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

** The University Authorities reserve all the rights to make any additions / deletions or changes / modifications to this syllabus as deemed necessary.
Faculty of Pharmaceutical Science & Technology
B.Pharm.
III Semester
TEACHING & EXAMINATION SCHEME

<table>
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<tr>
<th>Sr.No.</th>
<th>Subject Code</th>
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<th>Periods</th>
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|        |              |                                                       |       |       |     |       |
| 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

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|        |              |                                                                        | L       | T       | P       |         |
| 1      | 61PY551      | Pharmaceutical Technology-I (Pharmaceutical Formulation & Cosmetology)  | 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 L, 0 T, 12 P, 28 Credits
Faculty of Pharmaceutical Science & Technology

B. Pharm.

VI Semester

TEACHING & EXAMINATION SCHEME

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## Faculty of Pharmaceutical Science & Technology

**B.Pharm.**

**VII Semester**

**TEACHING & EXAMINATION SCHEME**

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

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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.
B. Pharm.
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” 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.

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 Reynolds’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 psychrometric charts.
6. To study the characteristic of crystals, study of crystal habit.
7. To study the solubility of crystals.

Text Books:
4. C.V.S. Subrahmanyam, Pharmaceutical engineering, Vallabh publications, Delhi., India.

Reference Books:
5. Unit operation of chemical engineering .Mcabe Smith, Latest edition,
B. Pharm.
III Semester

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.

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.

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
4. Rose, industrial Microbiology.

Reference Books:-
2. Malcolm Harris, Balliere Tindall & cox; pharmaceutical Microbiology.
B. Pharm.
III Semester
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

UNIT: II

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.


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-Pondorf verley, Reformatsky, Mannich, Michael, Witting, 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

<table>
<thead>
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<th>S. No.</th>
<th>BOOK'S NAME</th>
<th>AUTHOR'S NAME</th>
<th>PUBLISHER'S NAME</th>
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<tr>
<td>2.</td>
<td>Text Book of Organic Chemistry</td>
<td>B.S. Bhal &amp; Arun Bhal</td>
<td>S. Chand Publisher</td>
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<td>4.</td>
<td>Chemistry of carbonyl compounds</td>
<td>Gutschi</td>
<td>Prentice Hall of India, New Delhi</td>
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REFERENCE BOOKS

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<th>S. NO.</th>
<th>BOOK'S NAME</th>
<th>AUTHOR'S NAME</th>
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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, Guttikas, 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:
   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.
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.
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
6. Medicinal Plant Glycosides – Sim, Toranto
B. Pharm.
III Semester

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.

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

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.
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:**

3. C.C. Chatterjee: Human Physiology.

**Reference Books:**

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
2. Theory of evaporation, heat and material balances.
5. Recent advances in evaporation.

UNIT-III: DISTILLATION
1. Raoult's law, phase equilibrium, volatility and relative volatility.
2. Applications of distillation.
4. Rectification, rectifying columns, fractionating columns, method for calculation of number of theoretical plates, HETP (McCabe 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
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.
5. Recent Advancement in drying technology.

UNIT-V:
   a) AUTOMATED PROCESS CONTROL SYSTEM (APCS):
      1. Process variables, temperature and pressure control, flow level etc. and their measurement.
      2. Elements of APCS and Computer aided manufacturing (CAM).
   b) INDUSTRIAL / INTRODUCTION TO PHARMACEUTICAL ENVIRONMENT-
      1. Pollution control, hazards like mechanical, chemicals, electrical fire and dust hazards in Pharmaceutical industries.
      2. Industrial dermatitis and safety measure.

