Marks
	Total	50 Marks

L	T	P	C
6	0	0	6

IMMUNOLOGY AND IMMUNOTECHNIQUES

Total Hours: 90

Objective: To learn about the structural features of the components of the immune system as well as their functions.

Unit-1

[18 HRS]

Elements of immunology

Types of immunity-innate and acquired. Humoral and cell mediated immunity. Central and peripheral lymphoid organs-Thymus, bone marrow, spleen, lymph nodes and other peripheral lymphoid tissues-GALT. Cells of the immune system-Lymphocytes, mononuclear phagocytes-dendritic cells,granulocyte, NK cells and mast cells, cytokines.

Antigens vs immunogens, haptens. Factors influencing immunogenicity. Immunoglobulins - structure, classification and functions. Isotypes, allotypes and idiotypes.

Unit-2

[18Hrs]

Complement activation and its biological consequences.

Clonal selection theory. Organization and expression of immunoglobulin genes generation of antibody diversity. Class switching.

T-cell, B-cell receptors, Antigen recognition-processing and presentation to T-cells, Interaction of T and B cells. Immunological memory. Effector mechanisms-macrophage activation. Cell mediated cytotoxicity, immunotolerance, immunosuppression.

Unit-3

[18 HRS]

MHC genes and products.

Polymorphism of MHC genes,role of MHC antigens in immune response,MHC antigens in transplantation.

Immune response to infectious diseases-viral bacterial and protozoal.Cancer and immune system.

Unit-4

[18 HRS]

Immunization practices

Active and passive immunization. Vaccines-killed, attenuated-toxoids. Recombinant vector vaccines-DNA vaccines,synthetic peptide vaccines-antiidiotype vaccines production of polyclonal and monoclonal antibodies. Principles, techniques and application. Genetically engineered antibodies.

Fractionation of leucocytes by density gradient centrifugation. Identification of lymphocytes and their subsets in blood. Leukocyte migration inhibition technique. Delayed type hypersensitivity technique.

Unit-5

[18HRS]

Agglutination and precipitation techniques

Immuno electrophoresis, RIA, immunoblotting, avidin-biotin mediated immuno assay. Immuno histochemistry- immunofluoresence, immunoferritin technique. Fluorescent immunoassay.

Cytokines assay:-ELISA and ELISPOT. Production of cytokines invitro. Interferon production. Abzymes.

Text Books Recommended

- 1.Roitt et al.Roitt's Essential Immunology.10th ed.Blackwell Sci.2001
- 2.Richard A Goldsby et al.Kuby Immunology.4th ed.WH Freeman & Co.2003
- 3.Abbas et al.Cellular and Molecular Immunology.W.B Saunders Company,2000
- 4.Janeway,C.(Ed), Paul Travers. Immunobiology 5th ed.Garland Publ.2001
- 5.Eli Benjamini AU et al. Immunobiology 5th ed. Garland Publ.2001
- 6.NMS Series in immunology.3rd ed.Lippincott willams and Wilkins
- 7.Bier et al.Fundamentals of Immunology, Springer Verlag,1986

NUTRITIONAL BIOCHEMISTRY

T	T	P	C
6	0	0	6

Total Hours: 90

Objective: To acquire detailed knowledge regarding the biological basis of nutrition and the mechanisms by which diet can influence health.

Unit-1

[18 HRS]

Introduction and definition of food and nutrition

Function of foods and its relation to nutrition and clinical health, essential nutrients, analysis of food composition, food groups, food habits. Nutritional challenges in future – Food production, food storages, functional foods, new protein foods, new fat foods and changing food habits. Food adulteration and hygiene.

Unit-2

[18 HRS]

Measurement of food stuffs

Measurement of food stuffs by Bomb calorimeter. Calorific values of proteins, carbohydrates and fats. Energy consideration in nutrition, respiratory quotient, BMR and SDA. Measurement of BMR, factors affecting BMR, regulation of body temperature, energy needs, total energy requirement, estimation of energy requirement and energy value of foods. Requirements of carbohydrates and lipids. Essential fatty acids.

