

Faculty of Pharmaceutical Science & Technology

Study and Evaluation Scheme

Of

Bachelor of Pharmacy (B.Pharm.)

(Applicable w.e.f Academic Session 2013-17 till revised)



AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

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Faculty of Pharmaceutical Science & Technology**B.Pharm.****III Semester****TEACHING & EXAMINATION SCHEME**

Sr.No.	Subject Code	Subject	Periods			Credits
			L	T	P	
1	61PY301	Unit Operation-I	4	0	0	4
2	61PY302	Pharmaceutical Organic Chemistry-II	4	0	0	4
3	61CH303	Pharmacognosy-II (Pharmacognosy & Phytochemistry-I)	4	0	0	4
4	61PY304	Pharmaceutical Microbiology	4	0	0	4
5	61PY305	Human Anatomy & Physiology - II	4	0	0	4
1	61PY351	Unit Operation-I (Lab)	0	0	3	2
2	61PY352	Pharmaceutical Organic Chemistry-II (Lab)	0	0	3	2
3	61CH353	Pharmacognosy-II (Pharmacognosy & Phytochemistry-I (Lab)	0	0	3	2
4	61PY354	Pharmaceutical Microbiology (Lab)	0	0	3	2
5	61PY355	Human Anatomy & Physiology - II (Lab)	0	0	3	2
TOTAL			20	0	15	30

Faculty of Pharmaceutical Science & Technology**B.Pharm.****IV Semester****TEACHING & EXAMINATION SCHEME**

Sr. No.	Subject Code	Subject	Periods			Credits
			L	T	P	
1	61PY401	Unit Operation-II	4	0	0	4
2	61PY402	Pharmaceutical Biochemistry	4	0	0	4
3	61PY403	Dispensing and Community Pharmacy	4	0	0	4
4	61PY404	Pharmaceutical Analysis-I	4	0	0	4
5	61PY405	Pathophysiology & Toxicology	4	0	0	4
1	61PY451	Unit Operation-II (Lab)	0	0	3	2
2	61PY452	Pharmaceutical Biochemistry (Lab)	0	0	3	2
3	61PY453	Dispensing and Community Pharmacy (Lab)	0	0	3	2
4	61PY454	Pharmaceutical Analysis-I (Lab)	0	0	3	2
5	61PY455	Pathophysiology & Toxicology (Lab)	0	0	3	2
TOTAL			20	0	15	30

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TEACHING & EXAMINATION SCHEME

Sr. No.	Subject Code	Subject	Periods			Credits
			L	T	P	
1	61PY501	Pharmaceutical Technology-I (Pharmaceutical Formulation & Cosmetology)	4	0	0	4
2	61PY502	Medicinal Chemistry-I	4	0	0	4
3	61PY503	Pharmacognosy-III (Pharmacognosy & Phytochemistry-II)	4	0	0	4
4	61PY504	Hospital Pharmacy & Health Education	4	0	0	4
5	61PY505	Pharmacology-I	4	0	0	4
1	61PY551	Pharmaceutical Technology-I (Pharmaceutical Formulation & Cosmetology) (Lab)	0	0	3	2
2	61PY552	Medicinal Chemistry-I (Lab)	0	0	3	2
3	61PY553	Pharmacognosy-III (Pharmacognosy & Phytochemistry-II) (Lab)	0	0	3	2
4	61PY554	Pharmacology-I (Lab)	0	0	3	2
TOTAL			20	0	12	28

Faculty of Pharmaceutical Science & Technology**B. Pharm.****VI Semester****TEACHING & EXAMINATION SCHEME**

Sr. No.	Subject Code	Subject	Periods			Credits
			L	T	P	
1	61PY601	Pharmaceutical Technology-II (Pharmaceutical formulation & NDDS)	4	0	0	4
2	61PY602	Medicinal Chemistry-II	4	0	0	4
3	61PY603	Pharmacy Law & Ethics	4	0	0	4
4	61PY604	Pharmaceutical Analysis-II	4	0	0	4
5	61PY605	Pharmacology-II	4	0	0	4
1	61PY651	Pharmaceutical Technology-II (Pharmaceutical formulation & NDDS) (Lab)	0	0	3	2
2	61PY652	Medicinal Chemistry-II (Lab)	0	0	3	2
3	61PY653	Pharmaceutical Analysis-II (Lab)	0	0	3	2
4	61PY654	Pharmacology-II (Lab)	0	0	3	2
5	61PY655	Educational Tour Report	0	0	3	2
TOTAL			20	0	15	30

Faculty of Pharmaceutical Science & Technology**B.Pharm.****VII Semester****TEACHING & EXAMINATION SCHEME**

Sr. No.	Subject Code	Subject	Periods			Credits
			L	T	P	
1	61PY701	Biopharmaceutics & Pharmacokinetics	4	0	0	4
2	61PY702	Medicinal Chemistry-III	4	0	0	4
3	61PY703	Pharmacognosy-IV (Industrial Pharmacognosy)	4	0	0	4
4	61PY704	Pharmaceutical Analysis-III	4	0	0	4
5	61PY705	Pharmacology-III	4	0	0	4
6	61PY751	Biopharmaceutics & Pharmacokinetics (Lab)	0	0	3	2
8	61PY752	Pharmacognosy-IV (Industrial Pharmacognosy) (Lab)	0	0	3	2
9	61PY753	Pharmaceutical Analysis-III (Lab)	0	0	3	2
11	61PY755	Professional Training				2
TOTAL			20	0	9	28

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VIII Semester

TEACHING & EXAMINATION SCHEME

Sr.No.	Subject Code	Subject	Periods			Credits
			L	T	P	
1	61PY801	Pharmaceutical Management	4	0		4
2	61PY802	Pharmaceutical Biotechnology	4	0		4
3	61PY803	Chemistry of Natural Products	4	0		4
4		Elective-I (Group-A)	4	0		4
5		Elective-II (Group-B)	4	0		4
6	61PY851	Pharmaceutical Biotechnology (Lab)		0	3	2
8	61PY852	Chemistry of Natural Products (Lab)		0	3	2
9	61PY853	Project Work		0	8	4
TOTAL			20	0	14	28

Elective-I (Group-A)

61PY804 -A	Pharmaceutical Marketing
61PY805-A	Packaging Technology
61PY806 -A	Cosmetic Technology
61PY807 -A	Pharmaceutical Enterprise

Elective-II (Group-B)

61PY804-B	Drug design & Lead Identification
61PY805-B	Quality Assurance, Good Manufacturing & Validation
61PY806-B	Standardization of Herbal Drugs
61PY807-B	Clinical Pharmacy & Drug Interaction

Note: Student can choose only one subject in each group.

***For any elective subject to be applicable in the batch, it is necessary that at least 10 students should opt the particular subject.**

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III Semester
Unit Operation-I

Course Objective: the subject deals with the importance of unit operation in manufacturing of pharmaceuticals. Focus on principle, theory and mechanism, working and construction of equipments of different unit operations in pharmaceutical plant.

Unit-I

Unit operation- Introduction to unit operation and pharmaceutical engineering (units & dimensions). Basic laws, materials and energy balances.

Fluid flow-

Types of fluids- Newtonian and non Newtonian's fluid. Types of flow, Reynolds's number and its significance.

Viscosity- Definition, concept of boundary layer (distribution of velocities in a pipe). Basic equations of fluid flow, Bernoulli's theorem and its applications.

Measurement of pressure- manometers, friction losses, losses in pipe fittings & joints.

Measurement of fluid flow- Principle, construction and working of venturimeter, orifice meter, pitot tube and rotameter.

Flow control (valves)- Plug cock, globe valves, gate valves & water hammer.

Unit-II

Filtration and centrifugation- Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter etc. Factors affecting filtration.

Centrifugation- Principle of centrifugation, industrial centrifugal filters and centrifugal sedimenters

Material handling system

Liquid handling system- Different types of pumps.

Solid handling system- Principle, construction and working of belt conveyors, screw conveyors & pneumatic conveyors.

Unit-III

Crystallization- Characteristics of crystals like purity, size, shape, geometry, habit, forms size and factors affecting them, solubility curves.

Theory of crystallization- Nucleation mechanisms, crystal growth, Mier's super saturation theory and its limitations.

Crystallizers- Study of various types of crystallizers-Agitated batch crystallizers, Swenson-Walker crystallizer, Krystal crystallizer, vacuum crystallizer. Caking of crystals & its preparation.

Unit-IV

Refrigeration and air conditioning: Basic concepts and definition, wet bulb and adiabatic saturation temperature, psychometric chart & measurement of humidity, application of humidity measurement in pharmacy.

Refrigeration- Theory and application of refrigeration, refrigeration cycle.

Air conditioning- Theory of air conditioning, application and types.

Principle and application of humidification and dehumidification.

Unit- V

Material of constructions: General study of composition, corrosion, resistance, properties and applications of the materials of construction with special reference to stainless steel & glass.

Practical

1. Measurement of rate of flow of fluid and pressure by-
 - i) Simple manometer
 - ii) Venturi meter
 - iii) Orifice meter
2. To determine Reynold's number.S
3. To study the various factors affecting rate of filtration-
 - i) Effect of different filter media
 - ii) Effect of viscosity of filtrate
 - iii) Effect of pressure
 - iv) Effect of thickness of cake
 - v) Effect of filter aids
4. To study the principle of centrifugation for
 - i) Liquid- liquid separation and stability of emulsion
 - ii) Solid-liquid separation and stability of suspension
5. To determine the dry bulb and wet bulb temperature using psychometric charts.
6. To study the characteristic of crystals, study of crystal habit.
7. To study the solubility of crystals.

Text Books:

1. Sambhamurthy, Pharmaceutical Engineering, New Age Publishers.
2. Gavhane, K.A. "Unit Opeation-I", Nirali Prakashan.
3. Badger W.L. and Banchero J.T. Introduction to Chemical Engineering Mc Graw Hill International Book Co., London.
4. C.V.S. Subrahmanyam, Pharmaceutical engineering, Vallabh publications, Delhi., India.

Reference Books:

1. Perry R.H. & Chilton C.H. Chemical Engineers Handbook, Mc Graw Kogakusha Ltd.
2. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering Mc Graw Hill International Book Co., London.
3. Cooper and Gunn.s Tutorial Pharmacy, S.J. Carter., Latest edition
4. Bentley's Pharmaceutics.Davis, Latest edition
5. Unit operation of chemical engineering .McCabe Smith, Latest edition,

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Pharmaceutical Microbiology

Course Objective: this subject may provide fundamental knowledge about pathogenic/non pathogenic microorganism and their management. The students can learn about various sterilization techniques, microbiological assay and pharmaceutical applications of microbiology.

Unit-I:

1. Introduction to the scope of microbiology.
2. Structure of bacterial cell.
3. Classification of microbes and their taxonomy: Bacteria and viruses.

Unit-II:

1. Identification of Microbes: Stains and types of staining techniques, electron microscopy.
2. Nutrition, cultivation & isolation of bacteria & viruses.

Unit-III:

1. Control of microbes by physical and chemical methods.
2. Disinfection, factors influencing disinfectants, dynamics of disinfection, Disinfectants and Antiseptics and their evaluation.
3. Sterilization, different methods, validation of sterilization methods & equipments.

Unit-IV:

1. Sterility testing as per I.P.
2. Immunity, primary and secondary, defensive mechanisms of body, microbial resistance, interferon
3. Preservative efficacy

Unit-V:

1. Microbial assays of antibiotics, vitamin B12.
2. Factory and hospital hygiene- control of microbial contamination during manufacture, Manufacture of sterile products- clean and aseptic area, nosocomial infection, control of Hospital infections.

PRACTICALS

1. Study of sterilization methods & equipments
 - Dry heat
 - Moist heat
2. Preparation of various types of culture media.
3. Isolation of bacteria.
4. Sub-culturing of common bacteria, fungi, yeast.
5. Identification and staining of bacteria.
 - Simple staining
 - Gram staining
 - Acid fast staining
 - Hanging drop preparation.
6. Evaluation of disinfectants and antiseptics
 - Phenol coefficient test, minimum inhibitory concentration.
7. Test for sterility of pharmaceutical products as per IP.
8. Microbial assay of antibiotics as per IP.

Books Recommended:-

Text Books:

1. Pelczar and Reid; Microbiology
2. W. B Hugo and A.o. Russel; pharmaceutical microbiology balackwell scientific publication, Oxford London.
3. Ananthnarayan; text book of microbiology.
4. Rose, industrial Microbiology.

Reference Books:-

1. I.P. B.P., U.S.P. – Latest edition.
2. Malcolm Harris, Balliere Tindall & cox; pharmaceutical Microbiology.

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Pharmaceutical Organic Chemistry-II

Course Objective: The subject of Pharmaceutical Organic Chemistry-II will be treated in its modern prospective including Introduction, Significance, Nomenclature, Classification and Mechanism of organic compounds, keeping for the sake of convenience.

