

SEMESTER-V

SCHEME OF TEACHING

SUB CODE	NAME OF SUBJECT	CONTACT HOURS PER WEEK		CREDITS	
		T	P	T	P
B501T	Pharmaceutical Biotechnology Theory	4	--	3	--
B502T	Pharmaceutical Biostatistics Theory	4	--	3	--
B502P	Pharmaceutical Biostatistics Practical	--	3	--	3
B503T	Pharmacognosy-III Theory	4	--	3	--
B503P	Pharmacognosy-III Practical	--	3	--	3
B504T	Pharmacology-III Theory	4	--	3	--
B504P	Pharmacology-III Practical	--	3	--	3
B505T	Pharmaceutical Analysis-II Theory	4	--	3	--
B505P	Pharmaceutical Analysis-II Practical	--	3	--	3
B506T	Biochemistry-I Theory	4	--	3	--
Total		36		30	

SCHEME OF EXAMINATION

SUB CODE	NAME OF SUBJECT	DURATION OF EXAM (HRS)		MARKS			
		T	P	THEORY		PRACTICAL	
				University level evaluation	Institute level evaluation	University level evaluation	Institute level evaluation
B501T	Pharmaceutical Biotechnology Theory	3	--	80	20	--	--
B502T	Pharmaceutical Biostatistics Theory	3	--	80	20	--	--
B502P	Pharmaceutical Biostatistics Practical	--	3	--	--	80	20
B503T	Pharmacognosy -III Theory	3	--	80	20	--	--
B503P	Pharmacognosy -III Practical	--	3	--	--	80	20
B504T	Pharmacology-III Theory	3	--	80	20	--	--
B504P	Pharmacology-III Practical	--	3	--	--	80	20
B505T	Pharmaceutical Analysis-II Theory	3	--	80	20	--	--
B505P	Pharmaceutical Analysis-II Practical	--	3	--	--	80	20
B506T	Biochemistry-I Theory	3	--	80	20	--	--
TOTAL		30		480	120	320	80

SUBJECT : **Pharmaceutical Biotechnology**
SUBJECT CODE : **B501T**
RATIONALE : Biotechnology has become an important technology for obtaining drugs from bio-sources. Large numbers of drugs are prepared using biotechnology. The course enables student to learn basic technology for production of various classes of drugs.

COURSE OBJECTIVES :
 To learn the basic principles of technology involved in production of bio-derived drugs

- LEARNING OUTCOMES: The student should be able to:**
1. Describe the basic principles underlying the technology used for production of drugs using biotechnology.
 2. Describe the methods used in the production of various vaccines, antibiotics and other biological products.

PREREQUISITES: General biology, Anatomy, Physiology, biochemistry

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
		T	P	TOTAL HRS		INTERNAL		EXTERNAL		
						T	P	T	P	
B501T	Pharmaceutical Biotechnology	4	-	4	3	20	--	80	--	100

CONTENT:

1	Immunology and Immunological Preparation: Principles, antigens and haptens, immune system cellular humoral immunity, immunological tolerance, antigen antibody reaction and their application. Hypersensitivity, Active and Passive immunization; Classification of immunological preparations, Vaccines, Sera, Toxoids– General methods of preparation, standardization and storage. Brief introduction of venoms.	15
2	Immunologicals- MMR Vaccine, Rubella Vaccine, Polio Vaccine, Pneumonia Vaccine, Diphtheria Vaccine, BCG Vaccine, Chicken pox Vaccine, Influenza Vaccine, Anti-RH factor, Hepatitis B Typhoid, Anti rabies serum, and Tetanus serum, Anti snake vaccine.	20
3	Biopharmaceuticals: Definition, Classification and applications.	05
4	Genetic Recombination: Microbial genetics and variation. Introduction of DNA, Mutation and its applications, Methods of genetic modification and its applications in industrial microbiology	15
5	Antibiotics: Historical development of antibiotics, antimicrobial spectrum and methods used for their standardization. Screening of soil for organisms producing antibiotics, fermenter, its design, and control of different parameters. Isolation of mutants, factor influencing rate of mutation. Design of fermentation process. Isolation of fermentation products with special reference to penicillin, streptomycins, tetracyclines and vitaminB12.	15
6	Microbial Transformation: Introduction, types of reactions mediated by microorganisms, design of biotransformation process, selection of organisms, biotransformation process and its improvements with special reference to steroids.	15