Unit-3

[18 HRS]

Essential amino acids and biological value of proteins

Improvement of protein quality by supplementation and fortification. Nitrogen balance-positive and negative nitrogen balance. Protein energy malnutrition-Marasmus and Kwashiorkor. Special aspects of nutrition during pregnancy and lactation.

Unit-4

[18 HRS]

Minerals

Sources, daily allowances, absorption, metabolism, biological roles and clinical significance of calcium, phosphorus, sodium, potassium. Trace element-metabolism of iron-absorption, storage, transport and excretion-iron deficiency and overload.copper, zinc, selenium, cobalt.

Unit -5

[18 HRS]

Vitamins

Water soluble vitamins-ascorbic acid, thiamin, riboflavin, niacin, pantothenic acid, lipoic acid, biotin, folic acid and vitamin B12, structures, sources, recommended daily allowances. Biological actions. Coenzyme functions, clinical significance, deficiency symptoms. Fat soluble vitamins- structures, sources, recommended daily allowances, biological action, clinical significance, deficiency symptoms. Hypervitaminosis.

Text Books recommended

1. Biochemistry and Physiological aspects of human nutrition. Stipanuk, Saunders, 2000
2. Human Nutrition and Dietetics-Davidson and Passmore, ELBS
3. Principles of Nutrition and Dietetics-Swaminathan, Bangalore printing and publ.co.Ltd
4. Human Nutrition and Diabetics. Garrow and James Churchill Livingstone
5. Normal and therapeutic nutrition-Corine Robinson
6. Food nutrition and diet therapy-Krause and Hunscher
7. Advanced text book on food and nutrition-M. Swaminathan (Vol. 1&2)

BIOTECHNOLOGY

L	T	P	C
5	0	0	5

Total Hours: 75 HRS

Objective: To develop understanding of industrial processes for production of antibiotics, enzymes etc.

Unit – 1 [15 HRS]

Recombinant DNA technology

Basic Principles. Uses of restriction enzymes for the production of DNA fragments. Cloning vectors-Plasmids (pBR 322, pUC 18), phages (and M13) and cosmids. YACs, BACs, PACs, HAECs and HACs. Splicing of DNA, cohesive end method, blunt end ligation.

Gene transfer methods – calcium phosphate coprecipitation, electroporation, lipofection, microinjection. Cloning strategies-genomic and cDNA libraries. Chromosome walking.

Unit – 2 [15 HRS]

Human genome and Gene therapy

In vitro fertilization and embryo transfer. Animal vaccines-production of vaccine for foot and mouth disease of cattle.

Techniques in Human genome mapping-FISH, PCR, RFLP, DNA fingerprinting. Gene therapy-ex vivo and in vivo. Antisense RNA technology and applications. Hazards and safety aspects of genetic engineering.

Unit – 3 [15 HRS]

Plant cell and tissue culture

Culture media and cell culture. Tissue culture, micropropagation and somaclonal variation. Protoplast culture-isolation and purification of protoplasts,

protoplast fusion, genetic modification of protoplasts. Methods of gene transfer in plants-Agrobacterium mediated transformation, viral vectors and particle gun method.

Transgenic plant technology-genetic engineering of plants for pest resistance, virus resistance, herbicide tolerance, stress tolerance and delay of fruit ripening. Use of plants to produce commercially important proteins, antibodies, viral antigens and peptide hormones.

Unit - 4 **[15 HRS]**

Bioprocess

Basic principles of microbial growth. Types, design and operation of fermenters. Fermentation culture medium-carbon, nitrogen and vitamin sources. Anti foaming devices. Downstream processing-separation, concentration, purification, modification and drying. Production of vitamin B12, pencillin, streptomycin.

Unit – 5 **[15HRS]**

Waste treatment

Aerobic and anaerobic. Composting, Utilization of cellulose, Bioremediation, Microbial degradation of xenobiotics. Biodegradable plastics. Single cell protein.

Immobilized enzymes, methods and applications. Industrial applications of enzymes in food, diary and leather industry.