UNIT: I

Nucleophilic Aromatic Substitution Reactions, α , β Unsaturated Carbonyl Compounds, Conservation of Orbital symmetry & Rules. Electrocyclic, Cycloaddition and Sigmatropic reactions. Neighbouring group effect, Catalysis by Transition metal complexes. New Organic Reagents Used in drug Synthesis.

UNIT: II

Chemistry of Heterocyclic Compounds: Definition, Nomenclature, Classification, Nature, Preparations, Physical & Chemical Properties, Acidity & Basicity and important Pharmaceutical Applications of some Important Heterocyclic Compounds.

- a) **Five Membered Six Membered Ring Systems with One Hetero Atom:** Furan, Pyrrol, Thiophene & Pyridine.
- b) **Five Membered Six Membered Ring Systems with Two Hetero Atoms:** Pyrazole, Imidazole, Oxazole, Isoxazole, Thiazole and a Comparative Study of Pyrazine, Pyrimidine & Pyridazine.
- c) **Five Membered Ring with Three Hetero Atoms:** Triazole.

UNIT: III

- a) **Polymer and Polymerization:** Definition, Classification, Reaction mechanism, Preparation, Properties and Uses of Some Important Polymers.
- b) Chemistry of Nucleic Acids (nucleotides & Nucleosides) & Amino Acids.

UNIT-IV

- a) **Chemistry of Carbohydrates:** Definition, Nomenclature, Classification, Relative Configuration of Some Important Monosaccharide's, Glucose Structure, Mutarotation, Ring Structure, Epimerization, Glycosidic Linkage, Structure of Disaccharide Sucrose, Structural Components of Starch & Cellulose and Pharmaceutical Importance.
- b) **Chemistry of Proteins & Poly Peptides:** Definition, Classification of Proteins, Denaturation, Isoelectric Point, C-Terminal & N-Terminal Concept and Pharmaceutical Importance.
- c) **Chemistry of Lipids:** Definition, Characterization of Lipids (Saponification Value, Acid Value & Iodine Value), Rancidity & Hydrogenation of Oils and Fats.

UNIT: V

Molecular Rearrangement and Synthetic Applications associated with Following Reactions: Cannizzaro, Perkin, Reimer-Tieman, Meerwein-Ponndorf-Verley, Reformatsky, Mannich, Michael, Wittig, Beckmann, Claisen, Sandmeyer, Dieckmann, Cyano-addition, Hydroboration-Metal Hydride Reduction and Oxidation with Cr & Mn Compounds.

LIST OF PRACTICALS

1. To synthesize and calculate percentage yield of some important heterocyclic compounds.
(At least 5)
2. To determine the Acid Value of oils & fats.
3. To determine the Saponification Value of oils & fats.
4. To determine the Iodine Value of oils & fats.
5. To determine the melting point, boiling point, solubility of some important heterocyclic compounds.
(At least 5)

BOOKS RECOMMENDED

S. No.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Organic Chemistry	R.T. Morrison & R.N. Boyd	Prentice India Pvt. Ltd. New Delhi
2.	Text Book of Organic Chemistry	B.S. Bhal & Arun Bhal	S. Chand Publisher
3.	Practical Organic Chemistry (4 th Edition 1986)	F.G. Mann & B.C. Saunders	Orient Longman
4.	Chemistry of carbonyl compounds	Gutschi	Prentice Hall of India, New Delhi

REFERENCE BOOKS

S. NO.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	An introduction to the organic chemistry of heterocyclic compounds	R. M. Acheson	Interscience Publication, New York
2.	A Text Book of Pharmaceutical Chemistry	L.M. Antherden	Bentley & Drivers, Oxford University Press, New Delhi
3.	A Guide Book To Mechanism in Organic Chemistry	P. Sykes	Orient Longman, New Delhi
4.	Organic Chemistry (Vol. I & II)	I.L. Finar	ELBS London
5.	Vogel's Text Book of Practical Organic Chemistry (5 th Edition)	Furniss <i>et al.</i>	ELBS London
7.	Practical Pharmaceutical Chemistry	A.A. Siddiqui & Mohd. Ali	CBS Publishers & Distributors Pvt. Ltd.

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Pharmacognosy-II

Course Objective: the study involves traditional and alternative medicines, used and practiced as conventional methods of herbal drug therapy; hence the subject deals with basic understanding of herb and best available option possible for medicinal purpose.

Unit-I: Phytochemical Screening:

a. Preparation of plant extracts .

b. Screening of plant extracts

alkaloids, saponins, , flavonoids and, tannins and, cynogenetic glycosides, amino acids .

Unit-II:

a. Principles and methods of Quantitative microscopical analysis:-

Stomatal index, Stomatal number, Palisade ratio, Vein islet number and vein termination number; Lycopodium Spore method for the evaluation of starches.

b.Enzymes,

Biological sources, preparation, properties, identification tests and uses of Diastase, Papain, Pepsin, Trypsin and Pancreatin.

Unit-III:

a.Ayurvedic and Traditional system of medicine:

Brief Introduction and principals of Ayurvedic, Unani , Siddha and Homeopathic systems of medicines. Introduction to Herbal Pharmacopoeia with special reference to Arishtas, Asavas, Gutikas, Tailas, Churnas, Lehyas and Bhasmas.

b.Pharmaceutical aids :-

Study of Pharmaceutical aids like Talc, Diatomite, Kaolin, Bentonite, Fullers earth, Gelatin and Natural colors.

Unit-IV:

a.Resins :

Introduction, classification and properties of resins. pharmacognostical Study of drugs containing Resins and Resin Combination like Podophyllum, Cannabis, Capsicum, Shellac, Asafoetida, Balsam of tolu, Balsam of peru, Benzoin, Turmeric, Ginger.

b.Tannins :

Introduction, classification and properties of tannins. pharmacognostical Study of tannins & tannin containing drugs like Gambier (Pale Catechu),Black Catechu, Gall and Myrobalans (Harde, Baheda,).

Unit-V:

a.Pharmacognostical studies of traditional drugs:

Amla, Kantkari, Satavari, Tylophora, Bhilawa, Kalijiri, Bach, Rasna, Punamava, Chitrack, Apamarg, Gokhru, Shankhpushpi, Brahmi, Adusa, Atjuna, Ashoka, Methi, Lahsun, Palash, Guggal, Gymnema, Shilajit, Nagarmotha and Neem.

b. Plant bitters, plant Sweeteners and plant laxative.

PRACTICALS:

1. To isolate quinine from cinchona.
2. Determination of Vein islet number and Vein-let termination number of two dicot leaf drugs.
3. Determination of Palisade ratio of two dicot leaf drugs.

4. Measurement of Calcium oxalate crystals in powdered crude drug.
5. Determination of Stomatal number and Stomatal index of two dicot leaf drugs.
6. To determine the moisture of crude drug by IR moisture balance.
7. Determination of Stomatal number and Stomatal index of two dicot leaf drugs.
8. Morphological identification of Myrobalans Gambier, Black Catechu, Gall .
9. Morphological identification of Podophyllum, Cannabis, Capsicum, Shellac . Asafoetida, Balsam of tolu, Balsam of peru
10. Morphological and Microscopical identification of, Neem.
11. Morphological and Microscopical identification of Bach.
12. Morphological and Microscopical identification of Methi,
13. Morphological and Microscopical identification of Amla & Lahsun.
14. Identification tests Diastase, Papain, Pepsin, Trypsin and Pancreatin.
15. Chemical identification of Talc, Kaolin, Bentonite.

Text Book:

1. C.K. Kokate, Gokhale and Purohit, A Text Book of Pharmacognosy, Nirali Prakashan, Pune
2. C.S. Shah & J.S. Quadry, A Text Book of Pharmacognosy

Reference Books:

1. S.S. Handa and V.K. Kapoor, Pharmacognosy, Vallabh Prakash, Delhi
2. G.E. Trease and W.C. Evans, Pharmacognosy (India Reprint J. P. Publication, Delhi)
3. T.E. Wallis, Text Book of Pharmacognosy, C.B.S. Publication, Delhi
4. V.E. Tylor, L.R. Brady & J.E. Robbers, Lea & Febiger Philadelphia, U.S.A.
5. C.K. Atal and B.M. Kapoor, Cultivation & Utilization of Aromatic Plants, Council of Scientific Industrial Research (CSIR) New Delhi
6. Medicinal Plant Glycosides – Sim, Toronto

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Human Anatomy & Physiology-II

Course Objective: the subject involves the study of human anatomy along with activity performed by the organ and role in the formation of complete coordination of human body.

1. **Digestive System:** Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food.

Overview of Disorders of digestive system, appendicitis, gastrointestinal tumors, dental, caries' disease, periodontal cirrhosis, hepatitis, gallstones, anorexia, peptic ulcers.

2. **Respiratory System:** Anatomy of respiratory organs & its functions, respiration, mechanism and regulation of respiration, respiratory volumes and vital capacity.

3. **Central Nervous System:** Functions of different parts of brain and spinal cord, Neurohumoral transmission in the central nervous system, reflex action electroencephalogram, specialized functions of the brain, Cranial nerves and their functions.

Overview of CNS Disorder: Alzheimer's Disease, Parkinson cerebral palsy, poliomyelitis multiple sclerosis, dyslexia, Trigeminal neuralgia, headache, epilepsy, Reyes syndrome, Neuritis, Sciatica.

4. **Autonomic Nervous System :** Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission in the A.N.S.

5. **Urinary System:** Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid-base balance.

Overview of Disorder of urinary system, cystitis, nephrosis Renal failure, Gout, glomerulonephritis , Urinary tract infection.

6. **Reproductive System:** Male and female reproductive systems and their hormones, physiology of menstruation, coitus and fertilization. Sex differentiation, spermatogenesis & oogenesis. Pregnancy its maintenance and parturition.

Overview of Disorders of Reproductive systems: - Sexually transmitted diseases Gonorrhoea, Syphilis, Genital herpes, Prostatitis impotence, in fertility, Menstrual, abnormalities (Amenorrhoea, dysmenorrhoea) Ovarian cysts, endometriosis, cervical cancer, Trichomoniasis, prostate cancer, breast cancer.

7. **Endocrine System:** Basic anatomy and physiology of Pituitary, Thyroid, Parathyroid. Adrenals, Pancreas, Testes and ovary, their hormones and functions.

Overview of Disorders of endocrine system: Pituitary dwarfism, gigantism, acromegaly, diabetes, insipidus, cretinism, Myxedema, exophthalmic goiter, aldosteronism, pheochromocytoma , Addison's disease, Cushing's syndrome, Diabetes mellitus

Practical

1. Study of different systems with the help of charts and models.
2. Microscopic studies of different tissues.
3. Simple experiments involved in the analysis of normal and abnormal urine: Collection of specimen, appearance, determination of pH, Sugars, proteins, urea and creatinine.
4. Physiological experiments on nerve-muscle preparations.
5. Determination of vital capacity, experiments on spirometry.
6. To study male and female reproductive system with the help of chart.
7. study structure and physiology of eye with the help of chart
8. study structure and physiology of skin (model)
9. study structure and physiology of ear (model)
10. study structure and physiology of lungs(model)

Text Books:

1. Chatterjee, C.C, **Human Physiology**, Medical allied agency, Calcutta.
2. Ross and Wilson, **Human anatomy and Physiology**, Churchill Livingstone London.
3. C.C. Chatterjee: Human Physiology.

Reference Books:

1. Gerard J. Tortora and Nicholas P. Anagnostakos ; Principles of Anatomy and physiology. Harper and Row publishers, New York.
2. Sujit K. Chaudhuri: Concise Medical Physiology.
3. Kathleen J.W., Wilson Ross and Wilson: Anatomy and Physiology in Health and Illness
4. Arthur C. Guyton: Textbook of Medical Physiology.
5. Cyril A. Keele, Erie Neil, Norman Joels and Samson Wrights: Applied Physiology
6. Shalya, Subhas, **Human Physiology** CBS publisher Delhi.
7. Chaurasia, B.D, **Human anatomy, Regional and applied.** , CBS publisher New Delhi

B. Pharm.
IV Semester
UNIT OPERATION– II

Course Objective: After reading this subject, the students can learn about fundamental knowledge of unit process and unit operation. Also this subject will provide knowledge about the principle, construction, working, advantages and disadvantages of various equipments used to carry out unit operations and unit processes.

UNIT-I: STOICHIOMETRY

1. Fundamentals of concept of materials and energy balance, units and dimensions. Simple inter-conversion of units, stoichiometry.
2. Dimensional equations and dimensionless formulae, dimensionless groups, dimensional analysis.
3. Equilibrium states, rate process, steady states and unsteady states
4. Lab scale, pilot scale and industrial scale

UNIT-II: EVAPORATION

1. Basic concept of phase equilibria, factors affecting evaporations. Applications of evaporation.
2. Theory of evaporation, heat and material balances.
3. Types of evaporation- steam jacketed kettle, film evaporators, horizontal tube and vertical evaporator, single effect and multiple effect evaporators. Capacity of multiple effect evaporators.
4. Mathematical problems on evaporation.
5. Recent advances in evaporation.

