<table>
<thead>
<tr>
<th>SN</th>
<th>Topics</th>
<th>Hrs</th>
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</thead>
<tbody>
<tr>
<td>01</td>
<td><strong>Oral Controlled Drug Delivery Systems</strong></td>
<td>13</td>
</tr>
<tr>
<td>02</td>
<td><strong>Sterile Dosage Form:</strong></td>
<td>10</td>
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<tr>
<td></td>
<td>Type of injections, parenteral routes of administrations, water for injection, pyrogenicity, its sources and elimination, large &amp; small volume parenteral. Formulation and development of sterile dosage forms, active ingredients, solvent and vehicles, surfactant and solubilizers, antimicrobials, antioxidants, buffers, chelating agents, tonicity adjusters. Containers and closures for sterile dosage forms. Quality control tests like sterility, pyrogen, clarity, safety and leakage testing.</td>
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<tr>
<td>03</td>
<td><strong>Microencapsulation:</strong></td>
<td>07</td>
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<tr>
<td></td>
<td>Introduction, importance of microencapsulation in pharmacy, concept of core &amp; coating materials, Techniques of microencapsulation:, coacervation phase separation, multi orifice centrifugal process, spray drying &amp; spray congealing, air suspension and coating pan, solvent evaporation, evaluation of microcapsules.</td>
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<td>04</td>
<td><strong>Fundamental Concepts in Controlled Release</strong></td>
<td>07</td>
</tr>
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<td>Introduction, Rationale, Classification and Factors influencing design and performance of sustained/controlled drug delivery system, Physicochemical properties of a drug influencing drug product design and performance, Biological factors influencing design and performance of sustained/controlled release system, Polymer properties influencing drug permeation.</td>
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<td>05</td>
<td><strong>Parenteral Controlled Drug Delivery Systems</strong></td>
<td>08</td>
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<tr>
<td></td>
<td>Introduction, Sustained/controlled release dosage forms: - aqueous solution (high viscosity products, complex formation), oil solution, oil suspensions, biocompatible carriers (erythrocytes, biological and synthetic macromolecules), liposomes, implants, infusion devices, prodrugs. Drug targeting: - Active and passive drug targeting, carriers for targeted drug delivery system (Monoclonal antibodies, immunoliposomes, lipoproteins, polymeric micelles and nanoparticles)</td>
<td></td>
</tr>
</tbody>
</table>
DOSAGE FORM TECHNOLOGY II (BP-807)

PRACTICALS:
Preparation and evaluation of following dosage forms:
1. Small volume parenterals: solution, emulsion, suspension, powder ready to use.
2. Large volume parenterals
3. Ophthalmic solutions
4. Otic solution.
5. Microspheres.
7. Microencapsules

REFERENCE BOOKS:
8. Indian Pharmacopoeia. Published by the IP commision, Ghaziabad, Delhi.
B.Pharm-IV (Semester- VIII)
MEDICINAL CHEMISTRY III (BP-802)

<table>
<thead>
<tr>
<th>SN</th>
<th>Topics</th>
<th>Hrs</th>
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</thead>
<tbody>
<tr>
<td>01</td>
<td>Drug acting on respiratory system: Antiasthamatics, Bronchodilators, Phosphodiesterase Inhibitors, Expectorants, Decongestants and Antitussives.</td>
<td>08</td>
</tr>
<tr>
<td>02</td>
<td>Sympathetic and parasympathetics drugs: Adrenergic Neurotransmitters Anti Adrenergic, Cholinergic and Anticholinergics, Antispasmodics, Ganglionic Stimulants and Blockers, Neuromuscular Blockers.</td>
<td>13</td>
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<tr>
<td>03</td>
<td>Thyroids and antithyroids.</td>
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<tr>
<td>04</td>
<td>Histamine and Antihistaminic agents</td>
<td>06</td>
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<tr>
<td>05</td>
<td>Narcotic Analgesics and NSAIDS</td>
<td>04</td>
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<tr>
<td>06</td>
<td>Prostaglandins and Eicosanoids</td>
<td>03</td>
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<td>07</td>
<td>Steroids.</td>
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<td>08</td>
<td>Oxytocics</td>
<td>02</td>
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</tbody>
</table>