7	Enzyme immobilization: Technique of immobilization, factors affecting enzyme kinetics .Study of enzymes such as hyaluronidase, penicillinase, streptokinase and streptodornase, amylase and proteases etc. Immobilization of bacteria and Plant cell.	15
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BOOKS RECOMMENDED:

1. "Pharmaceutical Biotechnology", Purohit S S, Ab Grobias Publication
2. "Pharmaceutical Biotechnology", Sambhamurthy K., New Age International Publication
3. "Principles Of Fermentation Technology", Stanbury Peter F., Aditya Books Publication
4. "Biotechnology", Singh B.D., Kalyani Publication
5. "Biotechnology Unlipfed", Gracs Eric S., University Press Elsevier
6. "Foundations In Pharmaceutical Biotechnology", Nagori B P, Pharma Book Syndicate Publication
7. "Methods In Biotechnology And Bioengineering" Vyas S.P., Cbs Publication
8. "Text Book Of Biotechnology: Fundamentals", Jain S K, Cbs Publication
9. "Biotechnology An Introduction", Barnum Susan R., Wadsworth Publication
10. "Biotechnology The Biological Principles", Trevan M.D., Tata Mcgraw-Hill Publication

SUBJECT : **Pharmaceutical Biostatistics**
SUBJECT CODE : **B502T & B502P**
RATIONALE : Biostatistics is used in day to day life of any professional. The course enables student to learn the fundamentals of biostatistics and its application in pharmacy.

COURSE OBJECTIVES :

1. To learn fundamentals of statistics
2. To learn different methods of statistics for data description and data analysis with special focus on pharmaceutical sciences.

LEARNING OUTCOMES: The student should be able to:

1. Explain the basic principles of statistics.
2. Carry out data analysis using different statistical tools pertaining to data variability, probability and correlation.
3. Carry out correct sampling for collecting data.

PREREQUISITES: Basic arithmetics

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS		EVALUATION SCHEME				TOTAL MARKS
		T	P	TOTAL HRS	T	P	INTERNAL		EXTERNAL		
							T	P	T	P	
B502T & B502P	Pharmaceutical Biostatistics	4	3	7	3	3	20	20	80	80	200

CONTENT:

1.	Basic concepts of Biostatistics- Statistics & Biostatistics, Variables and Constants, population and sample Statistical data- Classification, Presentation and tabulation of data, Frequency distribution- graphical presentation of data	10
2.	Central tendency- Central tendency and its measures with their properties, comparisons of different measures, Applications in pharmaceutical studies	10
3.	Variability- Dispersion of data, its measures, properties of different measures, coefficient of variation, Measures relating to the shape of the distribution graph- Skewness and Kurtosis	10
4.	Probability distributions- Binomial distribution, Poisson Distribution, Normal Distribution- Applications in pharmacy	15
5.	Correlation & Regression Correlation- Definition, Types, Methods of analysis- Scatter diagram, correlation coefficient, spearman's correlation	10
6.	Tests of significance- Terms and Procedure of testing of hypothesis, Tests of significance for large samples, Tests of significance for small samples- t-distribution, and its applications in testing of hypothesis, F-distribution and its applications	15
a	t-test- t2-distribution, properties and conditions of t2- distribution, Applications of t2- distribution in testing of hypothesis	10
b	ANOVA- Definition, Technique and assumptions, One-way and Two-way ANOVA - Applications of mathematical modeling	10
c	Sampling Methods: Sample and population, need of sampling, sample size, methods of sampling	10

B502P Pharmaceutical Biostatistics Practical

1	(Use of functions and data analysis component of Excel)
2	Finding average and variability
3	Performing various significance tests
4	Various exercises based upon use of computers in treatment of Pharmacokinetic data and BA –BE Data.
5	Demonstration of Biostatistics softwares and its application in pharmacy
6	Linear regression and correlation analysis