UNIT-III: DISTILLATION

1. Raoult's law, phase equilibrium, volatility and relative volatility.
2. Applications of distillation.
3. Theory of distillation of mixtures like binary mixtures of miscible liquids and binary mixtures of immiscible liquids.
4. Rectification, rectifying columns, fractionating columns, method for calculation of number of theoretical plates, HETP (**Mc Cabe Thiel method**).
5. Simple distillation, steam distillation, azeotropic and extractive distillation, Vacuum, flash and molecular distillation. Mathematical problems on distillation.
6. Recent Advances in Distillation.

UNIT-IV: DRYING

1. Theory of drying, Application of drying. Drying curve.
2. Mechanism of drying, rate of drying, time of drying, calculation Of LoD. Equilibrium Moisture Content (EMC) and Free Moisture Content (FMC).
3. Types of dryers, dryers used in pharmaceutical industries- Tray dryer, Fluidized bed dryer (FBD), spray dryer and special drying methods. Freeze drying and Freeze dryer.
4. Mathematical problems on drying.

- Recent Advancement in drying technology.

UNIT-V:

a) AUTOMATED PROCESS CONTROL SYSTEM (APCS):

- Process variables, temperature and pressure control, flow level etc. and their measurement.
- Elements of APCS and Computer aided manufacturing (CAM).

b) INDUSTRIAL / INTRODUCTION TO PHARMACEUTICAL ENVIRONMENT-

- Pollution control, hazards like mechanical, chemicals, electrical fire and dust hazards in Pharmaceutical industries.
- Industrial dermatitis and safety measure.

LIST OF PRACTICALS RECOMMENDED:

- To study and determine the effect of surface area on rate of evaporation. Also plot a graph between rate of evaporation and surface area.
- To study and determine the effect of temperature on rate of evaporation. Also plot a graph between rate of evaporation and temperature.
- To study and determine the effect of consistency on rate of evaporation.
- To study and determine the surface area on rate of drying. Also plot a graph between rate of drying and surface area.
- To study and determine the temperature on rate of drying. Also plot a graph between rate of drying and temperature.
- To determine the rate of drying and free moisture content and also plot a **FMC** curve.
- To determine the rate of drying and equilibrium moisture content (**EMC**)
- To study and separate volatile oil from a simple mixture containing volatile components using simple distillation technique.
- To study and perform the steam distillation technique.
- To study and perform extractive distillation technique.
- To study and determine overall heat transfer coefficient of various colour bodies.

TEXT BOOKS

S. No.	BOOK'S NAME (Latest Edition)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Pharmaceutical Engineering	Sambhamurthy	New Age Int. Pvt. Ltd
2.	Pharmaceutical Engineering	C.V.S. Subrahmanyam	Vallabh prakashan, New Delhi
3.	Unit Operation-I	Gavhane, K.A.	Nirali Prakashan

REFERENCE BOOKS

S. No.	BOOK'S NAME (Latest Edition)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Introduction to Chemical Engineering	Badger W.L. and Banchemo J.T.	Mc Graw Hill, International Book Co., London.
2.	Unit Operations of Chemical Engineering	McCabe & Smith	Mc Graw Hill International Book Co., London.
3.	Unit Operation of Chemical Engineering	McCabe W.L. and Smith J.C.	Mc Graw Hill, International Book Co., London.

B. Pharm.

IV Semester

PATHOPHYSIOLOGY & TOXICOLOGY

COURSE OBJECTIVE: The course describes the basic understanding of change from normal physiological functioning of the various systems of the human body. The course is based on illness and disease within a systems framework across the lifespan.

General Pathophysiology:

UNIT I

- (a) Cell injury: Cellular response, Genetic and acquired etiology of cell injury. Morphology of cell injury & cellular adaptation.
- (b) Pathogenesis of reversible and irreversible cell injury due to various causing factors.

UNIT II

- (a) Inflammation: Pathogenesis of acute & chronic inflammation. Chemical mediators in inflammation.
- (b) Hypersensitivity: hypersensitivity types I, II, III, IV and biological significance of hypersensitivity. Allergy due to food, chemicals and drugs.

Systemic Pathophysiology:

UNIT III

- (a) Disorder of blood cell: Anaemia and malaria etc.
- (b) Disorder of blood vessel and heart: Hypertension and Arrhythmia etc.
- (c) Disorder of Skin diseases.
- (d) CANCER & AIDS

UNIT IV

- (a) Disorder of respiratory tract: Bronchial Asthma, Cough.
- (b) Disorder of digestive tract: Dyspepsia, Peptic ulcer, Jaundice.
- (c) Disorder of nervous system: Epilepsy, Migraine, Depression.

UNIT V Toxicology

- (a) Toxicity, Mechanism of toxicity.
- (b) Teratogenicity.
- (c) Toxicity of heavy metals and their antidotes.

PRACTICALS

To Prepare and submit survey report of prevalence of a disease in particular area.

TEXT BOOKS (Latest Edition)			
S.No	Name of the book	Author	Publisher
01	Ross and Wilson Anatomy and Physiology in Health and Illness	A. Waugh and A. Grant	Churchill Living Stone, Edinburgh,
02	Textbook of pathology	Harsh Mohan	Jaypee brothers medical publishers,
03	Human Physiology” (Vol. I & Vol. II)	C.C. Chatterjee	Medical Allied Agency, Calcutta,

REFERENCE BOOKS (Latest Edition)			
S.No	Name of the book	Author	Publisher
01	Text book of Medical Physiology	A. C. Guyton and J.E.	W.B. Saunders

		Hall,	company,
02	Principles of Anatomy and Physiology	G. J. Toratora,	John-Wiley & sons New York,
03	Text Book of Human Histology with Colour Atlas	Inderbir Singh,	Jaypee Brothers, New Delhi,
04	Pathophysiology in medical science	H.E.A. Mentz,	
05	Pathophysiology-principles of disease	Martha J. Miller,	
06	Textbook of practical physiology	Ranade VG,	Pune vidyarthi griha prakashan pune,
07	Atlas of normal histology	Difore S.H.,	Lea and febiger Philadelphia,
08	Atlas of normal histology	Difore S.H.,	Lea and febiger Philadelphia,
09	Pharmacotherapy, Principle and Practice	J.P. Dipiro.,	Tata Mc graw hill publishing company limited,New york
10	Medical laboratory technology	Kanai Mukherjee	Tata Mc graw hill publishing company limited,

B. Pharm.

IV Semester

PHARMACEUTICAL ANALYSIS – I

Course Objective: The subject of Pharmaceutical Analysis-I will be treated in its modern prospective including Introduction, Significance, Various Basic Analytical Techniques and also cover the computation of analytical results, keeping for the sake of convenience.

UNIT-I: INTRODUCTION

1. Significance of quantitative analysis in quality control. Concept of errors and their types. Preliminaries and definitions of precision, accuracy, significant figures, standard deviation.
2. Fundamentals of volumetric and gravimetric analysis. Methods of expressing concentration (primary and secondary standards), calibration of analytical equipments and concept of titration

UNIT-II: ACID BASE TITRATION

1. Acid - Base concept, role of solvent, Relative strength of acid and base, Concept of ionization, Law of Mass Action, Common Ion Effect and Ionic product of water.
2. Concept of pH and hydrolysis of salt, Handerson - Hasselbach equation. Buffer solution, Neutralization curve. Acid base indicator (Theory, type and Choice).
3. Application in the assay of Phosphoric acid, Sodium hydroxide, Calcium carbonate, Sodium carbonate, boric acid etc.

UNIT-III: REDOX TITRATION

1. Concept of Oxidation and Reduction, Redox reaction, Strength, Equivalent weight of oxidizing and reducing agents. Theory of redox titration, redox indicators.
2. Iodimetry and Iodometry. Mesurment of electrode potential, Oxidation Reduction curve
3. Application in assay of Ferrous sulphate, Potassium iodide, Potassium permanganate, and Copper sulphate etc.

UNIT-IV: PRECIPITATION TITRATION

1. Principles of precipitation titration, Effect of acid, temperature and solvent upon the solubility of the precipitatae.
2. Argentometric titration including GayLussac methods, Mohr's methods, Volhard's methods and Fajan's methods.
3. Concept of adsorption indicators and titration involving Ammonium or Potassium thiocyanate, Mercuric nitrate, Barium sulphate etc.

UNIT-V: GRAVIMETRIC ANALYSIS

1. Principles of gravimetric analysis and typical methods involving precipitation, coagulation, incineration and digestion procedures. Concept of Super-saturation, Co-precipitation, Post-precipitation, filtration.
2. Application of gravimetric estimation of Barium as Barium sulphate, Aluminium as Aluminum oxide, Calcium as Calcium oxalate and other organic precipitance.
3. Recent advances in Titrimetric analysis (Volumetric & Gravimetric).

List of Practicals

1. Standardization of analytical weights and calibration of volumetric apparatus.
2. Preparation and standardization of Boric acid. (Acid & Base Titration)
3. Preparation and standardization of Ascorbic acid. (Acid & Base Titration)
4. Preparation and standardization of Hydrochloric acid. (Acid & Base Titration)

5. Preparation and standardization of Sodium hydroxide (0.1 N). (Acid & Base Titration)
6. Preparation and standardization of Potassium permanganate. (Redox Titration)
7. Perform the assay of Copper sulphate. (Redox Titration)
8. Perform the assay of Ferrous sulphate. (Redox Titration)
9. Perform the assay of Sodium thiosulphate. (Redox Titration).
10. Preparation and standardization of Iodine solution. (Redox Titration)
11. Preparation and standardization of Potassium thiocyanate. (Precipitation Titration)
12. Preparation and standardization of Ammonium thiocyanate. (Precipitation Titration)
13. Preparation and standardization of Silver nitrate. (Precipitation Titration)
14. Preparation and standardization of Barium sulphate. (Precipitation Titration)
15. Preparation of Gooch crucible for filtration and use of Sintered glass crucible. (Gravimetric Analysis)
16. Determination of water of hydration. (Gravimetric Analysis)
17. Standardization of Calcium as Calcium oxalate. (Gravimetric Analysis)
18. Standardization of Aluminium as Aluminium oxide. (Gravimetric Analysis)
19. Perform the assay of Sodium bicarbonate. (Neutralization Reaction)
20. Perform the assay of Potassium bicarbonate. (Neutralization Reaction)

S. No.	BOOK'S NAME (Latest Edition)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Practical Pharmaceutical Chemistry", Part- I & II, 4 th Ed., (1 st Indian Re-Print)	Beckett & Stenlake	CBS Publishers & Distributors
2.	Analytical Chemistry, Theory & Practice, 3 rd Ed.	Verma R.M.	CBS Publishers & Distributors, New Delhi
3.	Pharmaceutical Drug Analysis	Ashutosh Khar	New Age International Publishers

REFERENCE BOOKS

S. No.	BOOK'S NAME (Latest Edition)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	A Text Book of Quantitative Inorganic Analysis (Including Elementary Instrumental Analysis) 3 rd Ed.	Vogel's	ELBS-Longman
2.	Vogel's Text Book of Quantitative Chemical Analysis	Mendham J., Denny R.C., Barnes J.D., Thomas M., Jeffery G.H.	Pearson Education Asia
3.	Quantitative Chemical Analysis, 2 nd Ed	Ayers	(Harper International Ed.), Harper and Row,
4.	Analytical Chemistry, 4 th Ed	Gary D.C.	John Wiley & Sons, New York
5.	Quantitative Analysis	Alexeyev V	CBS Publishers & Distributors
6.	A Text Book of Pharmaceutical Analysis	Cornners K.A.	Wiley Inter-Science

B. Pharm.

IV Semester

DISPENSING AND COMMUNITY PHARMACY

COURSE OBJECTIVE: The course describes the basic clinical and scientific knowledge obtained from their previous didactic coursework in the care of patients in actual institutional practice settings.

UNIT I

- a. Prescription: Definition, parts, handling, sources of errors in prescriptions knowledge of latin terms commonly used in prescription writing and their translation into English. Modern concepts of dispensing pharmacy.
- b. Posology: Calculation of doses and a general know-how of the doses.

UNIT II

- a. Introduction to clinical pharmacy practice: Definition and scope, common daily terminology used in the practice of medicine, functioning and working of clinical pharmacy unit, manpower requirements.
- b. Compounding & Dispensing of medication: Definition of dispensing & compounding. Good dispensing & compounding practices, fundamental operations in compounding. Containers & closures for dispensed products, labeling & storage of compounded products. Dispensing of prefabricated dosage forms, patient counseling, and documentation of compounding & dispensing records.

UNIT III

- a. Incompatibilities: definition, Physical, chemical and therapeutic incompatibilities. Reasons and correction of incompatibilities, role of pharmacist in overcoming such incompatibilities in prescription.
- b. Handling of Incompatibilities: Incompatibility of alkaloidal salts, barbiturates, salicylates, iodides salts, gas production (chemical types), etc.