Text Books recommended

1. Fermentation Biotechnology O.P. Ward. 1989 Prentice Hall
2. Biotechnology J.E.Smith Cambridge University Press 1996
3. Introduction to Biotechnology Brown, Campbell and Priest Blackwell Science 1987
4. A Textbook on Biotechnology H.D.Kumar 2nd edition East West Press 1998
5. Molecular Biotechnology Glick and Pasternak, Panima Publ.
6. From Genes to clones Winnaecker VCH Publication
7. Elements of Biotechnology P.K.Gupta, Rastogi Publication, 1998

8. Molecular Biology and Biotechnology. Walker and Gingold 3rd ed. Panima Publ. 1999
9. Plant Biotechnology. Lgnacimuthu, Oxford, IBH
10. Recombinant DNA Technology, Watson, Scientific American Publ.
11. Principles of Genome analysis, Primrose, Oxford University Press, 1998.

RESEARCH METHODOLOGY

	L	T	P	C
Total Hours: 75	5	0	0	5

Objective: To approach the literature and theoretical issues related to project, develop strategy and design for data collection and analysis and deal with ethical and practical problems in research.

Unit -1

[15 HRS]

Introduction about Thesis preparation

Thesis writing, Publication in a scientific journal, Preparation of abstract and manuscript. Contents-Preamble, the problem, objectives, hypothesis to be tested, study, design, setup, measurement procedures, analysis of data, organization of report; Displaying data tables, graphs and charts – preparation of project proposal: Thrust area – funding agencies (National and International) – kinds of research program in India and abroad – career development in laboratory research – principle and method of patenting.

Unit -2

[15 HRS]

Selection of research problems

Hypothesis - definition and characteristics. Experimental approaches - biological, physical and chemical methods. Sources of information: Journals, e-journals, books, biological abstracts, Preparation of index cards, Review writing, Article writing - structure of article. Selection of journals for publication- Impact factor - Citation index and H-index. Proposal writing for funding.

Unit -3 [15 HRS]

Biostatistics

Uses of measures of central values, measures of dispersion (Standard Deviation and coefficient of variation) in data analysis and presentation. Sample testing: large samples (Z), small sample test: t, Chi-square, ANOVA - one way & two way.

Unit – 4 [15 HRS]

Chromatography Techniques

General principles of partition and adsorption chromatography. paper, TLC, GLC, Column chromatography, Ion exchange chromatography, Molecular exclusion chromatography, Affinity Chromatography, Special Forms of affinity chromatography – immuno affinity, metal chelate, dye-ligand and covalent chromatography, HPLC.

Unit – 5 [15 HRS]

Introduction to Bioinformatics

Bioinformatics and its applications, Information networks - EMB net and NCBI. Databases; primary nucleic acid databases - EMBL; GenBank and DDBJ. Structure of gene bank entries. Protein sequences databases; primary databases PIR, MIPS, SWISS - PROT, TrEMBL, NRL-3D. Structure of SWISS - PROT entries. Secondary Databases; PROSITE, PROFILES, PRINTS, Pfam, BLOCKS and IDENTITY. Composite protein Databases.

Text Book Recommended

1. Wilson and walker. A biologist guide to principles and techniques of practical biochemistry 5th ed. Cambridge University Press 2000
2. Boyer, R. Modern Experimental Biochemistry, 3rd ed. Addison Wesley Longman, 2000.
3. Upadhyay, Upadhyay and Nath. Biophysical Chemistry Principles and Techniques, Himalaya Publ. 1997
4. Simpson CFA & Whittacker, M., Electrophoretic Techniques.
5. Sambrook, Molecular Cloning. Cold Spring Harbor Laboratory, 2001.
6. Friefelder and Friefelder, Physical Biochemistry-applications to Biochemistry and Molecular Biology. WH Freeman & Co. 1994

Immunology, Microbial and molecular Techniques

L	T	P	C
0	0	4	2

1. Immunodiffusion-Ouchterlony
2. Immunoelectrophoresis
3. dot ELISA
4. Simple staining
5. Negative staining
6. Gram's staining
7. Acid Fast staining
8. Separation of proteins by SDS-PAGE
9. Western Blotting of protein
10. Separation of DNA by Agarose gel electrophoresis