BOOKS RECOMMENDED:

1.	“Methods Of Biostatistics”, Mahajan
2.	“Basic Biostatistics For Pharmacy”, Atul Prakashan (First Edition)
3.	“Advanced Mathematics And Biostatistics For Pharmacy”, Dr. K. R. Kachot (Third Edition)
4.	“Biostatistics- A Foundation For Analysis In The Health Sciences”, Wayne W. Deniel (Seventh Edition)
5.	“An Introduction To Biostatistics”, P. S. S. Sundar Rao, J. Richard (Third Edition)
6.	“Probability And Statistics”, Mary R. Spiegel
7.	Biostatistics and computer applications- Shah
8.	Fundamentals of Biostatistics - Khan and Khanum
9.	Fundamentals of Biostatistics - Rosner
10.	Biostatistical Methods - Looney
11.	Pharmaceutical Statistics, Bolton, Second Edition, Marcel Dekker Incorporation.

SUBJECT : Pharmacognosy -III
SUBJECT CODE : B503T & B503P
RATIONALE : It provides knowledge of drugs of natural origin. Since ages humans have been using drugs from natural origin. Many of the allopathic drugs also have herbal origin. Learning these drugs is of great value for pharmacy professionals as these drugs have important place in treatment of diseases.

COURSE OBJECTIVES :

1. To learn general morphological and microscopical characters of crude drugs
2. To understand general methods of checking purity of herbal drugs.

LEARNING OUTCOMES: The student should be able to:

1. Identify the crude drugs belonging to different classes based on morphological, microscopical and chemical properties.
2. Narrate the therapeutic and pharmaceutical uses of these drugs

PREREQUISITES: Biology and Pharmacognosy-I of semester-III and IV

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS		EVALUATION SCHEME				TOTAL MARKS
		T	P	TOTAL HRS	T	P	INTERNAL		EXTERNAL		
							T	P	T	P	
B503T & B503P	Pharmacognosy-III	4	3	7	3	3	20	20	80	80	200

CONTENT:

No.	Topics	
1.	Glycosides containing drugs: Definition, classification & chemical tests of glycosides; Saponins: Liquorice, Ginseng, Dioscorea, Cardioactive sterols: Digitalis, Squill, Strophanthus, Arjuna. Anthraquinone cathartics: Aloe, Senna, Rhubarb, Cascara. Others: Psoralea, Gentian, Saffron, Chirata, Quassia,	40
2.	Study of traditional drugs: I Aduśa, Apamarg, Bhilawa, Chakramadu, Chitrak, Gokhru, Satavari, Gymnema, Kalijiri, Karanj, Long Pepper, Malkagni, Manjith, Methi.	40
3.	Tannin: Definition, classification & chemical tests of tannins; Catechu, Gall, Myrobalan	20

B503P Pharmacognosy-III Practical

To study morphology and microscopy of following:	
1.	Senna leaf,
2.	Thevatia leaf , Chitrak root
3.	Satavari root,
4.	Liquorice,
5.	Karanj Seed
6.	Long pepper fruit
7.	Aduśa leaf,
8.	Apamarg herb

9.	Arjuna bark, Quassia wood
10.	Chakramadu Leaf
11.	Gymnema leaf
12.	Majith root
13.	To study morphology of Ginseng, Dioscorea, Gokhru, Digitalis, Squill, Strophanthus.
14.	To study morphology of Arjuna, Aloe, Senna, Rhubarb, Cascara, Psoralea, Ammi Majus.
15.	To study morphology of Ammi Visnaga, Gentian, Saffron, Chirata, Quassia.