UNIT-IV

- a. Pharmaceutical care: Definition and principles of pharmaceutical care. Emergency treatment in shock, snake-bite, burns, poisoning, heart diseases, fractures, resuscitation methods.
- b. Surgical supplies: An account of surgical dressing like primary wound dressing, absorbents, bandage, adhesive tapes, protective, Method of preparation of Ligatures and suture materials.

UNIT-V Pharmacy and Health Education

- a. Compliance to treatment and role of pharmacist: Impact of diseases on drug action.
- b. Dispensing of proprietary medicines. Future trends in dispensing.
- c. Concepts of health and diseases, disease agents and prevention of diseases.

- d. Food requirements, balanced diet, nutritional deficiency disorders, their treatment and prevention.
- e. Demography and family planning: Demography cycle. Various contraceptive methods. Medical termination of pregnancy.
- f. First Aid Emergency treatment of shock, snake bites, burns, poisoning, and fractures.

PRACTICALS:

1. To know your Pharmacy practice lab.
2. Dispensing of prescriptions falling under the categories: Mixtures, solutions, emulsions. creams, ointments, powders, suppositories, ophthalmic, capsules, pastes, jellies, pastille, lozenges, pills, tablet triturates, lotions, liniments, inhalations, paints, etc.
3. Identification of various types of incompatibilities in prescription, correction thereof and dispensing of such prescriptions.
4. Dispensing procedures involving pharmaceuticals calculations, pricing of prescriptions and dosage calculations for pediatric and geriatric patients.
5. Dispensing of prescriptions involving adjustment of tonicity.
6. Categorization and storage of pharmaceutical products based on legal requirements of labeling and storage.
7. Prescription reading (Minimum of three Prescriptions).
8. Study of some marketed preparations (Minimum of three).

Project report

Project report on visit to the nearby Community for counseling on the rational use of drugs and aspects of health care.

Books Recommended

TEXT BOOKS			
S.No	Name of the book	Author	Publisher
01	N.K. Jain and S.N. Sharma	Concise Pharmaceutical Dispensing.	Vallabh Prakashan, Delhi.
02	N.K. Jain	Health Education and Community Pharmacy.	CBS Publishers,
03	P.C. Dandiya, R.K. Khar and N. Gumbani	Hospital Pharmacy.	CBS Publisher.

REFERENCE BOOKS(Latest Edition)			
S.No	Name of the book	Author	Publisher

01	Pharmaceutical Dosage Forms and Drug Delivery Systems	H. C. Ansel,	Lippincott Williams and Wilkins, New Delhi,
02	Remington The Science and Practice of Pharmacy, Vol: I and II	Alfonso R. Gennaro,	Lippincott Williams
03	Cooper and Gunn's Dispensing for Pharmaceutical Students,	Carter S.J,	CBS Publishers, New Delhi,
04	Cooper and Gunn's Tutorial pharmacy	Carter S.J,	CBS Publishers , New Delhi,
05	Pharmaceutics The Science of Dosage Form Design	M.E.Aulton	Churchill Livingstone, Edinburgh,
06	Bentley's textbook of Pharmaceutics	E.A.Rawlins	English language book Society
07	Pharmaceutical Calculations	Herfindal,	B I Waverley Pvt. Ltd., New Delhi,
08	Clinical Pharmacy & Therapeutics.	Alfonso R. Gennaro,	Lippincott Williams
09	Indian Pharmacopoeia 2007,	Govt. of India	Published by The Controller of Publications, Delhi.
10	Pratibha Nand and R.K. Khar	Hospital & Clinical Pharmacy.	

B. Pharm.
IV Semester
PHARMACEUTICAL BIOCHEMISTRY

Course Objective: The subject of Pharmaceutical Chemistry (Biochemistry) gives knowledge of various method required for determination of diseases involves test of organs, blood, urine.

UNIT-I: BIOCHEMISTRY- introduction and scope of biochemistry, Importance of Biochemistry in Medical and Pharmaceutical Science.
Biochemical organization of cell, Production of Cell energy.

UNIT-II: ENZYMES

Definition, nomenclature, mechanism of action, Enzyme Kinetics, factor Affecting enzyme activity, enzyme inhibition, Michael's Menton equation, Importance of Enzymes in Diagnosis.

Co-enzymes- Vitamins as co enzyme and their importance, metals as co enzyme.

Vitamins- Classification and properties of vitamins, Daily requirement, Role of Vitamins as coenzyme and Body Growth and its significance.

UNIT-III: CARBOHYDRATES

Classification of carbohydrates Glycolysis, Citric acid cycle Glycogenesis, Glycogenolysis, HMP shunt, Role of sugar nucleotide in Biosynthesis and pentosephosphate pathway, Blood Sugar and its regulation.

Lipids- Classification of lipids, oxidation of fatty acids (Alpha and Beta), Essential fatty acids Eicosanoids , Biosynthesis of Ketone Bodies, Fatty Acids, Lipoproteins.

UNIT-IV: AMINO ACIDS

Classification of amino acids properties Metabolism of amino acids role of amino acids and proteins.

Nucleic acids- genetic organization of the mammalian genome, Biosynthesis of RNA DNA , Mutation, DNA Replication and their repair mechanism, genetic code.

UNIT-V: HORMONES

Classification of Hormones, mechanism of action (Adrenaline, nor Adrenaline, progesterone, Aldosterone, Testosterone, Insulin) deficiency of Hormones, its nature and various types of functions of hormones.

Nutrition- Daily nutritional Requirement, Test for Liver and kidney, Importance of Carbohydrates, proteins, vitamins, fats.

Deficiency of liver, kidney (Stone formation, Jaundice, Collectomy).

Recent trends in Biochemistry

Types and uses of Biochemistry analyzer CBC (complete blood checkup) various brands of Biochem analyzer in market.

Various types of Reagent Kit available in the Market.

General Study of Blood testing card like malaria, TB (tuberculosis), dengue, HIV, Hemoglobin, Typhoid, Sugar etc.

List of Practicals

1. Identification of carbohydrates.
2. Identification of amino acids.
3. Estimation of uric acid in urine.
4. Estimation of glucose in urine.
5. Estimation of creatinine in urine.
6. Estimation of glucose in blood.
7. Estimation of urea in blood.
8. Estimation of creatinine in blood.
9. Fat determination in milk
10. Identification of Blood Glucose.
11. Determination of Blood cholesterol.
12. Determination of SGOT SGPT
13. Estimation of Alkaline Phosphate in serum

TEXT BOOKS

S. No.	BOOK'S NAME (Latest Edition)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Review of Biochemistry	Harpers	Lange medical publication
2.	Element of Biochemistry .	OP Agrawal	Goel publishing House Meerut
3.	Principle of Biochemistry	A.L. Lehinger	CBS Publisher and distributor

REFERENCE BOOKS

S. No.	BOOK'S NAME (Latest Edition)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Text Book of Biochemistry	West and Todd	ELBS-Longman
2.	British Pharmacopeia	HerMajestys stationary office	Universitypress Cambridge
3.	The pharmacopoeia of India	Ayers	(Harper International Ed.), Harper and Raw,
4.	Text book of Biochemistry	Harrow B & Mazur A	WB Saunders Co. Philadephia
5.	Outline of Biochemistry	Conn EE Stumph P K	John Willery and Sons New York
6.	Text Book of Biochemistry	Raman Rao	
7.	Fundamental of biochemistry	AC Deb	New central Book Agency

- Chloral hydrate oral solution B.P.

ii) Suspensions:

- Magnesium sulphate oral suspension B.P.

- Milk of magnesia I.P.

- Aluminum hydroxide gel

iii) Emulsions:

- Liquid paraffin oral emulsion B. P.

2. Preparation, evaluation and packaging of ointments like-

-Salicylic acid ointment B.P.

- Compound benzoic acid ointment B.P.

3. Preparation, evaluation and packaging of cosmetic preparation of followings:

Cold cream, vanishing cream, cleansing cream, all purpose cream, protective cream, foundation lotion, sunscreen preparation, cream shampoo, clear liquid shampoo, shaving cream, after shave lotion, face powder, face pack, body powder, mouth washes, hair conditioner etc. (at least 10 exp in 5 labs).

RECOMMENDED BOOKS

S. No.	BOOK'S NAME (LATEST EDITION)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Pharmaceutical Sciences, Vol. I & Vol. – II	Remington	Mack Publishing Co., U.S.A.
2.	Theory and Practice of Industrial Pharmacy	Lachman L., Lieberman H.A, Kanig J.L,	Lea & Febiger, Philadelphia, U.S.A.
3.	Introduction to Pharmaceutical Dosage Forms	H.C. Ansel	Lea & Febiger, Philadelphia, U.S.A.
4.	A handbook of cosmetics	Mittal B.M. & Saha R.N.	Vallabh Prakashan.

REFERENCE BOOKS

S. No.	BOOK'S NAME (LATEST EDITION)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Tutorial Pharmacy	J.W. Cooper, & G. Gunn	Petman Books Ltd., London.
2.	Drug Delivery Systems	R.L. Juliano	Oxford University Press, Oxford
3.	Cosmetics: Science and Technology	Balsam and Sagarin	Wiley-Interscience, Canada
4.	Modern Cosmetics	Thomssen E.G.	Universal Publishing Corporation

B. Pharm.
V Semester
MEDICINAL CHEMISTRY - I

THEORY

Course Objective: The subject of Medicinal Chemistry-I will be treated in its modern prospective including Introduction, Synthesis, Classification, Mode of Action and Structure Activity Relationship of Medicinal Agents, keeping for the sake of convenience.

UNIT: I **(06 HOURS)**

BASIC PRINCIPLE OF MEDICINAL CHEMISTRY

- a) Physicochemical Aspect (Optical, Geometric & Bioisosterism of drug molecules & biological action).
- b) Receptor Theory (Type of receptors, Drug-Receptor Interaction including transduction mechanism).

Introduction, Structures, Synthesis, Classification, Mode of Action and Structure Activity Relationship of Medicinal Agents.

UNIT: II **(08 HOURS)**

Drugs Acting at Synaptic & Neuro Effector Junction Sites

a). Cholinergic, Anti-cholinergic, Anti-cholinesterases:

Drugs affecting cholinergic neurotransmission: Neurochemistry and stereochemistry of acetylcholine, acetylcholine mimetics-muscarinic agonists, acetylcholinesterase inhibitors, acetylcholine antagonists-muscarinic antagonists.

b) Adrenergic & Anti-adrenergic Drugs:

Drugs affecting adrenergic neurotransmission: Neurochemistry and stereochemistry of norepinephrine, sympathomimetic agents, sympatholytic agents, drugs affecting catecholamine biosynthesis, drugs affecting catecholamine storage and release, ergot alkaloids, xanthine bronchodilators

UNIT: III **(06 HOURS)**

a) Drugs Used in the Treatment of Neuro-degenerative Disorder: Anti-alzheimer's agents, Anti-parkinsons agents.

b) Neuromuscular Blockers/Ganglion Blocking Agents

UNIT: IV **(10 HOURS)**

AUTOCOIDS

a) Anti-histaminics: H₁, H₂ & H₃ Receptor Antagonist:

b). Prostaglandins

c) Eicosanoids

UNIT: V **(08 HOURS)**

a) Diagnostic agents.

b) Pharmaceutical Aids.

LIST OF PRACTICALS

1. Synthesis of drug having Cholinergic, Anti-Cholinergic & Anti-Cholinesterase activity. (At least 3)
2. Synthesis of drug acting as diagnostic agent.
3. Synthesis of drugs having Anti-histaminic activity. (At least 3)
4. Synthesis of drugs used in the treatment of neuro degenerative disorders. (At least 2)
5. Synthesis of drug having neuromuscular blocking activity.
6. Determination of melting point and boiling point of synthesized drugs.
7. Separation and identification of organic mixtures containing not more than two compounds. (At least 5)

BOOKS RECOMMENDED

S. No.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	A Text Book of Medicinal Chemistry (Synthetic & Biochemical Approach)	S. N. Pandey	S.G. Publishers, Varanasi
2.	Medicinal & Pharmaceutical Chemistry	Harkishan Singh & V. K. Kapoor	Vallabh Prakashan, New delhi
3.	Medicinal Chemistry	Ashutosh Khar	Wiley Estern, Limited Publishers, New Delhi
4.	Drug Design Series	E.J. Arins	Academic Press, New York
5.	Practical Application of Computer Aided Drug Design	Paul Charifron	Marcel Dekker-1997
6.	Practical Pharmaceutical Chemistry	A.A. Siddiqui & Mohd. Ali	CBS Publishers & Distributors Pvt. Ltd.
7.	Practical Organic Chemistry	Mann & Saunder	Orient Longman, UK

REFERENCE BOOKS

S. NO.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Indian Pharmacopoeia 1985, 1996 & 2007	Annonymous	Ministry of Health, New Delhi
2.	Principles of Medicinal Chemistry	W. C. Foye	Lea and Febiger, Philadelphia
3.	A Text Book of Organic, Medicinal and Pharmaceutical Chemistry	Wilson & Giswold	J. Lippincott Co., Philadelphia
4.	Organic Chemistry (Vol. I & II)	I.L. Finar	ELBS London
5.	Vogel's Text Book of Practical Organic Chemistry (5 th Edition)	Furniss <i>et al.</i>	ELBS London
6.	Practical Organic Chemistry (Vol. I, II, III)	Vogel's	The ELBS / Longman, London

B. Pharm.
V Semester

PHARMACOGNOSY - III

(Pharmacognosy & Phytochemistry - II)

COURSE OBJECTIVE The subject of Pharmacognosy-III will be treated in its modern prospective including Introduction, Classification, keeping for the sake of convenience.

