# JSS Academy of Higher Education & Research, Mysuru

(Deemed to be University)

( Accredited 'A$^{+}$' Grade by NAAC )

## JSS COLLEGE OF PHARMACY,ROCKLANDS,OOTY

( ISO 9001:2015 Certified )


## ( Academic Year : 2021 - 2022 )

## Course: III . B. PHARM

## Vision

To be preeminent colleges in shaping society–worthy and SMART Pharmacy Professionals of global repute

## Mission

- To adopt and lead the transformation of pharmacy education, practice and research nationally and globally.
- To inspire and nurture students to become exemplary professionals to serve the global society
- To develop competencies among students and empower them to meet the changing needs of the profession
- To impart quality education and practice to promote and advance public health
- To impart holistic and value-based education to produce new generation humane pharmacy professionals
- To address the sustainable health care challenges through innovative measures and technologies

## Programme Educational Objectives

1. To acquire the theoretical knowledge of Pharmaceutical Sciences
2. To acquire practical skills in

- Isolation and identification of medicinal compounds from natural sources
- Synthesis and analysis of medicinal compounds
- Screening for pharmacological activities
- Formulation of pharmaceutical dosage forms and their evaluation
- Comprehensive pharmaceutical care to patients

3. To demonstrate the leadership qualities, ethical attitude and to engage in life-long learning
4. To acquire skills for designing the research questions, protocol, data analysis and reporting research outcomes

## Programme Outcomes

1. Pharmacy Knowledge
2. Planning abilities
3. Problem analysis
4. Modern tool usage
5. Leadership skills
6. Professional Identity
7. Pharmaceutical Ethics
8. Communication
9. Pharmacist and society
10. Environment and sustainability
11. Lifelong learning

# Contents



## 1. EXCERPT FROM JSS ACADEMY OF HIGHER EDUCATION & RESEARCH REGULATIONS

Medium of instruction and examinations
Medium of instruction and examination shall be in English.

**Working days in each semester**
Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year.

**Attendance and progress**
A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

**Program/Course credit structure**
As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, tutorial hours, practical classes, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

**Credit assignment**

**Theory and Laboratory courses**
Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and /or tutorial (T) hours, and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and tutorial hours, and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

**Minimum credit requirements**

The minimum credit points required for award of a B. Pharm. degree is 208. These credits are divided into Theory courses, Tutorials, Practical, Practice School and Project over the duration of eight semesters. The credits are distributed semester-wise as shown in Table IX. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

The lateral entry students shall get 52 credit points transferred from their D. Pharm program. Such students shall take up additional remedial courses of 'Communication Skills' (Theory and Practical) and 'Computer Applications in Pharmacy' (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points to attain 59 credit points, the maximum of I and II semesters.

**Academic work**

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses.

**Course of study**

The course of study for II B. Pharm shall include Semester Wise Theory & Practical as given in Table – I to II The number of hours to be devoted to each theory, tutorial and practical course in any semester shall not be less than that shown in Table – I to II.

Table – I: Course of study for semester V

| Course code | Name of the course | No. of hours | Tutorial | Credit points |
|---|---|---|---|---|
| BP501T | Medicinal Chemistry II – Theory | 3 | 1 | 4 |
| BP502T | Industrial Pharmacy I– Theory | 3 | 1 | 4 |
| BP503T | Pharmacology II – Theory | 3 | 1 | 4 |
| BP504T | Pharmacognosy and Phytochemistry II– Theory | 3 | 1 | 4 |
| BP505T | Pharmaceutical Jurisprudence – Theory | 3 | 1 | 4 |
| BP506P | Industrial Pharmacy I – Practical | 4 | - | 2 |
| BP507P | Pharmacology II – Practical | 4 | - | 2 |
| BP508P | Pharmacognosy and Phytochemistry II – Practical | 4 | - | 2 |
| Total | | 27 | 5 | 26 |

Table – II: Course of study for semester VI

| Course code | Name of the course | No. of hours | Tutorial | Credit points |
|---|---|---|---|---|
| BP601T | Medicinal Chemistry III – Theory | 3 | 1 | 4 |
| BP602T | Pharmacology III – Theory | 3 | 1 | 4 |
| BP603T | Herbal Drug Technology – Theory | 3 | 1 | 4 |
| BP604T | Biopharmaceutics and Pharmacokinetics – Theory | 3 | 1 | 4 |
| BP605T | Pharmaceutical Biotechnology – Theory– Theory | 3 | 1 | 4 |
| BP606T | Quality Assurance –Theory | 3 | 1 | 4 |
| BP606P | Medicinal chemistry III – Practical | 4 | - | 2 |
| BP607P | Pharmacology III – Practical | 4 | - | 2 |
| BP608P | Herbal Drug Technology – Practical | 4 | - | 2 |
| Total | | 30 | 6 | 30 |

**End semester examinations**

The End Semester Examinations for each theory and practical course through semesters III to IV shall be conducted by the university.