BOOKS RECOMMENDED:

1. Sims, Medicinal Plant Glycosides, University Of Toronto Press.
2. Anasari, Pharmacognosy Textbook of Natural Products, Latest Edition.
3. Ashutosh Kar, Pharmacognosy And Pharmacobiotechnology, New Age International
4. Jackson Betty P., Atlas Of Microscopy Of Medicinal Plants, Culinary Herbs And Spices, CBS Publication
5. Rangari & Rangari, Text Book Of Pharmacognosy
6. Kokate C.K. Practical Pharmacognosy, Vallabh Prakashan, Delhi
7. Kokate C.K, Purohit A.P. And Gokhale S.B. Pharmacognosy (Degree) Nirali Prakashan,
8. Wallis T.E., Text Book Of Pharmacognosy, 5th Edition, CBS Publishers And Distributors
9. Wagner, Plant Drug Analysis, Springer Verlag Publication
10. Bruneton Jean, Pharmacognosy : Phytochemistry Medicinal Plants, Lavoisier Publishing
11. Trease E And Evans W.C. Pharmacognosy, Balliere Tindall. Eastbourne, U.K.
12. Tyler V.C., Brady L.R. And Robers W.E. , Pharmacognosy, Lea And Febiger, Ph
13. Harborne J B, Phytochemical Methods, Champan And Hall, International Edition, London
14. Ayurvedic Pharmacopoeia Of India
15. Herbal Pharmacopeia 1-2 (IDMA)
16. The Wealth Of India, Raw Materials (All Volumes) Council Of Scientific And Industrial Research (Csir), New Delhi.
17. The Wealth Of India – First Supplement Series (Row Materials) Vol- 1to 10
18. Who Monographs On Selected Medicinal Plants Vol-1-2
19. Indian Medicinal Plants (Plate) Vol-1-4, Kirtikar K. R
20. Indian Medicinal Plants (Text) Vol-1-4, Kirtikar K. R.
21. Quality standards of Indian medicinal plants vol I-IV(ICMR)
22. MG Chauhan, Microscopy Of Bark Drug, Jamnanagar Ayurved University
23. MG Chauhan, Microscopy Of Leaf Drug, Jamnanagar Ayurved University

SUBJECT : Pharmacology-III
SUBJECT CODE : B504T & B504P
RATIONALE : This is one of the core subjects of Pharmacy field where student learns the biological effects of drugs. The subject has direct application to the profession as it teaches the student about how the drug produce effect, what effects are produced, what side effects are produced, where and when it should be used etc. The subject is an extension of Pharmacology-I learnt in Semester-III

COURSE OBJECTIVES :
 To learn the mechanism of action, pharmacological effects, pharmacokinetics, adverse effects, therapeutic application of various classes of drugs with special attention to drugs acting on cardiovascular, urinary, gastrointestinal system.

LEARNING OUTCOMES: The student should be able to:

1. Narrate the principles involved in measurement of drug effects
2. Classify the drugs according to pharmacological classes
3. Explain the mechanism of action, pharmacodynamics and pharmacokinetic effects of drugs, adverse effects, contraindications and therapeutic application of various classes of drugs.
4. Conduct some simple *in vivo* experiments to demonstrate the pharmacological actions of the drugs.

PREREQUISITES:
 Knowledge of Human Anatomy Physiology, Health Education, Biochemistry and basic physics and chemistry. Fundamentals of pharmacology learnt in previous semesters.

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS		EVALUATION SCHEME				TOTAL MARKS
		T	P	TOTAL HRS	T	P	INTERNAL		EXTERNAL		
							T	P	T	P	
B504T & B504P	Pharmacology-III	4	3	7	3	3	20	20	80	80	200

CONTENT:

1	Pharmacology of Nitric oxide, endothelins, Atrial Natriuratic Peptide (ANP) & purines	10
2	Pathophysiology of and Drugs used in : Congestive Cardiac Failure, Angina, Myocardial Infarction, Cardiac Arrhythmias, Hypertension, Hyperlipidemia and Atherosclerosis, Anemia, Coagulation disorders, Shock	40
3	Drugs Acting on Urinary System Fluid and electrolyte balance, Diuretics, Anti diuretics, Urine acidifying and alkalinizing agents.	15
4	Pharmacology of Gastro Intestinal Tract : Antacids, Antiemetics, Antidiarrheal, Laxatives, carminatives, appetizers, demulcents, Adsorbants, Astringents, Digestants Pathophysiology and Drugs used in: Peptic Ulcer & Inflammatory Bowel Disease	20
5	Concepts of RIA, Radioligand Studies, ELISA, HTS	15