UNIT: I

- a) General method of investigation of biosynthetic pathways of primary & secondary metabolites. Introduction to basic metabolic pathways.
- b) Radio – tracer techniques and utilization in biogenetic studies. A brief introduction of chemical nature of phytoconstituents.

UNIT: II

Concepts of stereoisomerisms Nature, distribution, classification, general methods of isolation and properties of:

- a) Alkaloids
- b) Glycosides

UNIT: III

- a) Herbs as health food& cosmeceuticals.
- b) Natural dyes, Immunomodulators and Adaptogens.

UNIT: IV

- a) Biogenesis and pharmaceutical application of the following phytoconstituents Atropine, Morphine, digoxin, Reserpine, Ergometrine.
- b) Role of Medicinal & aromatic plants in National Economy.

Unit-V

- a) Systematic pharmacognostical study of alkaloidal drugs like: Cinchona, Ergot, Ephedra, Ipecac, Kurchi, Rauwolfia and Vasaka Belladonna, Vinca, Coffee, Colchicum, Datura, Duboisia, Hyosyamus, Lobelia, Opium, Nux-vomoca, Pilocarpus, Solanum, Tobacco, Tea and Withania.
- b) Systematic pharmacognostical study of Glycosides drugs like: Aloe, Ammi majus, Digitalis, Liquorice, Senna and Saffron Ammi visnaga, Cascara, Chirata, Dioscoria, Gentian, Ginseng, Squill, Strophanthus and Quassia.

LIST OF PRACTICALS

1. Identify Colchicum, Ginseng and Ipecac leaves morphologically.
2. Identify Aconite, Hyoscyamus and Withania leaves morphologically.
3. Perform morphological, microscopic and chemical evaluation of Vinca.
4. Perform morphological, microscopic and chemical evaluation of Withania.
5. Perform morphological, microscopic and chemical evaluation of Senna leaves.
6. Perform morphological, microscopic and chemical evaluation of Liquorice.
7. Perform morphological, microscopic and chemical evaluation of Nux vomica seeds.
8. Perform morphological, microscopic and chemical evaluation of Ephedra.
9. Perform morphological, microscopic and chemical evaluation of Kurchi bark.
10. Isolate Nicotine from tobacco.
11. Isolate Caffeine from tea leaves.
12. Isolate aloin from Aloe vera.
13. Isolate alkaloids from nux vomica seeds.
14. Isolate starch from potatoes.
15. To identify the given sample of powdered crude drug by various phytochemical tests.
(Cinchona/Rauwolfia/Senna/Ephedra)

BOOKS RECOMMENDED

S. No.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Pharmacognosy	. Trease, G.E. and Evans, W.C	Bailliere Tindall, Eastbourne, U.K
2.	Pharmacognosy	Tayler, V.C., Brady, L.R. and Robers, J.E.	Lea and Febiger, Philadelphia
3.	A text book of Pharmacognosy	Shah, C.S. and Quadry, J.S.,	B.S. Shah Publishers, Ahmedabad.

REFERENCE BOOKS

S. No.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Indian Pharmacopoeia 1985, 1996 & 2007	Anonymous	Ministry of Health, New Delhi
2.	Pharmacognosy,	Kokate, C.K., Purohit, A.P. and Gokhale, S.B.,	Nirali Prakashan, Pune

B. Pharm.
V Semester

HOSPITAL PHARMACY & HEALTH EDUCATION

Course Objective: The aim of the subject is to provide how a pharmacy interfaces with the total hospital operations, the personnel utilized within the pharmacy, the standards of the practice, technology and the distributive function of the pharmacy in the hospital.

UNIT: I

(i) Status of Health Delivery System In India: Definition and role of hospitals in the health delivery system. Type of hospitals, Beneficial available for medical facility in India.

(ii) Hospital Pharmacy: Definition, function and objectives of hospital pharmacy, location, layout and flow chart of material and men, Personnel and facilities required including equipment.

UNIT: II Drug Distribution System in Hospitals

1. Purchasing Procedures.
2. Dispensing of drugs to inpatients.
3. Dispensing of drugs to outpatient.
4. Dispensing of scheduled drugs.
5. Types of distribution of drugs and charging policies in hospital.
6. Central sterile supply unit and their management.

UNIT: III

a) Drug Information Service and Drug Information Bulletin: Sources of Information on drugs, disease treatment schedule, procurement of Information, computer services, Medication error

b) Records: Maintenance of records of issue and use of Narcotics and dangerous drug, ward stock medicines and emergency drug.

UNIT: IV

Medical Store and OTC Counter: Objective, layout facility and procedure for procurement of drug and supplies from medical stores depot. OTC establishment, dispensing, personnel, space, equipment, apparatus and other facility required for safe efficient speedy dispensing of drugs.

UNIT: V

Pharmacy Therapeutic Committee (PTC): Constitution and function of PTC, Hospital formulary system and its organization function and composition.

Surgical Instrument, Hospital Equipment and Health accessories and their uses.

BOOKS RECOMMENDED

S. NO.	BOOK'S NAME	AUTHOR'S NAME
1	Pharmaceutical Science	Remington
2	Hospital and clinical Pharmacy	Pratibha nand and Khar
3.	Pharmacist year book	PC dandiya, RK khar and ghumbani

REFERENCE BOOKS

S. NO.	BOOK'S NAME	AUTHOR'S NAME
1	Hospital Pharmacy	W.E Hassan
2.	GCP ICH guidelines	-----
3.	Hospital Pharmacy	SH Merchant and J S Quadry

B. Pharm.
V Semester
PHARMACOLOGY - I

COURSE OBJECTIVE The course describes the basic understanding of drugs, their science of interaction with the body and the response of body to the drug.

UNIT: I GENERAL PHARMACOLOGY

- a) Introduction To Pharmacology, Sources of Drugs, Dosage Forms And Routes of Administration. Mechanism of Action. Combined Effect of Drugs. Factors Modifying Drug Action. Tolerance and Dependence.
- b) Brief Overview of Discovery and Development of New Drugs. Drug Nomenclature and Sources of Drug Information.

UNIT: II PHARMACOKINETICS & PHARMACODYNAMICS

- a) Absorption, Distribution, Metabolism and Excretion of Drugs.
- b) Mechanism of Drug Action through Cell Membrane, Receptors and Types, Drug Receptor Interactions, Ion Channels, Enzymes and Carrier Proteins.

UNIT: III PHARMACOLOGY OF ANS: Cholinergic System

- a) Parasympathomimetic (Cholinergic) drugs.
- b) Parasympatholytic (anti Cholinergic) drugs.
- c) Drug acting on autonomic ganglia (Stimulants and blocking agents).

UNIT: IV PHARMACOLOGY OF ANS: Adrenergic system

- a) Sympathomimetic (Adrenergic) drugs.
- b) Sympatholytic (Anti-adrenergic) drugs.

UNIT: V AUTOCOIDS

- a) Histamine, Antihistaminics.
- b) Serotonin, agonists and antagonists.
- c) Arachidonic acid metabolites.

LIST OF PRACTICALS

1. To study various Experimental pharmacology based Softwares.
2. Study of instruments used in experimental pharmacology.
3. Enlist various experimental laboratory animals.

4. To perform the preparation of physiological salt solution and storage.
5. To perform the preparation of various drug solution and storage.
6. Study of anesthetics used in animal studies.
7. Study of various route of administration in Mice.
8. To perform the smoking and fixing of kymograph.
9. To study Organ Bath Assembly and assemble it to perform bioassay.
10. To Know about role of CPCSEA and AEC in Experimental Pharmacology

RECOMMENDED BOOKS

S. No.	BOOK'S NAME LATEST EDITION	AUTHOR'S NAME	PUBLISHER'S NAME
1.	The Pharmacological Basis of Therapeutics by Alfred Goodman Gilman	Theodore W.Rall, Alan S.Nies and Palmer Taylor.	R.W. Ruddon and A.G. Gil, Pergamon press.
2.	Essentials of Medical Pharmacology.	K.D.Tripathi	Vallabh Prakashan, Delhi.
3.	Pharmacology and Pharmacotherapeutics.	R.S.Satoskar and S.D.Bhandarkar	
4.	Pharmacology.	H.P.Rang and M.M.Dale	
5	Clinical Pharmacology.	D.R.Laurence and P.N.Bennett	

REFERENCE BOOKS

S. No.	BOOK'S NAME LATEST EDITION	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Fundamentals of Experimental Pharmacology	Ghosh, MN	Scientific Book Agency, Calcutta.
2.	Drug Delivery Systems	R.L. Juliano	Oxford University Press, Oxford
3.	Cosmetics: Science and Technology	Balsam and Sagarin	
4.	Modern Cosmetics	Thomssen E.G.	Universal Publishing Corporation

B. Pharm.
VI Semester

PHARMACEUTICAL TECHNOLOGY- II
(Pharmaceutical Formulation and NDDS)

COUSRE OBJECTIVE: The students can learn about formulation of tablets, capsules, microcapsules, microcapsules, parenterals and novel drug delivery systems. This subject also provides information about equipments and procedures employed in development of formulation strategies.

UNIT: I : TABLETS

a) Oral tablets

Product development: Formulation additives, methods of preparations like wet granulation, dry granulation, direct compression, sponification etc.

Production: Tablet machines, physics of tablet making, processing problems, Compression and consolidation of powdered solids, Heckel plots, force displacement curves (F-D curves), factors influencing the strength of tablets.

b) Other forms of tablets:

Formulation and evaluation of chewable, soluble, effervescent, buccal and sublingual, implants, compression coated tablets, multilayer tablets etc.

c) Evaluation procedure for tablets.

d) Tablet coating: Types of coating, film forming materials, formulation of coating solutions, equipments for coating processes. Evaluation of coating tablets.

UNIT: II : CAPSULES

Definition, advantages and disadvantages of capsule dosage form.

a) Hard gelatin capsules: Formulation of shell and material for production of hard gelatin capsule, size of capsule, capsule production, methods of capsule filling and equipment employed.

b) Soft gelatin capsules: Soft gelatin, capsule shell, capsule content, importance of base absorption and minimum/ gram factors in soft capsule, quality control, stability testing and storage.

c) Microencapsulation:

Types of microcapsules, Importance & application of microencapsulation in pharmacy. Techniques employed like phase separation, coacervation, spray drying, fluidized bed coating, polymerization, complex emulsion etc.

d) Evaluation of microcapsules.

UNIT: III

CONTROLLED DRUG DELIVERY SYSTEMS: Introduction, terminologies, factors in design, fabrication of oral controlled release drug delivery systems. In vitro methods of evaluation of CDDSs. Formulation and evaluation- of ophthalmic, nasal and ear products.

UNIT: IV

a) PARENTERAL PRODUCTS

Preformulation factors, routes of administration, WFI, pyrogenicity, non-aqueous vehicles, Isotonicity and methods of its adjustment. Formulation details, containers and closures and their selection.

Prefilling treatment, washing of containers and closures, preparation of solutions and suspensions, filling and sealing of ampoules, vials and infusions.

b) PRODUCTION FACILITIES AND PROCESS CONTROL

Source of contamination and method of prevention, design of aseptic area, layout, air control, LAF and maintenance. Sterility testing of parenterals.

UNIT: V

a) SURGICAL PRODUCTS:

Definition, primary wound dressing, absorbents, surgical cotton, surgical gauze etc, bandages, adhesive tape, protective cellulosic haemostatics, official dressings, absorbable and non-absorbable sutures, ligatures and catguts.

b) PACKAGING AND PHARMACEUTICAL PRODUCTS

Packaging materials, types, specification and methods of evaluation, stability, aspects of packaging. Packaging equipments, factors influencing choice of containers, legal and other official requirements for containers. Packaging testing.