Medicinal Chemistry III(BP-808)

PRACTICAL:

Assay of following drugs
- Ibuprofen, Sulfanilamide, Isoniazid, Aspirin, Ascorbic acid, Sulfamethoxazole
- Paracetamol

Synthesis and physico-chemical characterization of following compounds
- Benzotriazole from o-phenylene diamine
- Phenytoin from benzoin
- Chlorobutanol from chloroform
- Quinoline from aniline by skrup method
- Benzildine acetone from benzaldehyde

Microwave assisted synthesis of following.
- 2-cyano-3-(4′-methoxyphenyl)-propenoate from P-anisaldehyde
- 2, 3 diphenyl quinaxaline from o-phenylene diamine

REFERENCES:

1. Wilson and Gisvold’s Text Book of Medicinal Chemistry, Lippincott Williams and Wilkins.
2. Indian Pharmacopoeia, Government of India, Ministry of Health and Family Welfare, Published by the Controller of Publications and Information Directorate (CSIR), New Delhi.
14. Kadam, Mahadik and Bothra “Advanced Practical Medicinal Chemistry”
B.Pharm-IV (Semester- VIII)
PHARMACEUTICAL ANALYSIS V (BP-803)

<table>
<thead>
<tr>
<th>SN</th>
<th>Topics</th>
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<tbody>
<tr>
<td>01</td>
<td>Chromatography: Introduction and classification of chromatography.</td>
<td>02</td>
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<tr>
<td>02</td>
<td>Column Chromatography: Adsorption column chromatography, Development Techniques (Frontal, displacement and elution analysis), Preparation of column, Factors affecting column efficiency, Partition chromatography.</td>
<td>05</td>
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<tr>
<td>03</td>
<td>Ion exchange Chromatography: Principle, Ion exchange resins/material, Properties of ion exchangers, Mechanism of ion exchange process, Factors affecting ion exchange.</td>
<td>05</td>
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<tr>
<td>04</td>
<td>Paper chromatography: Principle, Choice of filter papers, Solvents, Chromatographic chambers, Development techniques (Descending, Ascending, Radial multiple chromatography, two dimensional chromatography), Factors affecting retention factor.</td>
<td>05</td>
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<td>05</td>
<td>Thin layer chromatography (TLC): Principle, Different methods / techniques, Development of chromatograph, Rf value (Retention factor) and factors affecting Rf value.</td>
<td>07</td>
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<tr>
<td>06</td>
<td>Gas chromatography Theory, Instrumentation (Carrier gas, Columns, stationary phases for gas-liquid and gas-solid chromatography, Detectors- flame ionization, electron capture and thermal conductivity detector), Quantitative analysis.</td>
<td>07</td>
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<td>07</td>
<td>High Performance Thin layer chromatography (HPTLC) Principle, Instrumentation, Preparation of plate, Development techniques.</td>
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<tr>
<td>08</td>
<td>High Performance Liquid chromatography (HPLC) Principle, Instrumentation, Solvent treatment systems, Pumps, column packing material, Detectors.</td>
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<td>09</td>
<td>Gel chromatography: Theory, instrumentation and applications.</td>
<td>03</td>
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</tbody>
</table>

Pharmaceutical analysis-V (BP-809)

PRACTICAL:
1. Separation of mixture of amino acids / sugars / dicarboxylic acids by paper Chromatography.(Minimum four)
2. Experiment based on column chromatography. (Minimum two)
3. Experiment based on TLC. (Minimum three)
4. Experiment based on ion-exchange chromatography.
5. Demonstration HPLC
6. Biochemical analysis of glucose, cholesterol, creatinine, creatine in biological samples.

References:
1. S. Lindsay, High Performance Liquid Chromatography, Analytical Chemistry by Open Learning (ACOL), Wiley.
2. J. E. Willett, Gas Chromatography, Wiley.
3. Veronika Meyers, Practical High Performance Liquid Chromatography
8. Indian Pharmacopoeia, Government of India, Ministry of Health and Family Welfare, Published by the Controller of Publications and Information Directorate (CSIR), New Delhi.