B504P Pharmacology-III Practical

1. Demonstration of the isolated perfused mammalian heart by Langendorff's technique.
2. To study the effect of various drugs on isolated frog's heart using simulation software.
3. To study the effect of various drugs on rat/cat/dog blood pressure using simulation software.
4. To study the effect of various drugs on ciliary motility of frog (CAE)
5. To study the antidiarrheal effect of loperamide on castor oil/Carbachol induced diarrhea.
6. To study effect of Aspirin on aggregation & deaggregation of platelets in human plasma.
7. Bioassay of Heparin
8. To evaluate the anti-inflammatory effect of aspirin using carrageenan induced rat paw edema method
9. To study various methods of Bioassay of agonists and antagonists
10. To perform bioassay of Ach/ Histamine using Rat/ Guinea pig ileum by Graphical method
11. To perform bioassay of Ach using Rat ileum by Matching method
12. To perform bioassay of Ach using Rat ileum by 3 point method
13. To perform bioassay of Ach/ Carbachol using Rat ileum by 4 point method
14. To perform bioassay of Atropine/ Pheniramine maleate using Rat / Guinea pig ileum by Graphical method
15. To determine the nature of Unknown drug using Rat ileum.
16. To study the effect of urea, furosemide & Acetazolamide on rat urine output

BOOKS RECOMMENDED:

1. Pharmacological Basis Of Therapeutics By Goodman & Gillman
2. Pharmacology And Pharmacotherapeutics By Satoskar & Bhandarkar
3. Essentials Of Pharmacotherapeutics By F.S.K. Barar
4. Essentials: Of Medical Pharmacology By K.D. Tripathi
5. Pharmacology By Rang & Dale
6. Fundamentals Of Experimental Pharmacology By M.N. Ghosh
7. Handbook Of Experimental Pharmacology By S.K. Kulkarni
8. Exp. P'ology by R.V. Goyal
9. Pharmacological Experiments On Isolated Preparations By Perry
10. Medical Pharmacology By Goth
11. Pharmacology By Gaddum
12. Lewis Pharmacology By Crosland
13. Textbook Of Pharmacology By Bowman & Rand
14. Elements Of Pharmacology By Dr. Derasari & Dr. Gandhi
15. Drug Interactions By Hansten
16. Introduction To General Toxicology By Aries Simonsis & Offermeier
17. Toxicology: The Basic Science Of Poisons By Casorett & Doull
18. Clinical Pharmacology By Lawrence
19. Principles Of Drug Action By Goldstein Aronow & Kalaman
20. Drug Treatment By Avery

SUBJECT : **Pharmaceutical Analysis-II**
SUBJECT CODE : **B505T & B505P**
RATIONALE : Measuring Drug purity is a primary requirement to ensure the quality of drugs. Quantifying the purity of compound can be done by different techniques. Some of the most commonly used techniques will be taught in this subject. This will make the student capable to work in a quality control department of the pharmaceutical industry.

COURSE OBJECTIVES :

1. To make student learn about various guidelines for method validation.
2. To provide the hands-on experience by actually conducting these assays in the lab.

LEARNING OUTCOMES: The student should be able to:

1. Narrate the principles of methods and instruments used in assay of various drugs and chemicals.
2. Conduct assays of some drugs using these methods and instruments.
3. Describe basic principles and guidelines pertaining to quality assurance of drugs.

PREREQUISITES:

Basic knowledge of physics, chemistry and pharmaceutical calculations taught in earlier semesters. Also knowledge of Pharmaceutical analysis studied in Semester-II becomes mandatory for this subject.