LIST OF PRACTICALS

A) Tablets:

I. Preparation and evaluation of tablets (Uncoated)

- i) Paracetamol tablets IP
- ii) Diclofenac sodium tablets
- iii) Aspirin tablets
- iv) Effervescent tablets

II. Preparation and evaluation of tablets (Coated)

- i) Ibuprofen tablets IP (film coated)
- ii) Aspirin tablets (enteric coated)
- iii) Diclofenac sodium tablets (dip coated)

B) Capsules:

i) Capsule filling: Chloramphenicol capsules

C) Parenterals:

i) Disodium EDTA injection IP

ii) Dextrose- NaCl IV infusion IP

iii) Water for injection IP

D) Eye drops and ointment

i) Zinc Sulphate IP (eye drop)

ii) Sulphacetamide Sodium IP (eye ointment)

E) Controlled drug delivery systems:

i) Aspirin extended release tablets (matrix type)

ii) Diclofenac sodium SR tablets (coated granules/ matrix type)

RECOMMENDED BOOKS

S. No.	BOOK'S NAME (LATEST EDITION)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	The Theory & Practice of Industrial Pharmacy.	Lachman, L., Lieberman, H.A., and Kanig, J.L.	Lea & Febiger, Philadelphia
2.	Introduction to Pharmaceutical Dosage Forms.	Ansel, H.C.	V.M. Verghese & Co., Mumbai.
3.	Modern Pharmaceutics	Banker, G.S. and Rhode, C.T.	Marcel Dekker

REFERENCE BOOKS

S. No.	BOOK'S NAME (LATEST EDITION)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Drug Delivery Systems	R.L. Juliano	Oxford University Press, Oxford
2.	Tutorial Pharmacy	J.W. Cooper, & G. Gunn	Petman Books Ltd., London.
3.	Modern Cosmetics	Thomssen E.G.	Universal Publishing Corporation
4.	Cosmetics: Science and Technology	Balsam and Sagarin	Wiley-Interscience, Canada

B. Pharm.
VI Semester
MEDICINAL CHEMISTRY-II

Course Objective: The subject of Medicinal Chemistry-II will be treated in its modern prospective including Introduction, Synthesis, Classification, Mode of Action and Structure Activity Relationship of Medicinal Agents, keeping for the sake of convenience.

UNIT: I DRUG DESIGN (A MODERN APPROACH)

- a) Principles of Drug Design, Quantitative Structure Activity Relationship (Hansch Analysis, 3 D QSAR, COMFA), Preliminary Idea of QSPR in Drug Design.
- b) Molecular Modeling and Computer Aided Drug Design. Introduction to Analogue Based Drug Design.

Synthetic Procedure of Selected Drugs Only, Classification, Mode of Action, Therapeutic Use, Structure Activity Relationship of the following class of drug:

UNIT: II DRUGS ACTING ON CENTRAL NERVOUS SYSTEM

- a) **General & Local Anaesthetics:** Thiopental, Methohexital, Lignocaine, Benzocaine.
- b) **Sedative & Hypnotics:** Phenobarbitone, Alprazolam.
- c) **Anti-depressants:** Imipramine, Amitriptyline.
- d) **Anti-anxiety Agent:** Diazepam, Chlordizepoxide.
- e) **Anti- convulsants:** Phenytoin, Carbamazepine, Ethosuximide, Valproic Acid.
- f) **Anti-psychotic Drugs:** Haloperidol.
- g) **CNS Stimulants:** Caffeine, Nikethamide.

UNIT: III

- a) **Diuretics:** Acetazolamide, Chlorthiazide, Furosemide, Ethacrynic Acid, Spironolactone.
- b) **Non-Steroidal Anti-inflammatory Drugs (NSAID), Anti-pyretic Agents and Analgesic Drugs:** Paracetamol, Diclofenac Sodium/Potassium, Ibuprofen, Aspirin, Mefenamic Acid, Indomethacin.
- c) **Anti-Gout Drugs:** Allopurinol.

UNIT: IV DRUGS ACTING ON CARDIOVASCULAR SYSTEM

- a) **Cardiac Glycosides:** Digitoxin, Digoxin.
- b). **Anti-anginal Drugs (Vasodilators & Cardiotonics):** Verapamil, Nifedipine, Amlodipine.
- c) **Anti-arrhythmic Drugs:** Procainamide, Disopyramide.
- d) **Anti-hypertensive Drugs:** Captopril, Enalapril, Minoxidil, Lisinopril, Reserpine.
- e) **Anti-hyperlipidaemic Drugs:** Clofibrate, Niacin, Probucol.
- f) **Anti-coagulant & Anti-thrombolytic Drugs:** Warfarine, Heparine, Protamine.

UNIT: V SYNTHESIS OF AT LEAST TWO DRUGS FROM EACH CATEGORY

- a) **Drugs Acting on Gastro-intestinal System:** Emetics & Anti-emetics, Purgative & Laxatives, Antacids & Drugs Used in the Treatment of Peptic Ulcer.
- b) **Drugs Acting on Respiratory System:** Anti-asthmatics & Expectorants, Anti-tussives & Bronchodilators.

LIST OF PRACTICALS

1. To synthesize the drugs acting on central nervous system. (At least 5)
2. To synthesize the drugs acting on cardiovascular system. (At least 5)
3. To synthesize the drugs having diuretic activity. (At least 2)
4. To synthesize the drugs having anti - inflammatory, analgesic and anti - pyretic activity. (At least 2)
5. To synthesize the drugs acting on gastrointestinal system. (At least 3)
6. To synthesize the drugs acting on respiratory system. (At least 3)
7. To determine melting point and boiling point of the synthesized drugs.
8. To establish the Pharmacopoeial standards for the synthesized drugs.

BOOKS RECOMMENDED

S. No.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	A Text Book of Medicinal Chemistry (Synthetic & Biochemical Approach)	S. N. Pandey	S.G. Publishers, Varanasi
2.	Medicinal & Pharmaceutical Chemistry	Harkishan Singh & V. K. Kapoor	Vallabh Prakashan, New delhi
3.	Medicinal Chemistry	Ashutosh Khar	Wiley Estern, Limited Publishers, New Delhi
4.	Drug Design Series	E.J. Arins	Academic Press, New York
5.	Practical Application of Computer Aided Drug Design	Paul Charifron	Marcel Dekker-1997
4.	Practical Pharmaceutical Chemistry	A.A. Siddiqui & Mohd. Ali	CBS Publishers & Distributors Pvt. Ltd.
5.	Practical Organic Chemistry	Mann & Saunder	Orient Longman, UK

REFERENCE BOOKS

S. NO.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Indian Pharmacopoeia 1985, 1996 & 2007	Anonymous	Ministry of Health, New Delhi
2.	Principles of Medicinal Chemistry	W. C. Foye	Lea and Febiger, Philadelphia
3.	A Text Book of Organic, Medicinal and Pharmaceutical Chemistry	Wilson & Giswold	J. Lippincott Co., Philadelphia
4.	Organic Chemistry (Vol. I & II)	I.L. Finar	ELBS London
5.	Vogel's Text Book of Practical Organic Chemistry (5 th Edition)	Furniss <i>et al.</i>	ELBS London
6.	Practical Organic Chemistry (Vol. I, II, III)	Vogel's	The ELBS / Longman, London

B. Pharm.
VI Semester

PHARMACY LAW & ETHICS

Objective- The law defines a set of responsibilities for pharmacists and for others who are formally involved with medication use. The law also provides a mechanism through which adverse outcomes are reviewed by affording responsible persons.

UNIT: 1

- a) **Legislation of India:** Drug Legislation of India Legislation for import, export, Manufacture Distribution sale of Drugs and Cosmetics.
- b) Pharmaceutical Education (Related to Pharma journals and Articles)

UNIT- 2

- A) **Drug and Cosmetic Act and rules 1945:** General Study of drug and cosmetic act and rules, Retail and wholesale distribution of drugs, Drug inspectors its powers duties, Sampling, procedures, procedure for obtaining license under this act. All schedules, labeling and storage condition of drugs.
- b) Medicinal and Toilet Preparation Act.
- c) Poisons Act 1919.
- d) Patents Acts 1970.

UNIT: 3

- a) Narcotics Drugs and Psychotropic Substance (Acts and rules).
- b) Prevention of Cruelty to Animal Act 1961.
- c) State shop and establishment Act and rules.
- d) AICTE Act.

UNIT: 4

- a) Weighing and Measure Act.
- b) Packaging and commodity Act.
- c) US Food and fedrel D and C Act.
- d) Medical termination of pregnancy 1970 act and rules.

UNIT: 5

- a) Factory Act.
- b) Minimum Wages Act.
- c) Insecticides Act.
- d) Consumer protection Act 1948 its amendments.
- e) A Brief review of Drugs and Pharmaceutical industry.

BOOKS RECOMMENDED

S. NO.	BOOK'S NAME	AUTHOR'S NAME
1.	Pharmaceutical Jurisprudence	N.K jain
2.	Pharmaceutical Jurisprudence	S.P.Aggarwal and R.Khanna
3.	A Rext Book of Forensic Pharmacy	Mittal national book depot

4.	Drug and Cosmetics Act rules	Despande,S.W
5	Drug and Pharmacy Laws in India	Sadhna Mandir

REFERENCE BOOKS

S. NO.	BOOK'S NAME	AUTHOR'S NAME
1.	The Bare Acts and rules	Government of India
2.	Drug and Cosmetics Act and Rules with drug order	Mallick eastern book company1998
3.	The Laws of drugs	Beotra

B. Pharm.
VI Semester

PHARMACEUTICAL ANALYSIS – II

Course Objective: The course describes the basic understanding of the principle of Instrumentation and techniques involved in drugs analysis and evaluation.

UNIT: I

A. Non-Aqueous Titrations: General discussion and principle of titrations in non aqueous media, aprotic, protophilic, protogenic and amphiprotic solvents. Titrations with perchloric acid, potassium methoxide and tetrabutyl ammonium hydroxide.

B. Complexometric Titration: Principles of complexometric titrations, chelating agent, indicators, titrations with disodium edentate.

UNIT: II

A. Potentiometric Titrations: Introduction, Electrochemical cells, Nernst equation, half-cells, electrodes, measurement of potential, applications and advantages.

B. Conductometric Titrations: Basic concepts, different types of Conductometric titrations, apparatus used, applications and advantages.

UNIT: III

A. Polarography And Amperometry: Basic concept, theoretical considerations, Basic instrumentation, apparatus, principles, general polarography analysis and applications in pharmaceutical analysis. Amperometric titrations with one polarized electrode, general Procedure, titration curves and applications.

B. Miscellaneous Methods Of Analysis: Diazotization titrations, Kjeldahl method of Nitrogen estimation, Karl- Fischer titration.

UNIT: IV

A. Turbidometry: Theory, instrumentation and applications.

B. Fluorimetry: Theory, instrumentation and applications.

UNIT: V

A. Colorimetric Method: Theory, instrumentation and applications.

B. Principle, Instrumentation And Pharmaceutical Applications: Paper, TLC & Column Chromatography.

LIST OF PRACTICALS

- 1) Preparation and Standardization of 0.1 N Perchloric acid.
- 2) Preparation and Standardization of 0.1 N Sodium Methoxide Solution.
- 3) Preparation and Standardization of 0.05N Disodium EDTA Solution.
- 4) Separation of a mixture of Amino acid by thin layer Chromatography Technique
- 5) Determination of the percentage of purity of Aniline by non aqueous method
- 6) Separation of Amino acid by Ascending paper Chromatography
- 7) Separation of Amino acid by Radial paper Chromatography
- 8) Exercises based on Column chromatography (demonstration only).
- 9) Fluorimetric estimation of quinine.
- 10) Assay of riboflavin - Colorimetric method
- 11) Assay of rifampicin - Colorimetric method.
- 12) Titrations using potentiometric technique.
- 13) Exercises involving conductometric titrations.
- 14) Exercises based on Turbidimetry
- 15) Exercise involving Kjeldahl

RECOMMENDED BOOKS

S.no.	Book Name	Author's Name	Publisher's Name
1.	Practical Pharmaceutical Chemistry	Beckett, A H and Stenlake, J.B	The Athlone Press of the University of London
2.	Textbook of Chemical Analysis	Joffery Vogel's	ELBS -Longman
3.	Gurdeep Chatwal	Instrumental methods of analysis	-

REFERENCE BOOKS

S.no.	Book Name	Author's Name	Publisher's Name
1.	Pharmacopoeia of India	-	Ministry of Health, Govt of India.
2.	Instrumental methods of analysis	Willard H.H. and Merrit L. Jr and Dean J.A	Van Nostrand Renhold, New York

B. Pharm.
VI Semester
Pharmacology II

COURSE OBJECTIVE: The course describes the basic understanding of drugs acting on various systems and the mechanism involved.

UNIT I Drugs Acting on Central Nervous System:

- a. General anesthetics
- b. Local anesthetics.
- c. Alcohols and Disulfiram.
- d. Sedatives and Hypnotics.
- e. Antidepressants
- f. Anti-epileptic drugs.
- g. Anti-Parkinsonian drugs.
- h. Non-steroidal analgesics, anti-inflammatory and anti-pyretic agents, drugs used in gout.
- i. Drug addiction and drug abuse.

UNIT II Drugs Acting on Cardiovascular System

- a. Cardiac glycosides.
- b. Antiarrhythmic drugs.
- c. Antihypertensive drugs.
- d. Coronary vasodilators and drugs used in angina.
- e. Hypolipidemic drugs.