LIST OF PRACTICALS RECOMMENDED:
  1. To study and determine the effect of surface area on rate of evaporation. Also plot a graph between rate of evaporation and surface area.
  2. To study and determine the effect of temperature on rate of evaporation. Also plot a graph between rate of evaporation and temperature.
  3. To study and determine the effect of consistency on rate of evaporation.
  4. To study and determine the surface area on rate of drying. Also plot a graph between rate of drying and surface area.
  5. To study and determine the temperature on rate of drying. Also plot a graph between rate of drying and temperature.
  6. To determine the rate of drying and free moisture content and also plot a FMC curve.
  7. To determine the rate of drying and equilibrium moisture content (EMC)
  8. To study and separate volatile oil from a simple mixture containing volatile components using simple distillation technique.
  9. To study and perform the steam distillation technique.
 10. To study and perform extractive distillation technique.
 11. To study and determine overall heat transfer coefficient of various colour bodies.

TEXT BOOKS

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

REFERENCE BOOKS

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<th>AUTHOR'S NAME</th>
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</thead>
</table>
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
(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.

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<td>S.No</td>
<td>Name of the book</td>
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<tr>
<td>01</td>
<td>Ross and Wilson Anatomy and Physiology in Health and Illness</td>
<td>A. Waugh and A. Grant</td>
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<tr>
<td>02</td>
<td>Textbook of patholgy</td>
<td>Harsh Mohan</td>
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<td>03</td>
<td>Human Physiology” (Vol. I &amp; Vol. II)</td>
<td>C.C. Chatterjee</td>
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<tr>
<td>S.No</td>
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<tr>
<td>01</td>
<td>Text book of Medical Physiology</td>
<td>A. C. Guyton and J.E.</td>
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<td></td>
<td>Title</td>
<td>Author(s)</td>
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<tr>
<td>02</td>
<td>Principles of Anatomy and Physiology</td>
<td>G. J. Torotora,</td>
</tr>
<tr>
<td>03</td>
<td>Text Book of Human Histology with Colour Atlas</td>
<td>Inderbir Singh,</td>
</tr>
<tr>
<td>04</td>
<td>Pathophysiology in medical science</td>
<td>H.E.A. Mentz,</td>
</tr>
<tr>
<td>05</td>
<td>Pathophysiology-principles of disease</td>
<td>Martha J. Miller,</td>
</tr>
<tr>
<td>06</td>
<td>Textbook of practical physiology</td>
<td>Ranade VG,</td>
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<tr>
<td>07</td>
<td>Atlas of normal histology</td>
<td>Difore S.H.,</td>
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<tr>
<td>08</td>
<td>Atlas of normal histology</td>
<td>Difore S.H.,</td>
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<tr>
<td>09</td>
<td>Pharmacotherapy, Principle and Practice</td>
<td>J.P. Dipiro,</td>
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<td>10</td>
<td>Medical laboratory technology</td>
<td>Kanai Mukherjee</td>
</tr>
</tbody>
</table>
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
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
3. Application in the assay of Phosphoric acid, Sodium hydroxide, Calcium carbonate, Sodium carbonate, boric acid etc.

UNIT-III: REDOX TITRATION
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. Argentomateric 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: GRAVEMATERIC ANALYSIS
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 per magnate. (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)

**TEXT BOOKS**

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<tr>
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</thead>
<tbody>
<tr>
<td>2.</td>
<td>Vogel’s Text Book of Quantitative Chemical Analysis</td>
<td>Mendhanm J., Denny R.C., Barnes J.D., Thomas M., Jeffery G.H.</td>
<td>Pearson Education Asia</td>
</tr>
<tr>
<td>3.</td>
<td>Quantitative Chemical Analysis, 2nd Ed</td>
<td>Ayers</td>
<td>(Harper International Ed.), Harper and Raw,</td>
</tr>
<tr>
<td>5.</td>
<td>Quantitative Analysis</td>
<td>Alexeyev V</td>
<td>CBS Publishers &amp; Distributors</td>
</tr>
<tr>
<td>6.</td>
<td>A Text Book of Pharmaceutical Analysis</td>
<td>Cornners K.A.</td>
<td>Wiley Inter-Science</td>
</tr>
</tbody>
</table>
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.


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


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


c. Concepts of health and diseases, disease agents and prevention of diseases.
d. Food requirements, balanced diet, nutritional deficiency disorders, their treatment and prevention.