Reference Books: 1. Laboratory manual for Analytical Biochemistry & separation Techniques, P.Palanivelu, MKU University, Madurai.2001. 2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005. 3. Biochemical methods – S.Sadasivam, New Age International Pub, 2000. 4. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000. 5. Enzyme Kinetics – A modern Approach. AG Marangani, John Wiley & Sons, 2003. 6. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub,

Clinical analysis-I

L	T	P	C
0	0	4	2

Estimation of the following blood constituents

1. Blood sugar
2. Blood urea
3. serum uric acid
4. Serum creatinine
5. Serum cholesterol
6. Serum Total protein and A:G ratio
7. Serum Iron
8. Serum phosphorus
9. Serum triglycerides
10. Serum bilirubin

Reference Books: 1. Laboratory manual for Analytical Biochemistry & separation Techniques, P.Palanivelu, MKU University, Madurai.2001. 2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005. 3. Biochemical methods – S.Sadasivam, New Age International Pub, 2000. 4. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000. 5. Enzyme Kinetics – A modern Approach. AG Marangani, John Wiley & Sons, 2003. 6. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub,

MOLECULARENDOCRINOLOGY

L	T	P	C
4	0	0	4

Total Hours: 60

Objective: To analyze the roles of endocrine system in maintaining homeostasis, integrating growth and development etc.

Unit – 1

[12 HRS]

Hormones

Definition, classification, biosynthesis, circulation in blood, modification and degradation. Target tissue-feedback control. Hormone receptors-external features and structure, regulation of receptor levels. Mechanisms of hormone action.

Signal transduction. Plasma membrane receptors adenylate cyclase, Role of G proteins, protein kinases, tyrosine kinase, inositol phosphates, calcium, calmodulin. Steroid hormone receptors-mechanism of steroid hormone action.

Unit – 2

[12 HRS]

Hypothalamus and pituitary hormones.

Hypothalamic releasing factors. Anterior pituitary hormones-actions and feedback regulation of synthesis. Growth promoting, lactogenic hormones.

Glycoprotein hormones of the POMC family. Endorphins. MSH. Hypo and hyperactivity of pituitary, hormones-gigantism, acromegaly, dwarfism. Vasopressin and oxytocin. Diabetes insipidus, syndrome of inappropriate ADH secretion.

Unit – 3

[12 HRS]

Thyroid hormones

Synthesis and secretion, transport, metabolic fate, Biologicalactions. Antithyroid agents. Thyroid diseases-thyrotoxicosis, goiter, hypothyroidism, Graves's disease. Hashimoto's thyroiditis.

Parathyroid Hormone-Biological action and regulation of calcium and phosphorous metabolism, calcitonin. Pathophysiology.

Calcitriol-Biosynthesis, transport, functions, mechanism of action.

Unit -4

[12 HRS]

Pancreatic hormones

Cell types of the islets of Langerhans. Insulin-Biosynthesis regulation of secretion. Biological actions, Mechanism of action, Insulin receptor, Insulin signaling pathways, Glucagon, somatostatin and pancreatic polypeptide. Insulin like growth factors.

Gastrointestinal hormones-location of peptide producing cells, synthesis, structure and functions. Mechanism of action of secretin, GIP, VIP, gastrin, CCK, other peptides.

Unit – 5

[12 HRS]

Adrenal hormones

Glucocorticoids, Mineralocorticoids synthesis, secretion, transport, metabolism and excretion. Biological effects. Mechanism of action. Adrenal androgens-metabolic effects and functions Adrenal medulla-catecholamines, biosynthesis, storage, metabolism, regulation of synthesis.

Abnormal secretion of adrenal hormones-Addison's disease, Cushing's syndrome, congenital adrenal hyperplasia, pheochromocytoma.

Gonadal hormones-Androgens, estrogens. Biological actions. Ovarian cycle,.