UNIT III Drugs Acting on Gastrointestinal System

- a. Purgatives.
- b. Antacids and treatment of peptic ulcers.
- c. Emetics and antiemetics.

UNIT IV Drugs Acting on Respiratory System

- a. Expectorants.
- b. Antitussive bronchodilators.
- c. Drugs used in common cold.

UNIT V Bioassay:

- a. Principles of Bioassay and Biological Standardization.
- b. Bioassay of Drugs and Biological Standardization.

PRACTICALS:

1. To study analgesic effect of morphine in mice using tail flick method.
2. To study analgesic effect of morphine in mice using hot plate method.
3. To study the writhing effect in mice against acetic acid.
4. To study anticonvulsant activity of phenytoin against convulsimeter.
5. To determine the acute toxicity of a given drug (LD₅₀).
6. To demonstrate the effect of drug on blood pressure in anesthetized rat.
7. To study muscle relaxant property of diazepam in mice using rotarod apparatus.
8. To study antianxiety effect of diazepam in mice using elevated plus maze apparatus.

B. Pharm.
VII Semester

BIOPHARMACEUTICS & PHARMACOKINETICS

COURSE OBJECTIVE: This subject create the basis for student pharmacists and helpful in the design of dosage forms. The present syllabus also provides information about pharmacokinetic and pharmacodynamic profile of API and statistical study design for bioavailability and bioequivalence.

UNIT: I

a) BIOPHARMACEUTICS

Introduction to biopharmaceutics, definition, fundamental principles, concepts and its role in formulation development and clinical testing.

b) DRUG ABSORPTION

Mechanism of drug absorption like passive diffusion, active transport facilitated diffusion and pinocytosis. Factors affecting drug absorption-

i) Physicochemical factors

ii) Physiological factors

iii) Pharmaceutical factors etc.

c) DRUG DISTRIBUTION

Distribution of drug in blood and other body tissues. Apparent volume of distribution (V_d), Plasma-protein binding. Applications of drug- protein binding.

UNIT:II

a) PHARMACOKINETICS

Introduction to pharmacokinetics, Importance in bioavailability and clinical practice. Significance of plasma drug concentration measurement.

b) COMPARTMENT MODEL

Definition, types, concepts and their importance in Pharmacokinetics. Pharmacokinetics of drug absorption, zero order and first order absorption rate constant using Wagner-Nelson and Loo-Reigelman method.

UNIT: III

a) ONE COMPARTMENT AND MULTICOMPARTMENT MODELS

Volume of distribution and distribution coefficient. Determination of pharmacokinetic parameters from plasma and urine data after drug administration IV injection and oral administration. Curve fitting method (method of residuals), regression procedure.

b) NON-LINEAR PHARMACOKINETIC: With special reference to one compartment model i.v. drug administration. Michaelis Menton equation.

c) **CLINICAL PHARMACOKINETICS:** Definition, concept and scope. Dosage adjustment in patients with or without renal failure. Pharmacokinetic of drug interactions and their significance in combination therapy.

UNIT: IV

CONCEPT OF CLEARANCE

- a) Mechanism of renal clearance, clearance ratio, determination of renal clearance. Extraction ratio, hepatic clearance, biliary excretion, extra hepatic circulation.
- b) Non-compartment model: Concept, methods of determination of area under curve (AUC) and mean residence time (MRT).

UNIT: V

BIOAVAILABILITY AND BIOEQUIVALENCE: DEFINITION, TERMINOLOGIES AND IMPORTANCE. Measures of bioavailability, C-max, and AUC. Study design for bioavailability study. Review of regulatory requirements for conduction of bioequivalent.

LIST OF PRACTICALS

1. Establishment of standard curve of drug substances.
2. In vitro release study of the paracetamol tablets using various dissolution media.
3. In vitro dissolution study of the given sustained release dosage form.
4. To study the effect of hardness of tablet on dissolution rate.
5. To study the effect formulation on drug release.
6. To study the effect of protein binding of the given drugs.
7. To calculate various pharmacokinetic parameters from the given zero order drug release data.
8. To calculate various Pharmacokinetic parameters from the given first order drug release data.
9. To calculate the various Pharmacokinetic parameters from the given blood data of I.V bolus injection (one compartment model).
10. To study the effect of various diluents on dissolution rate of dosage form.
11. To perform and study dissolution study.
12. To study and prepare pharmaceutical buffers.

RECOMMENDED BOOKS

S. NO.	BOOK'S NAME (LATEST EDITION)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Biopharmaceutics and pharmacokinetics	<i>Brahmankar D. M., Sunil B Jaiswal</i>	Vallabh Prakashan
2.	Biopharmaceutics and Pharmacokinetics	Notari, R.E	An introduction Marcel Dekker Inc. N.Y.
3.	Biopharmaceutics & Clinical Pharmacokinetics	Gibaldi, Milo	Lea & Febiger, Philadelphia
4.	The Science & Practice of Pharmacy	Remington	Mack Publishing Co., Easton, Pennsylvania.

REFERENCE BOOKS

S. NO.	BOOK'S NAME (LATEST EDITION)	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Clinical Pharmacokinetics	Rowland, M. and Tozer, T.N	Lea & Febiger, N.Y.
2.	A Pharmacokinetics	Pecile, A & Rescigno, A.	Plenum Press, N.Y.
3.	Handbook of Basic Pharmacokinetics	Ritschel, W.A.	Drug Intelligence Publications, Hamilton.

**B. Pharm.
VII Semester**

MEDICINAL CHEMISTRY - III

THEORY

Course Objective: The subject of Medicinal Chemistry-III will be treated in its modern prospective including Introduction, Synthesis, Classification, Mode of Action and Structure Activity Relationship of Medicinal Agents, keeping for the sake of convenience.

UNIT: I

(06 HOURS)

a) Drug Metabolism (General Pathway of Drug Metabolism, Factors Affecting Drug Metabolism & Significance of Drug Metabolism in Medicinal Chemistry).

b) Basic Concept of Pro Drug and Applications.

UNIT: II

(08 HOURS)

Vitamins (Structure, Physiological Role, Important Chemical Reactions & Therapeutic Uses)

a) Fat Soluble Vitamins: Vitamin A1 & A2, Vitamin D, Tocopherols (α , β , γ), Vitamin K1, K2, K3 & K4.

b) Water Soluble Vitamins: Vitamin B (B1, B2, B6 & B12), Folic Acid, Ascorbic Acid, Nicotinic Acid & Cyanocobalamine.

UNIT: III

(10 HOURS)

Introduction, Structures, Synthesis, Classification, Mode of Action and Structure Activity Relationship of Medicinal Agents.

a) Steroids & Hormones

i) Androgens & Anabolic Steroids:

ii) Estrogens & Progestogens:

iii) Adrenocorticoids:

iv) Thyroid & Anti-thyroid Drugs:

v) Insulin & Oral Hypoglycemic Agents:

b) Nucleotidomimetics & Peptidomimetics.

UNIT: IV

(12 HOURS)

Introduction, Structures, Synthesis, Classification, Mode of Action and Structure Activity Relationship of Medicinal Agents.

a) Anti-neoplastic Agents

b) Antibiotics:

c) Immunosuppressive & Immunomodulatory Agents.

UNIT: V

(12 HOURS)

Introduction, Structures, Synthesis, Classification, Mode of Action and Structure Activity Relationship of Medicinal Agents.

Anti-infective & Anti-invasive Agents.

a) Anti-amoebic Drugs:

b) Anti-helminthic Drugs:

c) Anti-malarial Drugs:

d) Anti-trypanosomal Drugs:

e) Anti-tubercular Drugs:

f) Anti-fungal Drugs:

g) Anti-viral & Anti-HIV Drugs:

h) Disinfectants:

BOOKS RECOMMENDED

S. No.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	A Text Book of Medicinal Chemistry (Synthetic & Biochemical Approach)	S. N. Pandey	S.G. Publishers, Varanasi
2.	Medicinal & Pharmaceutical Chemistry	Harkishan Singh & V. K. Kapoor	Vallabh Prakashan, New delhi
3.	Medicinal Chemistry	Ashutosh Khar	Wiley Estern, Limited Publishers, New Delhi
4.	Drug Design Series	E.J. Arins	Academic Press, New York
5.	Practical Application of Computer Aided Drug Design	Paul Charifron	Marcel Dekker-1997
4.	Practical Pharmaceutical Chemistry	A.A. Siddiqui & Mohd. Ali	CBS Publishers & Distributors Pvt. Ltd.
5.	Practical Organic Chemistry	Mann & Saunder	Orient Longman, UK

REFERENCE BOOKS

S. NO.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Indian Pharmacopoeia 1985, 1996 & 2007	Anonymous	Ministry of Health, New Delhi
2.	Principles of Medicinal Chemistry	W. C. Foye	Lea and Febiger, Philadelphia
3.	A Text Book of Organic, Medicinal and Pharmaceutical Chemistry	Wilson & Giswold	J. Lippincott Co., Philadelphia
4.	Organic Chemistry (Vol. I & II)	I.L. Finar	ELBS London
5.	Vogel's Text Book of Practical Organic Chemistry (5 th Edition)	Furniss <i>et al.</i>	ELBS London
6.	Practical Organic Chemistry (Vol. I, II, III)	Vogel's	The ELBS / Longman, London

B. Pharm.
VII Semester

PHARMACOGNOSY-IV
(Industrial Pharmacognosy)

Course Objective: The subject of Pharmacognosy-IV will be treated in its modern prospective including Introduction, Classification, keeping for the sake of convenience.

UNIT: I

- a) Introduction, classification & study of different chromatographic methods in pharmacognosy.
- b) Application of chromatographic techniques in evaluation of herbal drugs.

UNIT: II

- a) Historical development of plant tissue culture, type of culture, Nutritional requirement, growth & their maintenance.
- b) Application of plant tissue culture for production of secondary metabolites and Role of plant growth regulators for the production of secondary metabolites.

UNIT: III

- a) **Volatile oils:** General methods of obtaining volatile oils from plants, Study of volatile oils from Mentha, Coriander, Cinnamon, Jatamansi, Cumin, Black pepper, Cassia, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Spearmint, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamom, Valerian, Musk, Palmarosa, Gaultheria.
- b) **Fibres:** General methods of obtaining fibres from plants. Study of fibres used in pharmacy such as Cotton, silk, wool, nylon, glass-wool, polyester and asbestos.

UNIT: IV

- a) Production and analysis of phytoconstituents of pharmaceutical importance like Quinine, Strychnine, Atropine, Morphine Podophyllotoxin, Papain, Vincristine, Ephedrine and Tannic acid.
- b) Spectral analysis of herbal drugs with emphasis on application of UV, IR, NMR, Mass Spectroscopy.

UNIT: V

An introduction of marine pharmacognosy and novel agents from marine sources like Cardiovascular active substances, Cytotoxic, Antimicrobial, Antibiotic, Anti-inflammatory, Antispasmodic Agents, Marine Toxin etc.

LIST OF PRACTICALS

1. To perform chromatography of amino acids.
2. To perform paper chromatography of sugars.
3. To perform TLC of alkaloids.
4. To perform TLC of extract of rauwolfia, datura.
5. To perform TLC of volatile oils i.e. eucalyptus oil, menthe oil.
6. To identify the presence of eugenol in clove oil by TLC.
7. To determine volatile oil content of eucalyptus leaf.
8. To determine volatile oil content of fennel fruits.
9. To isolate ammonium glycyrrhizinate from glycyrrhiza.
10. To extract aloin from aloe.
11. To extract tannic acid from myrobalan.
12. To perform column chromatography a natural dye.

BOOKS RECOMMENDED

S. NO.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Pharmacognosy	Trease, G.E.and Evans, W.C.,	Bailliere, Tindall, Eastbourne,
2.	Pharmacognosy	Taylor, V.E., Brady, L.R. and Robers, J.E.,	Lea and Febiger, Philadelphia
3.	Pharmacognosy	Kokate, C.K., Purohit, A.P. and Gokhale, S.B.,	Nirali Prakashan, Pune -

REFERENCE BOOK

S. NO.	BOOK NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Herbal Pharmacopoeia of India	-	Ministry of Health, Govt of India.
2.	Cultivation & Utilization of Aromatic Plants,	C.R Atal and B.M. Kapoor	Council of Scientific Industrial Research (CSIR) New Delhi.

B. Pharm.
VII Semester

PHARMACEUTICAL ANALYSIS – III

Course Objective: The course describes the basic understanding of the principle of Instrumentation and techniques involved in drugs analysis and evaluation.

UNIT: I

a) QUALITY ASSURANCE: Basics concepts of GLP, ISO 9000, TQM, International Conference of Harmonization (ICH), Regulatory control, regulatory drug analysis, interpretation of analytical data.

b) VALIDATION: Validation of Analytical methods (parameters of validation, pharmacopoeial requirements of analytical methods of validation) and Validation of Analytical Instruments as per Indian Pharmacopoeia.