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS		EVALUATION SCHEME				TOTAL MARKS
		T	P	TOTAL HRS	T	P	INTERNAL		EXTERNAL		
							T	P	T	P	
B505T & B505P	Pharmaceutical Analysis-II	4	3	7	3	3	20	20	80	80	200

CONTENT:

1	Theoretical considerations and application in drug analysis and quality control of the following analytical techniques. Precipitation Titrations: Precipitation reactions, Solubility products, Effect of acids, temperature and solvent upon the solubility of a precipitate. Argentometric titrations and titrations involving ammonium or potassium thiocyanate, mercuric nitrate, and barium sulphate, Indicator, Gay-Lussac method, Mohr's method, Volhard's method and Fajan's method.	25
2	Gravimetric analysis: Precipitation techniques, Solubility products; The colloidal state, Super saturation co-precipitation, Post-precipitation, Digestional washing of the precipitate, Filtration, Filter papers and crucibles, Ignition, Thermogravimetric curves, Specific examples like barium sulphate, aluminium as aluminium oxide, calcium as calcium oxalate and magnesium as magnesium pyrophosphate, Organic precipitants.	25
3	Extraction procedures including separation of drugs from excipients	10
4	Electro analytical techniques: Electro analytical, Techniques: Potentiometry/ PH metry, Conductometry, Polarography, Amperography.	30
5	Quality Assurance. cGMP, GLP, ISO 9000, TQM, ICH guidelines for method validation.	10

B 505 P Pharmaceutical Analysis-II Practical

1. To determine %w/v of sodium chloride using Volhard's method.
2. To determine %w/v of sodium chloride using Mohr's method using potassium chromate as indicator.
3. To determine %w/v of sodium chloride using Mohr's method using adsorption indicator.
4. To determine % w/v of iodides by using standard solution of silver nitrate.
5. To determine moisture content of the given sample by Karl Fischer titration.
6. To find out the concentration of given acid solution by potentiometer.
7. To determine the content of sulfamethizole (from tablets) by potentiometer.
8. To find out the concentration of given acid solution by PH meter.
9. To determine the dissociation constant of given acetic acid solution by PH metry.
10. To find out the concentration of given acid solution by using Conductometer.
11. To find out optical activity of dextrose in the given solution of dextrose by using polarimeter.
12. To determine sulphate content as Barium sulphate by gravimetric method.
13. To determine chloride content as Silver chloride by gravimetric method.
14. To determine content of paracetamol and diclofenac sodium from the formulation (tablet).
15. To determine ascorbic acid content from tablets of ascorbic acid.
16. To determine aluminium content from aluminium hydroxide gel.

BOOKS RECOMMENDED:

1. K. A. Connors. A Textbook of Pharmaceutical Analysis, John Wiley & Sons. 3rd Ed.,1999
2. J. Mendham, R. C. Denney, J. D. Bernus, M. J. Khthomas, Vogel's Text book of quantitative chemical analysis ELBS UK, 5th Edition, 1996.
3. Practical Pharmaceutical Chemistry – I & II, A. H. Beckett and J. B. Stenlake, CBS Publishers.4th Ed. ,2004
4. D.A. Skoog, F.J. Holler, S. R. Crouch, Principles of Instrumental Analysis, Thomson corporation, 6th Ed.,2007
5. Gary D. Christian, Analytical chemistry, John Wiley & Sons N.Y., 5th Ed.1994.
6. J. H. Kemedly, Analytical chemistry: principles, W. B. Saunders publishing, 2nd ed. 1990
7. J.A. Dean, Analytical chemistry handbook, ,McGraw hill Inc., 1st Ed.,1995
8. S. M. Khopkar, New Age International Pvt. Ltd., Basic Concepts of analytical Chemistry, 2nd Ed.,1998
9. Indian Pharmacopoeia2007, Volume–I,II and III
10. Willard, Merritt, Dean, Settle, Instrumental Methods of Analysis, CBS Publishers 7th Ed., 1986
11. F. W. Fitiel and D. Kealy, Principles & Practice of Analytical Chemistry, Blackwell Science Ltd., 5th Ed., 2000
12. I. M. Pande, Systematic Analytical Chemistry, Central Book Depot Publications,1st Ed.,1965
13. R. Kellener, J.-M. Mermet, M. Offo, H.M. Winder, Analytical Chemistry, Wiley-VCH Verkp. GmbH, 1st Ed.,1968
14. Y. Anjaneyulu, K. Chandrasekhar, V. Manickam, A Text book of Analytical Chemistry, Pharma book Syndicate,1st Ed.,2006