Text Books recommended

1. Williams Text book of Endocrinology-Wilson and Foster 8th ed.
2. Mechanisms of hormone action-Autin and Short
3. Harpers Biochemistry-Murray et al 25th ed. Mc Graw Hill, 2000
4. Principles of Biochemistry-Mammalian Biochemistry-Smith et al. Mc Graw Hill 7th ed.

CLINICAL BIOCHEMISTRY

	T	P	C
L			
4	0	0	4

Total Hours: 60

Objective: To find out various metabolic disorders and their clinical symptoms.

Unit – 1

[12 HRS]

Inherited disorders of metabolism

Patterns of inheritance-autosomal and sex-linked disorders, disorders of amino acid metabolism-amino aciduria, phenylketonuria, Hartnup disease, alkaptonuria, albinism, cystinuria, cystinosis, homocystinuria and maple syrup urine disease.

Disorders of carbohydrate metabolism-glycogen storage diseases, galactosemia, fructose intolerance and fructosuria.

Disorders of Purine and pyrimidine metabolism; Hyperuricemia and gout. Hypouricemia. Orotic aciduria.

Unit – 2

[12 HRS]

Blood sugar homeostasis

Role of tissues and hormones in the maintenance of blood sugar. Hypoglycemia, hyperglycemia, glycosuria. Diabetes mellitus-classification, metabolic abnormalities, diagnosis and management. Acute complications-diabetic ketoacidosis hyperosmolal non-ketotic coma, long term complications retinopathy, neuropathy and nephropathy, glycosylation.

Unit – 3

[12 HRS]

Diseases of Liver

Bilirubin metabolism – Jaundice, Dubin Johnson syndrome, Rotor syndrome, Crigglers and Najjar syndrome, Differential diagnosis of Jaundice, consequences and biochemical findings in hepatitis and cirrhosis. Liver function tests, Gall stones and steatorrohea.

Disorders of lipid metabolism-lioproteinemia. Lipid storage diseases-Gauchers, Taysach's Niemann Pick and Sandhoff's disease. Fatty liver, Atherosclerosis.

Unit – 4

[12 HRS]

Plasma protein disorders.

Non-protein nitrogenous constituents in blood with reference to urea, uric acid, cretinine, abnormalities including uremia, plasma protein abnormalities hemoglobinopathy, porphyria, acute phase proteins, proteinuria.

Qualitative analysis of urine, renal function tests, Osmolality & free water clearance, acute & chronic renal failure, glomerulonephrities, Nephrotic syndrome, Renal hypertension, Urinary Calculi, analysis of stones, peritoneal & hemodialysis.

Unit – 5

[12 HRS]

Clinical enzymology

Clinical enzymology in diagnosis, test for the evaluation of endocrine dysfunction pituitary, thyroid, parathyroid, adrenal cortex & medulla. General concepts of metabolism & detection of inborn error in foetus & heterozygous carriers by enzymes assay in amniotic fluid. Plasma & cell biopsy specimen. Clinical significance of aspartate & alanine transaminase, Creatine kinase, lactate dehydrogenase, aldolase, Enzyme test in determination of myocardial infarction, muscle dystrophy & bone disorders.

Text Books recommended

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. Text book of Medical Biochemistry – S.Ramakrishnan, K.G.Prassanan, R.Rajan.

Reference Books

1. Harpers Biochemistry 24th edition
2. Clinical chemistry – Teity and Co

MOLECULAR BIOLOGY

L	T	P	C
4	0	0	4

Total Hours: 60

Objective: To distinguish the molecular architecture of eukaryotic cells and organelles and different molecular biology techniques that are used to isolate, separate and probe for specific proteins.

Unit – 1

[12 HRS]

Prokaryotic transcription and regulation

Basic principles of transcription – E.Coli RNA polymerase submit structure. Promoter sequence in E coli; Steps in transcription-initiation, elongation and termination. Rho dependent and Rho independent termination. Inhibitors of transcription, Post transcriptional processing of rRNA and tRNA. Regulation of transcription in prokaryotes – the lac operon and trp operon.

Unit – 2

[12 HRS]

Eukaryotic transcription and regulation

Eukaryotic RNA polymerases-structure and functions. RNA pol I, II and III, promoters, transcription factors, transcription complex assembly and mechanism of transcription, Transcriptional regulation in eukaryotes-hormonal (steroid hormone receptors), phosphorylation (STAT proteins).