UNIT: II

Introduction and theoretical concepts, preparation, procedure, instrumentation, method of detection and application of the following chromatographic techniques: Gas Chromatography, High performance liquid chromatography, High Performance Thin Layer Chromatography.

UNIT: III

a) ULTRAVIOLET ABSORPTION SPECTROSCOPY: Theory of electronic spectroscopy, absorption by organic molecules, choice of solvent and solvent effects, modern instrumentation –design and working principle. Applications of UV-Visible spectroscopy (qualitative and quantitative analysis), Woodward – Fischer rules for calculating absorption maximum, Photometric titrations and its applications.

b) Infra Red Spectroscopy: Introduction, basic principles, vibrational frequency and factors influencing vibrational frequency, instrumentation and sampling techniques, applications in Pharmacy. FT-IR-theory and applications

UNIT: IV

a) NMR SPECTROSCOPY: Theoretical aspects, basic instrumentation, elements of interpretation of spectra and application of ^1H NMR & ^{13}C NMR, Chemical Shift, Shielding & Desheilding, Spin - Spin Coupling.

b) FLAME PHOTOMETRY: Theory of emission spectra, equipment, and qualitative and quantitative applications with reference to flame photometry.

UNIT: V

a) MASS SPECTROSCOPY: Theoretical aspects, basic instrumentation, elements of interpretation of spectra and applications in pharmacy.

b) RADIO IMMUNO ASSAY: The theoretical aspects, basic instrumentation, elements of interpretation of spectra, and applications.

LIST OF PRACTICALS

- 1) To perform the quantitative spectrophotometric estimation of drug by (calibration) standard absorptivity method
- 2) To study the effect of various solvent on spectral features of any drug (Paracetamol)
- 3) To perform the quantitative spectrophotometric estimation of drug by calibration curve method
- 4) To perform the simultaneous estimation of Paracetamol & Nimesulide by simultaneous equation method
- 5) To perform the simultaneous quantitative spectrophotometric estimation of the two drugs by dual wavelength method
- 6) To interpret the given IR Spectra
- 7) Estimation of sodium ions using flame photometry
- 8) Estimation of potassium ions using flame photometry
- 9) Estimation of calcium ions using flame photometry
- 10) Determination of λ_{\max} of a drug
- 11) Assay of ibuprofen - UV-spectro photometry
- 12) Assay of paracetamol - UV-spectro photometry

RECOMMENDED BOOKS

S.no.	Book Name	Author's Name	Publisher's Name
1.	Practical Pharmaceutical Chemistry	Beckett, A H and Stenlake, J.B	The Athlone Press of the University of London
2.	Textbook of Chemical Analysis	Joffery Vogel's	ELBS -Longman
3.	Gurdeep Chatwal	Instrumental methods of analysis	-

REFERENCE BOOK

S.no.	Book Name	Author's Name	Publisher's Name
1.	Pharmacopoeia of India	Anonymous	Ministry of Health, Govt of India.
2.	Instrumental methods of analysis	Willard H.H. and Merrit L. Jr and Dean J.A	Van Nostrand Renhold, New York

B. Pharm.
VII Semester

PHARMACOLOGY – III

Course objective: The course describes the basic understanding to inculcate a rational and scientific basis of therapeutics in a pharmaceutical graduate.

UNIT: I DRUGS ACTING ON THE HAEMOPOIETIC SYSTEM

- a) Haematinics.
- b) Anticoagulants, vitamin K and haemostatic agents.
- c) Fibrinolytic and anti-platelet drugs.
- d) Blood plasma volume expanders.

UNIT: II PHARMACOLOGY OF ENDOCRINE SYSTEM

- a) Hypothalamic & pituitary hormones.
- b) Thyroid hormones & Thyroid Drugs.
- c) Parathormone, Calcitonin & Vitamin D.
- d) Insulin & glucagon.

UNIT: III

- a) ACTH & Cortico steroids.
- b) Androgens & anabolic steroids, Estrogens, Progesterone.
- c) Oral Contraceptives.

UNIT: IV

- a) General Principles of Chemotherapy, Sulfonamides, Cotrimoxazole, Quinolones.
- b) Antibiotics –Penicillins, Cephalosporins, Chloramphenicol, Tetracyclines, Macrolides.

UNIT: V

- a) Chemotherapy of Parasitic infections, Tuberculosis, Leprosy, Malaria, Fungal Infections, Viral diseases.
- b) Chemotherapy of Cancer.

RECOMMENDED BOOKS

S. No.	BOOK'S NAME LATEST EDITION	AUTHOR'S NAME	PUBLISHER'S NAME
1.	The Pharmacological Basis of Therapeutics by Alfred Goodman Gilman	Theodore W.Rall, Alan S.Nies and Palmer Taylor.	R.W. Ruddon and A.G. Gil, Pergamon press.
2.	Essentials of Medical Pharmacology.	K.D.Tripathi	Vallabh Prakashan, Delhi.
3.	Pharmacology and Pharmacotherapeutics.	R.S.Satoskar and S.D.Bhandarkar	
4.	Pharmacology.	H.P.Rang and M.M.Dale	
5	Clinical Pharmacology.	D.R.Laurence and P.N.Bennett	

REFERENCE BOOKS

S. No.	BOOK'S NAME LATEST EDITION	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Fundamentals of Experimental Pharmacology	Ghosh, MN	Scientific Book Agency, Calcutta.
2.	Drug Delivery Systems	R.L. Juliano	Oxford University Press, Oxford
3.	Cosmetics: Science and Technology	Balsam and Sagarin	
4.	Modern Cosmetics	Thomssen E.G.	Universal Publishing Corporation

B. Pharm.

VIII Semester

PHARMACEUTICAL BIOTECHNOLOGY

Course Objective: Pharmaceutical Biotechnology is the therapeutic application of Biotechnology that uses biological systems, living organisms, or derivatives thereof, to make or modify the drugs from various sources as well as to help us in the area of disease diagnosis.

UNIT: I IMMUNOLOGY AND IMMUNOLOGICAL PREPARATIONS

- a) Principles, Antigen and haptens, immune system, Cellular, and humoral immunity. immunological tolerance, antigen-antibody reactions and their applications.
- b) Active and passive immunization to human body. Vaccines their preparation and storage.

UNIT: II GENETIC RECOMBINATION

- a) Transformation, conjugation, transduction, protoplast fusion and gene cloning. Monoclonal antibodies & hybridoma technology with their application.
- b) Recombinant DNA technology & application. study of drugs produced by biotechnology such as Activase, Insulin.

UNIT: III ENZYME BIOTECHNOLOGY

- a) Brief introduction to immobilization methods and applications.
- b) Study of enzymes such as amylases, proteases, penicillinase, and streptokinase.

UNIT: IV ANTIBIOTICS

- a) Historical development of antibiotics, Screening of soil for organisms producing antibiotics. Antimicrobial spectrum and methods used for their standardization.
- b) Fermentor, its design and control of different parameters. Fermentation products with special reference to vitamin B12.

UNIT: V

- a) Introduction, types of reactions mediated by microorganisms, design of biotransformation processes, selection of organisms, and applications.
- b) Current developments in immune-technology: Diagnostic kits for: HIV, VDRL and other clinical pathological tests.

LIST OF PRACTICALS

- 1) Estimation of the given protein sample by UV spectrophotometric method.
- 2) Isolation and characterization of DNA from onion.
- 3) Preparation of nutrient media.
- 4) Culture techniques liquid media inoculation.
- 5) Culture techniques solid media inoculation like pour plate, stab culture, swab culture.
- 6) Bacterial enumeration by standard plate count technique(viable count).
- 7) Production of fermentation products like alcohol, amylase, streptomycin.
- 8) Microbiological assay of antibiotics & vitamins by turbidimetric method.
- 9) Isolation of DNA & its purity estimation .
- 10) Experimental devised to prepare various types of culture media.
- 11) Sterilization techniques & their validation.
- 12) Testing the sterility of pharmaceutical products as per I.P. requirements.

RECOMMENDED BOOKS

S.no.	Book Name	Author's Name	Publisher's Name
1.	Textbook of biotechnology	Vyas & Dixit	CBS Publication, New Delhi
2.	Method in biotechnology & Bioengineering	Vyas & Kohli	CBS Publication, New Delhi
3.	Laboratory Manual in Biochemistry	Jayaraman	New Age International Publishers

REFERENCE BOOK

S.no.	Book Name	Author's Name
1.	Microbiology	Pelczar, Reid & Chan
2.	Text Book of Biotechnology	R.C Dubey

B. Pharm.
VIII Semester

Pharmaceutical Management

Objective-This Subjects Deals with various methods for the smooth running of Pharmaceutical Industry.

UNIT- 1

Concept of management- Administrative management (Planning, Organizing Staff, Directing and Controlling) Entrepreneurship development, Operative Management (Personnel, materials, production , financial communication Motivation Decision making , innovative creativity, identification of key points to give maximum thrust for development and perfection.

UNIT-2

Economics - Principles of economics with special reference to the laws of demand and supply demand schedule, labor welfare ,General principle of insurance and inland and foreign trade , procedure of exporting and importing goods.

UNIT-3

Accountancy- Principles of accountancy , ledger posting and book entries, Preparation of trial balance, column of cash book, Bank reconciliation statement, Rectification of errors profit and loss statement Balance sheet , Purchase keeping and pricing of stock.

UNIT-4

Pharmaceutical Marketing – Functions ,buying, selling, transportation, storage, finance, Feedback, ,information, channels of distribution, wholesale, retail department store, multiple shop and mail order business.

Salesmanship- Principles of sales promotion, advertising ethics of sales, merchandising, literature, detailing, Recruitment, Training, evaluation compensation to the pharmacist.

UNIT-5

Production Management- A brief exposure of the different aspects of Production Management-Visible and Invisible inputs, Methodology of Activities, Performance Evaluation Technique, process Flow, maintenance Management.

Market Research- measuring and Forecasting Market demands- Major concept in demand Measurement, Estimating current demand, estimating industrial Sales, market share and future demand.

REFERENCE BOOKS

S. No.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Principles and Methods of pharmacy management	Smith	Febiger
2.	Principles of management	Koontz and O Donnel	Mcgraw Hill
3.	The Practices	H.C. Ansel	Lea & Febiger, Philadelphia, U.S.A.
4.	A handbook of cosmetics	Mittal B.M. & Saha R.N.	Vallabh Prakashan.

REFERENCE BOOKS

S. No.	BOOK'S NAME	AUTHOR'S NAME	PUBLISHER'S NAME
1.	Tutorial Pharmacy	J.W. Cooper, & G. Gunn	Petman Books Ltd., London.
2.	Drug Delivery Systems	R.L. Juliano	Oxford University Press, Oxford
3.	Cosmetics: Science and Technology	Balsam and Sagarin	Wiley-Interscience, Canada
4.	Modern Cosmetics	Thomssen E.G.	Universal Publishing Corporation

B. Pharm.
VIII Semester

CHEMISTRY OF NATURAL PRODUCTS

Course Objective: The subject of CHEMISTRY OF NATURAL PRODUCTS will be treated in its modern prospective including Introduction, Classification, keeping for the sake of convenience.

UNIT: I

- a) General methods of isolation of natural products, belonging to different groups.
- b) Concept of stereoisomerism taking examples of natural products.

UNIT: II

- a) Chemistry, biogenesis and pharmacological activity of medicinally important mono terpenes, sesquiterpenes, diterpenes, and triterpenoids.
- b) Chemistry and biogenesis of medicinally important lignans and quassanoids, flavonoids.

UNIT: III

- a) Chemistry and therapeutic activity of penicillin, streptomycin and tetracyclines
- b) Chemistry of lipids (fats, oils and waxes), phospholipids. Study of the chemistry of lipids (fats, oils and waxes), Phospholipids.

UNIT: IV

- a) Chemical and spectral approaches to simple molecules of natural origin
- b) Chemistry of Nucleic acid- Preliminary studies along with synthesis of purine and pyrimidine bases.

UNIT: V

Vitamins: Source, extraction, structure elucidation, synthesis and medicinal uses of the following

- i. Fat soluble vitamins- A, D, E & K.
- ii. Water soluble vitamins- B1, B2, B6, and C.

Carotenoids: α -carotenoids, β -carotenes, vitamin A, Xanthophylls of medicinal importance.

LIST OF PRACTICALS: Based on theory.

RECOMMENDED BOOK

S. No.	Book Name	Author's Name	Publisher's Name
1.	Organic Chemistry Vol.-I and II,	I.L. Finar	The English Language Book Society, London
2.	Pharmacopoeia of India	Govt. of India	Ministry of Health, Delhi
3.	Heterocyclic Chemistry	R.K.Bansal	Wiley Eastern, New Delhi -

REFERENCE BOOK

S. No.	Book Name	Author's Name	Publisher's Name
1.	Pharmacopoeia of India	-	Ministry of Health, Govt. of India.
2.	Heterocyclic Chemistry	Joul Smith	ELBS, London