SUBJECT : Biochemistry-I

SUBJECT CODE : B506T

RATIONALE : Understanding the chemistry of life is fundamentally required for studying the effect of drugs on human body. The course will enable student to learn the basic chemical reactions occurring in the human body. Also the various factors which can regulate this chemical processes will be taught.

COURSE OBJECTIVES:

1. To learn the structure and function of various biochemicals
2. To learn the basic metabolic processes occurring within the human body and factors regulating the same.

LEARNING OUTCOMES:

1. Describe the structure and functions of various biochemicals
2. Describe the various biochemical pathways occurring within the human body.
3. Describe the basic principles of enzymology.
4. Classify the different enzymes.

PREREQUISITES: Physics, chemistry, human anatomy physiology

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
		T	P	TOTAL HRS		INTERNAL		EXTERNAL		
						T	P	T	P	
B506T	Biochemistry-I	4	-	4	3	20	--	80	--	100

CONTENT:

1	Biological macromolecules: carbohydrates Introduction to carbohydrates. 1.1.1 Nomenclature, definition and classification of carbohydrates. 1.1.2 Monosaccharides. Classification, structural aspect and biological significance. 1.1.3 Disaccharides. 1.1.4 Oligosaccharides. 1.1.5 Polysaccharides. 1.1.5.1 Structure, classification, nomenclature and function. 1.1.5.2 Storage polysaccharides. 1.1.5.3 Structural polysaccharides. 1.1.6 Introduction to glycoprotein's and proteoglycans.	20
2	Introduction to lipid 2.1 Structure and function diversity of lipids. 2.1.1 Definition and classification. 2.1.2 Fatty acids, Triacyl glycerols, glycerophospholipids, Sphingolipids, steroids and other biologically important lipids (Terpenes, steroids, cholesterol etc.)	15
3	Proteins, structure and function 3.1 General structure of Amino acids. 3.1.1 Classification of Amino acids. 3.1.2 Derivative of amino acids. 3.1.3 Ionization of amino acids. 3.1.4 Peptide bond link amino acids in proteins. 3.1.5 Protein purification techniques.	20

	<p>3.1.6 Composition of amino acid in protein and determining sequence of amino acid residue methods.</p> <p>3.2 Structure of protein.</p> <p>3.2.1 Types of protein structure.</p> <p>3.2.2 Primary structure.</p> <p>3.2.3 Secondary structure.</p> <p>3.2.4 Tertiary structure.</p> <p>3.2.5 Quaternary structure.</p> <p>3.2.6 Stability of protein structure.</p> <p>3.3 Various other biologically important protein.</p>	
4	<p>Enzymes and coenzymes</p> <p>4.1 Structure and function of enzyme</p> <p>4.1.1 Classification of enzyme</p> <p>4.2 Enzyme kinetics and its mechanism of action</p> <p>4.2.1 Chemical kinetics</p> <p>4.2.2 Enzyme kinetics</p> <p>4.3 The Michaelis Menton equation</p> <p>4.3.1 Derivation of the Michaelis Menton equation</p> <p>4.3.2 The meaning of Km</p> <p>4.3.3 Kinetic constant indicative enzyme efficiency and specificity</p> <p>4.3.4 Measurement of Km and Vmax</p> <p>4.4 Enzyme inhibition</p> <p>4.4.1 Types of enzyme inhibition</p> <p>4.4.2 Reversible enzyme inhibition</p> <p>4.4.3 Irreversible enzyme inhibition</p> <p>4.5 Regulation of enzyme activity</p> <p>4.6 Enzymes and iso-enzymes in clinical diagnosis</p> <p>4.7 Coenzyme classification</p> <p>4.7.1 Role of vitamin as coenzyme</p> <p>4.7.2 Biological significance (Involvement in metabolism, cell transport, ETC energetics)</p> <p>4.8 Metal as coenzyme and its biological significance.</p>	20
5	<p>Physiologically important substrates.(porphyrin, bile pigments)</p> <p>5.1 Introduction to haemoglobin.</p> <p>5.2 Biosynthesis of porphyrins from urea cycle.</p> <p>5.3 Disorders of porphyrin biosynthesis.</p> <p>5.4 Biosynthesis of bile pigments.</p> <p>5.4.1 Bilirubin.</p> <p>5.4.2 Biliverdin.</p> <p>5.4.3 Disorders & clinical significance of bile pigments.</p> <p>5.5 Water & mineral metabolism.</p>	10
6	<p>Nucleic acids, genetic code & protein synthesis.</p> <p>6.1 Introduction to genetic organization of the mammalian genome.</p> <p>6.1.1 Structure of DNA.</p> <p>6.1.2 DNA super coiling.</p> <p>6.1.3 RNA & its types.</p> <p>6.1.4 Nucleases & hydrolysis of nucleic acids.</p> <p>6.2 Biosynthesis of DNA & its replication.</p> <p>6.3 Repair of damaged DNA.</p> <p>6.3.1 UV light causes dimerization.</p> <p>6.3.2 Excision repair.</p>	15