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<tr>
<th>SN</th>
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<tbody>
<tr>
<td>01</td>
<td>General - Prescribing Guidelines for – Pediatric patients, Geriatric patients, Pregnant and Breast Feeding womens.</td>
<td>05</td>
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<tr>
<td>02</td>
<td>Etiopathogenesis and pharmacotherapy of diseases / disorders associated Endocrine system: Diabetes mellitus, Disorders of Thyroid gland, Adrenocortical dysfunction, Oral Contraceptives.</td>
<td>05</td>
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<tr>
<td>03</td>
<td>Etiopathogenesis and pharmacotherapy of Infectious diseases: Tuberculosis, Leprosy, Meningitis, Respiratory Tract Infections, Gastroenteritis, Endocarditis, Septicemia, Urinary Tract Infections, Malaria, AIDS and Opportunistic Infections, Fungal Infections, Viral Infections, Gonorrhea and Syphilis.</td>
<td>18</td>
</tr>
<tr>
<td>04</td>
<td>Etiopathogenesis and pharmacotherapy of Oncology: Basic principles of Cancer therapy, Chemotherapy of Breast cancer, Leukemia, Cancer of G.I. Tract, Lungs, Prostate, Skin, Gynecological. Management of adverse effects of anticancer drugs.</td>
<td>09</td>
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<tr>
<td>05</td>
<td>Pharmacology of special topics: Gene therapy-Approach and Application of gene therapy, Stem Cell therapy</td>
<td>02</td>
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<td>06</td>
<td>Pharmacovigilence (drug safety): Introduction to Pharmacovigilence, Development of Pharmacovigilance system in India, Various legislations enacted, Safety regulations, WHO, CIOMS and Pharmacovigilance, ICH guidelines.</td>
<td>06</td>
</tr>
</tbody>
</table>

References:
1. B. Widdop. Therapeutic Drug Monitoring. Churchill Livingstone
13. Klaassen C.D, Casarett & Doull”s. Toxicology. The basic science of poison Mc-Graw Hill
20. Raymond J.M. Niesink, John de vries. Hollinger M.A. Toxicology- Principle and applications, CRC, Florida
21. Remington’s Pharmaceutical Science and practice pharmacy. Lippincott Williams and Wilkins, New Delhi
34. Maickel, Pradhan, Pharmacology in Medicines – Principles and Practice. SP Press International INC.
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<tbody>
<tr>
<td>01</td>
<td>Importance and status of herbal medicine</td>
<td>02</td>
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<tr>
<td>02</td>
<td><strong>Phytopharmaceuticals</strong>&lt;br&gt;Industrial methods of isolation and utilization of the following Phytopharmaceuticals:&lt;br&gt;Quinine, Cardiac glycosides, Sennosides, Diosgenin, Glycyrrhizin, Andrographolides, Rutin, Guggul lipids.</td>
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<tr>
<td>03</td>
<td><strong>Herbal Formulations</strong>&lt;br&gt;A comparative study of Ayurvedic and modern dosage forms, Different stages of Herbal formulations, study of methods of preparations of various ayurvedic dosage forms. like Aristas, Asava, Ghutika, Tailia, Churna, Avaleha, Ghrita and Bhasms, Unani formulations like Majoons, Safoofs and their evaluation. Determination of heavy metals in herbal preparation and alcohol contents in Aristas and Asvas.</td>
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<tr>
<td>04</td>
<td><strong>Chemotaxonomy</strong>&lt;br&gt;Introduction, merits &amp; demerits and application with examples.</td>
<td>04</td>
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<td>05</td>
<td><strong>Herbal Cosmetics:</strong>&lt;br&gt;Brief study of Phytcosmetics of industrial significance and current status.&lt;br&gt;Herbs used for different cosmetic preparations like Shampoos, Conditioners, Hair Darkeners and Skin Care.&lt;br&gt;Study of following herbs used in different cosmetics formulations— Soapnut, Amla, Henna, Hibiscus, Tea, Aloe vera, Glycyrrhiza, Turmeric, Sandalwood and others involved in the suitable formulation. Basic evaluation parameter for skin care and shampoos.</td>
<td>08</td>
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<tr>
<td>06</td>
<td><strong>Quality control in the production chain of herbal product</strong>&lt;br&gt;Introduction, product chain, Benefits of integral quality control and basic requirements of quality control of herbal production.</td>
<td>04</td>
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<td>07</td>
<td><strong>Neutraceuticals</strong>&lt;br&gt;Introduction, classification, Neutraceuticals and diseases cardiovascular, obesity, Diabetes, cancer and inflammatory diseases.</td>
<td>05</td>
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<td>08</td>
<td><strong>Brief account of plant based industries involved in medicinal and aromatic plants in India.</strong></td>
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</table>
INDUSTRIAL PHARMACOGNOSY (BP 8010)