Post transcriptional processing of mRNA, rRNA and tRNA. Alternative splicing. Catalytic RNA (ribozymes), RNA editing, Antisense RNA. The genetic code-general features. Mutations-point mutations and frameshift mutations. Suppressor mutations-nonsense and missense suppression.

Unit – 3

[12 HRS]

Translation

Components of protein synthesis-m RNA, ribosomes and tRNA. Mechanism of protein synthesis in bacteria and eukaryotes-amino acid activation, initiation, elongation and termination translation control in bacteria and eukaryotes.

Regulation of protein synthesis-constitutive, and narrow domain regulation, Inhibition of protein synthesis. Co and post translation modification. Protein degradation: the Ubiquitine pathway. Protein folding models, molecular chaperones.

Unit – 4

[12 HRS]

Gene expression and regulation

Levels of gene expression. Principles of gene regulation, cis acting elements and trans acting factors. Upregulation, down regulation, induction, repression, global and narrow domain mechanisms.

Genetic and epigenetic gene regulation by DNA methylation. DNA methylation in prokaryotes-modification systems, Dam methylation. Dcm methylation. DNA methylation in eukaryotes-cytosine methylation, CpG islands. Methylation and gene regulation in mammals and plants.

Epigenetic gene regulation by DNA methylation in mammals-role of imprinting and X-chromosome inactivation.

Unit – 5

[12 HRS]

Molecular oncology

Differences between benign and malignant tumors. Growth characteristics of malignant tumours. Morphological, ultrastructural and metabolic alterations in tumour cells. Mechanism of radiation, viral and chemical carcinogenesis. Multistage carcinogenesis-initiation, promotion, progression-oncogenes and proto-oncogenes-mechanism of protooncogene activation. Tumour suppressor genes-mechanism of action with examples.

Text Books Recommended

1. Lewin.Genes VII. Oxford University Press 2000.
2. Twyman. Advanced Molecular Biology Viva publ. 2nd ed 1998.
3. Alberts. Molecular Biology of the cell. 4th ed. Garland sci 2002
4. Lodish et al, Molecular cell biology, 4th ed. Freeman 2000
5. Pitot HC., Fundamental of Oncology, Marcel Dekker, 2002
6. Stansfield etal., Molecular Cell Biology, Schaum's Outlines. Mc Graw Hill,
1996

Clinical analysis-II

L	T	P	C
0	0	4	2

1. Estimation of urea from urine
2. Estimation of uric acid from urine
3. Estimation of phosphorus from urine
4. Estimation of calcium from urine
5. Estimation of glucose from urine
6. Titrable acidity and ammonia
7. Qualitative analysis of normal urine
8. Qualitative analysis of pathological urine

Reference Books: 1. Laboratory manual for Analytical Biochemistry & separation Techniques, P.Palanivelu, MKU University, Madurai.2001. 2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005. 3. Biochemical methods – S.Sadasivam, New Age International Pub, 2000. 4. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000. 5. Enzyme Kinetics – A modern Approach. AG Marangani, John Wiley & Sons, 2003. 6. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub,

Clinical Enzymology

L	T	P	C
0	0	4	2

Assay of the following serum enzymes

1. SGOT
2. SGPT
3. Acid phosphatase
4. Alkaline phosphatase
5. Amylase
6. LDH
7. Trypsin

Reference Books: 1. Laboratory manual for Analytical Biochemistry & separation Techniques, P.Palanivelu, MKU University, Madurai.2001. 2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005. 3. Biochemical methods – S.Sadasivam, New Age International Pub, 2000. 4. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000. 5. Enzyme Kinetics – A modern Approach. AG Marangani, John Wiley & Sons, 2003. 6. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub,

Field Work / Study Tour

BCPR-PROJECT

- i) Students should carry out individual project only.
- ii) Project report will be evaluated by Central valuation and Viva – Voce will be conducted by both the external examiner and the guide at the end of the Third semester itself.