6.4	Biosynthesis of RNA.
6.4.1	Types of RNA.
6.4.2	Transcription.
6.4.3	The lac operon the '-ve' & '+ve' resulation its role, function.
6.4.4	Post translation modifications of RNA.
6.5	Genetic code & transfer RNA.
6.6	Components of protein synthesis.
6.7	Inhibition of protein synthesis.
6.8	Regulation & protein synthesis.
6.9	Genetic engineering-brief overview.
6.10	Polymerase chain reactions. Types, classifications, function & biological significance.
6.11	Regulation of gene expression.

BOOKS RECOMMENDED:

1. Dr. U. Satyanarayana, Biochemistry, 2nd edition, Books and allied (P) Ltd., 2004.
2. P.C. Champe, R.A. Harvey, Biochemistry, 2nd edition, Lippincott – Raven publishers, 1994.
3. R. K. Murray, D.K. Granner, P.A. Mayes, V.W. Rodwell, Harper's Illustrated Biochemistry, 26th edition, McGraw Hill Publishers, 2003.
4. White, Philip Handler, E.L. Smith, R.L. Hill, I.R. Lehman, Principles of Biochemistry, 6th edition, Tata McGraw Hill Publishing Company Ltd., 2004.
5. W. H. Elliott, D. C. Elliott, Biochemistry & Molecular Biology, 1st edition, Oxford University Press, 1997.
6. G. L. Zubay, W. W. Parson, D.E. Vance, Principles of Biochemistry, 1st edition, WCB publishers, 1995.
7. E.E. Conn and P.K. Stumpf, G. Bruening, R. H. Doi, Outlines of Biochemistry, 5th edition, John Wiley & Sons, New York, 1999.
8. D. B. Marks, Board Review Series, Biochemistry, 2nd edition, Harwal Publishing, 1994.
9. D. L. Nelson, M. M. Cox, Lehninger Principles of Biochemistry, 4th edition, W. H. Freeman & Company, 2005.
10. R. H. Garrett, C. M. Grisham, Principles of Biochemistry with a Human Focus, 1st edition, Harcourt College Publishers, 2002.
11. M. Cohn, K.S. Roth, Biochemistry and Disease, 1st edition, William and Wilkins Co., Baltimore, 1996.
12. H. R. Horton, L. A. Moran, R. S. Ochs, J. D. Rawn, K. G. Scrimgeour, Principles of Biochemistry, 2nd edition, Prentice-Hall International Inc., 1996.
13. S. Ramakrishnan, K.G. Prasanan, R. Rajan, Textbook of Medical Biochemistry, 3rd Edition, Orient Longman, Madras, 2001