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

<p>| TEXT BOOKS |
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<tbody>
<tr>
<td>02</td>
<td>N.K. Jain</td>
<td>Health Education and Community Pharmacy.</td>
<td>CBS Publishers,</td>
</tr>
<tr>
<td>03</td>
<td>P.C. Dandiya, R.K. Khar and N. Gumbani</td>
<td>Hospital Pharmacy.</td>
<td>CBS Publisher.</td>
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<p>| REFERENCE BOOKS(Latest Edition) |
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<td>No.</td>
<td>Title</td>
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<tr>
<td>01</td>
<td>Pharmaceutical Dosage Forms and Drug Delivery Systems</td>
<td>H. C. Ansel</td>
<td>Lippincott Williams and Wilkins, New Delhi,</td>
</tr>
<tr>
<td>02</td>
<td>Remington The Science and Practice of Pharmacy, Vol: I and II</td>
<td>Alfonso R. Gennaro</td>
<td>Lippincott Williams</td>
</tr>
<tr>
<td>03</td>
<td>Cooper and Gunn's Dispensing for Pharmaceutical Students,</td>
<td>Carter S.J,</td>
<td>CBS Publishers, New Delhi,</td>
</tr>
<tr>
<td>04</td>
<td>Cooper and Gunn's Tutorial pharmacy</td>
<td>Carter S.J,</td>
<td>CBS Publishers, New Delhi,</td>
</tr>
<tr>
<td>05</td>
<td>Pharmaceutics The Science of Dosage Form Design</td>
<td>M.E.Aulton</td>
<td>Churchill Livingstone, Edinburgh,</td>
</tr>
<tr>
<td>06</td>
<td>Bentley's textbook of Pharmaceutics</td>
<td>E.A.Rawlins</td>
<td>English language book Society</td>
</tr>
<tr>
<td>07</td>
<td>Pharmaceutical Calculations</td>
<td>Herfindal,</td>
<td>B I Waverley Pvt. Ltd., New Delhi,</td>
</tr>
<tr>
<td>08</td>
<td>Clinical Pharmacy &amp; Therapeutics.</td>
<td>Alfonso R. Gennaro</td>
<td>Lippincott Williams</td>
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<tr>
<td>09</td>
<td>Indian Pharmacopoeia 2007,</td>
<td>Govt. of India</td>
<td>Published by The Controller of Publications, Delhi.</td>
</tr>
<tr>
<td>10</td>
<td>Pratibha Nand and R.K. Khar</td>
<td>Hospital &amp; Clinical Pharmacy.</td>
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</tbody>
</table>
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.
7. Estimation of urea in blood.
9. Fat determination in milk
10. Identification of Blood Glucose.
12. Determination of SGOT SGPT
13. Estimation of Alkaline Phosphate in serum

TEXT BOOKS

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<tr>
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<th>AUTHOR’S NAME</th>
<th>PUBLISHER’S NAME</th>
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<tbody>
<tr>
<td>1.</td>
<td>Review of Biochemistry</td>
<td>Harpers</td>
<td>Langue medical publication</td>
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<td>2.</td>
<td>Element of Biochemistry</td>
<td>OP Agrawal</td>
<td>Goel publishing House Meerut</td>
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<td>3.</td>
<td>Principle of Biochemistry</td>
<td>A.L.Lehinger</td>
<td>CBS Publisher and distributor</td>
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<tr>
<td>1.</td>
<td>Text Book of Biochemistry</td>
<td>West and Todd</td>
<td>ELBS-Longman</td>
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<td>2.</td>
<td>British Pharmacopeia</td>
<td>HerMajestys stationery office</td>
<td>Cambridge</td>
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<td>3.</td>
<td>The pharmacopoeia of India</td>
<td>Ayers</td>
<td>(Harper International Ed.), Harper and Raw,</td>
</tr>
<tr>
<td>5.</td>
<td>Outline of Biochemistry</td>
<td>Conn EE Stumph P K</td>
<td>John Willery and Sons New York</td>
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<td>7.</td>
<td>Fundamental of biochemistry</td>
<td>AC Deb</td>
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</table>
 COURSE OBJECTIVE  This subject deal with the study of various pharmaceutical formulations (including selection criteria for additives) and optimization of their quality, purity, safety and stability.