PRACTICAL

1. Isolation of aloin from Aloe vera.
2. Formulation and evaluation of following category of Ayurvedic preparations (Minimum one of each category)
   i. Asava and Arista
   ii. Churna
   iii. Lepas
   iv. Ghrita and Taila
   v. Natural sunscreen oil
   vi. Natural blooming bath oil
3. Extraction /Isolation of tannic acid from myrobalan.
4. Extraction and estimation of cardiac glycoside.
5. Preparation and evaluation of herbal cosmetics-  
   · Hairs cosmetics
   · Skin cosmetics

Reference Books

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<tbody>
<tr>
<td>01</td>
<td>Drug legislation in India. Origin and nature of pharmaceutical legislation in India, scope and objective, New drug policy.</td>
<td>03</td>
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<tr>
<td>02</td>
<td>Code of Ethics for Pharmacists. Pharmaceutical code of ethics, Study of code of pharmaceutical ethics drafted by PCI regarding to pharmacist in relation to his job, to his trade, and to medical profession.</td>
<td>02</td>
</tr>
<tr>
<td>03</td>
<td>Pharmacy Act 1948. Objective, Definitions, Pharmacy council of India and State Pharmacy Councils, Composition and Function, Preparation of Registers and qualifications for entry into registers, Educational Regulation and Approval of Courses and Institutions, Offences &amp; Penalties.</td>
<td>06</td>
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<tr>
<td>05</td>
<td>Drugs Price Control Order, 1995 Definition, price of bulk drugs, Retail price of formulation, DPEA, Maintenance of records.</td>
<td>02</td>
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<td>06</td>
<td>Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 Definitions, Prohibited Advertisement, Savings.</td>
<td>02</td>
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<tr>
<td>07</td>
<td>Drugs and Cosmetics Act 1940, Rules 1945 Definitions, Administrative bodies - DTAB and DCC, Composition and function, Central Drug Laboratories and Government Analysts, Drug inspectors, Licensing Authorities, Controlling Authorities and Customs Collectors Provisions, Manufacture and Sale of Drugs, Labeling and Packaging of Drugs, Provisions applicable to manufacture and sale of Ayurvedic Drugs, Provisions Governing Import, Various offences and corresponding Penalties, Schedules of the Drugs and Cosmetic Act and Rules.</td>
<td>15</td>
</tr>
<tr>
<td>08</td>
<td>Narcotic Drugs and Psychotropic Substances Act, 1985 and Rules, 1985 Introduction &amp; objective, Definitions, Prohibited and controlled operation, Authorities and officers, Offences and corresponding penalties.</td>
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<tr>
<td>09</td>
<td>Indian patent act</td>
<td>04</td>
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</tbody>
</table>

**REFERENCE BOOKS:**

1. The Bare Acts & Rules (With Latest Amendments), Government of India.
3. Jain N. K. “A Text Book of Forensic Pharmacy,” Vallabh Prakashan,
<table>
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<th>SN</th>
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</thead>
<tbody>
<tr>
<td>01</td>
<td><strong>Project Work:</strong>&lt;br&gt;The topic for the project shall be based on the practical work/theoretical/review oriented/any topic from current Pharmaceutical development and shall be assigned to him/her by the respective guide from faculty member (Maximum eight students per teacher) immediate from the date of the commencement of the eighth semester. Internal assessment will be based on average marks obtained after delivering three seminars on given topic during this semester.</td>
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