UNIT I  PREFORMULATION STUDIES

Objectives, study of physical properties of pharmaceuticals like physical forms, particle size, shape, density, wetting, solubility, pKa, partition coefficient, dissolution and their effect on formulation stability and bioavailability.

UNIT II  LIQUID ORAL DOSAGE FORMS

Introduction, various additives used in liquid oral formulations like vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colours, flavours etc. 

Formulation technology and evaluation of:

a) Solutions  

b) Suspensions  

c) Emulsions

UNIT: III  SEMISOLID DOSAGE FORMS

Definition, types, mechanism of drug penetration, factors influencing penetration. 

Classification of bases and their selection, general formulation of semisolid dosage forms, clear gels. 

manufacturing procedures, Evaluation and packaging.

UNIT: IV

a) SUPPOSITORYIES: Ideal Requirements, Bases, Manufacturing Procedure, Packaging and Evaluation.


UNIT: V  COSMETOLOGY AND COSMETIC PREPARATIONS

Fundamentals of Cosmetic Science, Structure and Function of Skin and Hair.

Formulation, Preparation, Evaluation and Packaging of Cosmetics for Skin and Hairs like Cold Cream, Vanishing Cream, Cleansing Cream, All Purpose Cream, Protective Cream, Antiperspirants, Deodorants, Face Powder & Shampoos and Conditioners, Shaving Cream and After Shaving Products.

LIST OF PRACTICALS

1. Preparation, evaluation and packaging of liquid orals like- 

i) Solutions:  - Strong sodium salicylate oral solution B.P.
- 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**

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<td>3.</td>
<td>Introduction to Pharmaceutical Dosage Forms</td>
<td>H.C. Ansel</td>
<td>Lea &amp; Febiger, Philadelphia, U.S.A.</td>
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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)

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<td>Practical Organic Chemistry</td>
<td>Mann &amp; Saunder</td>
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<td>2.</td>
<td>Principles of Medicinal Chemistry</td>
<td>W. C. Foye</td>
<td>Lea and Febiger, Philadelphia</td>
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</table>
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.

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
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)

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<td>Pharmacognosy</td>
<td>Tayler, V.C., Brady, L.R. and Robers, J.E.</td>
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<td>Kokate, C.K., Purohit, A.P. and Gokhale, S.B.,</td>
<td>Nirali Prakashan, Pune</td>
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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 outpatients.
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

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<td>Pharmaceutical Science</td>
<td>Remington</td>
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<td>Hospital and clinical Pharmacy</td>
<td>Pratibha nand and Khar</td>
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<td>3</td>
<td>Pharmacist year book</td>
<td>PC dandiya, RK khar and ghumbani</td>
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<td>W.E Hassan</td>
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<td>GCP ICH guidelines</td>
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<td>3</td>
<td>Hospital Pharmacy</td>
<td>SH Merchant and J S Quadry</td>
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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
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

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<td>by Alfred Goodman Gilman</td>
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<td>Pharmacology and Pharmacotherapeutics.</td>
<td>R.S.Satoskar and S.D.Bhandarkar</td>
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<td>5.</td>
<td>Clinical Pharmacology.</td>
<td>D.R.Laurence and P.N.Bennett</td>
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B. Pharm.
VI Semester

PHARMACEUTICAL TECHNOLOGY- II
(Pharmaceutical Formulation and NDDS)

COUSRE OBJECTIVE: The students can learn about formulation of tablets, capsules, 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, sheronization 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.


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, coascervation, spray drying, fluidized bed coating, polymerization, complex emulsion etc.

d) Evaluation of microcapsules.
UNIT: III

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

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)

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<td>Banker, G.S. and Rhode, C.T.</td>
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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)

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, Amitryptyline.
d) Anti-anxiety Agent: Diazepam, Chlordiazepoxide.
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, Reserpin.
e) Anti-hyperlipidaemic Drugs: Clofibrate, Niacin, Probucol.

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.

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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
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.

UNIT: 3
a) Narcotics Drugs and Psychotropic Substance (Acts and rules).
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 Federal 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.

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<td>The Laws of drugs</td>
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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.

UNIT: IV
A. Turbidometry: Theory, instrumentation and applications.
B. Fluorimetry: Theory, instrumentation and applications.

UNIT: V
A. Colorimetric Method: Theory, instrumentation and applications.
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 Disodum 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
12) Titrations using potentiometric technique.
13) Exercises involving conductometric titrations.
14) Exercises based on Turbidimetry
15) Exercise involving Kjeldahl

RECOMMENDED BOOKS

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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 (LD_{50}).
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 creates 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

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
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
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

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<td>1.</td>
<td>Biopharmaceutics and pharmacokinetics</td>
<td>Brahmankar D. M., Sunil B Jaiswal</td>
<td>Vallabh Prakashan</td>
</tr>
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<td>2.</td>
<td>Biopharmaceutics and Pharmacokinetics</td>
<td>Notari, R.E</td>
<td>An introduction Marcel Dekker Inc. N.Y.</td>
</tr>
<tr>
<td>3.</td>
<td>Biopharmaceutics &amp; Clinical Pharmacokinetics</td>
<td>Gibaldi, Milo</td>
<td>Lea &amp; Febiger, Philadelphia</td>
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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:

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<tr>
<td>1.</td>
<td>A Text Book of Medicinal Chemistry</td>
<td>S. N. Pandey</td>
<td>S.G. Publishers, Varanasi</td>
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<td>5.</td>
<td>Practical Organic Chemistry</td>
<td>Mann &amp; Saunder</td>
<td>Orient Longman, UK</td>
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<td>2.</td>
<td>Principles of Medicinal Chemistry</td>
<td>W. C. Foye</td>
<td>Lea and Febiger, Philadelphia</td>
</tr>
</tbody>
</table>
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.

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<td>1.</td>
<td>Pharmacognosy</td>
<td>Trease, G.E.and Evans, W.C.,</td>
<td>Bailliere, Tindall,</td>
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<td>Eastbourne,</td>
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<td>Pharmacognosy</td>
<td>Tayler, V.E., Brady, L.R. and Robers, J.E.,</td>
<td>Lea and Febiger, Philadelphia</td>
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<td>3.</td>
<td>Pharmacognosy</td>
<td>Kokate, C.K., Purohit, A.P. and Gokhale, S.B.,</td>
<td>Nirali Prakashan, Pune</td>
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<td>1.</td>
<td>Herbal Pharmacopoeia of India</td>
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<td>Ministry of Health, Govt of India.</td>
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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


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 & 13C 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 $\lambda_{\text{max}}$ of a drug
11) Assay of ibuprofen - UV-spectro photometry
12) Assay of paracetamol - UV-spectro photometry

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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.
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<td>R.S.Satoskar and S.D.Bhandarkar</td>
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<td>Clinical Pharmacology.</td>
<td>D.R.Laurence and P.N.Bennett</td>
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<td>Thomssen E.G.</td>
<td>Universal Publishing Corporation</td>
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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.

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<td>Text Book of Biotechnology</td>
<td>R.C Dubey</td>
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B. Pharm.
VIII Semester

Pharmaceutical Management

Objective- This Subject 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

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.
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<td>Principles and Methods of pharmacy management</td>
<td>Smith</td>
<td>Febiger</td>
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<td>Principles of management</td>
<td>Koontz and O Donnel</td>
<td>Mcgraw Hill</td>
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62
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.

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<td>Govt. of India</td>
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<td>3.</td>
<td>Heterocyclic Chemistry</td>
<td>R.K.Bansal</td>
<td>Wiley Eastern, New Delhi</td>
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</table>