Table – III: Semester V

| Course code | Name of the course | Internal Assessment | | | | End Semester Exams | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | Continuous Mode | Sessional Exams | | Total | Marks | Duration | |
| | | | Marks | Duration | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| BP501T | Medicinal Chemistry II – Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP502T | Industrial Pharmacy I– Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP503T | Pharmacology II – Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP504T | Pharmacognosy II – Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP505T | Pharmaceutical Biotechnology – Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP506P | Industrial Pharmacy I– Practical | 5 | 10 | 4 Hrs | 15 | 35 | 4 Hrs | 50 |
| BP507P | Pharmacology II – Practical | 5 | 10 | 4 Hrs | 15 | 35 | 4 Hrs | 50 |
| BP508P | Pharmacognosy II – Practical | 5 | 10 | 4 Hrs | 15 | 35 | 4 Hrs | 50 |
| Total | | 65 | 105 | 17 Hrs | 170 | 480 | 27 Hrs | 650 |

Table – IV: Semester VI

| Course code | Name of the course | Internal Assessment | | | | End Semester Exams | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | Continuous Mode | Sessional Exams | | Total | Marks | Duration | |
| | | | Marks | Duration | | | | |
| BP601T | Medicinal Chemistry III – Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP602T | Pharmacology III – Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP603T | Herbal Drug Technology – Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP604T | Biopharmaceutics and Pharmacokinetics – Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP605T | Pharmaceutical Biotechnology– Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP606T | Quality assurance – Theory | 10 | 15 | 1 Hr | 25 | 75 | 3 Hrs | 100 |
| BP606P | Medicinal chemistry III – Practical | 5 | 10 | 4 Hrs | 15 | 35 | 4 Hrs | 50 |
| BP607P | Pharmacology III – Practical | 5 | 10 | 4 Hrs | 15 | 35 | 4 Hrs | 50 |
| BP608P | Herbal Drug Technology – Practical | 5 | 10 | 4 Hrs | 15 | 35 | 4 Hrs | 50 |
| Total | | 75 | 120 | 18 Hrs | 195 | 555 | 30 Hrs | 750 |

**Internal assessment: Continuous mode**

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table – V: Scheme for awarding internal assessment: Continuous mode

| Theory | | |
|---|---|---|
| Criteria | Maximum Marks | |
| Attendance (Refer Table – VI) | 4 | 2 |
| Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar) | 3 | 1.5 |
| Student – Teacher interaction | 3 | 1.5 |
| Total | 10 | 5 |
| Practical | | |
| Attendance (Refer Table – VI) | 2 | |
| Based on Practical Records, Regular viva voce, etc. | 3 | |
| Total | 5 | |

Table – VI: Guidelines for the allotment of marks for attendance

| Percentage of Attendance | Theory | Practical |
|---|---|---|
| 95 – 100 | 4 | 2 |

| | | |
|---|---|---|
| 90 – 94 | 3 | 1.5 |
| 85 – 89 | 2 | 1 |
| 80 – 84 | 1 | 0.5 |
| Less than 80 | 0 | 0 |

**Sessional Exams**

Two sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical sessional examinations is given below. The average marks of two sessional exams shall be computed for internal assessment as per the requirements given in tables.

**Question Paper Pattern for Theory Sessional Examinations**

For subjects having University Examination

I. Multiple Choice Questions (MCQs)
(Answer all the questions) = 10 X 1 = 10
I. Long Answers (Answer 1 out of 2) = 1 X 10 = 10
II. Short Answers (Answer 2 out of 3) = 2 X 5 = 10

Total = **30 marks**

For subjects having Non University Examination

I. Long Answers (Answer 1 out of 2) = 1 X 10 = 10
II. Short Answers (Answer 4 out of 6) = 4 X 5 = 20

Total = **30 marks**

Question paper pattern for practical sessional examinations

I. Synopsis = 10
II. Experiments = 25
III. Viva voce = 05

Total = **40 marks**

Table – VII. Tentative schedule of end semester examinations

| Semester | For Regular Candidates | For Failed Candidates |
|---|---|---|
| V | November / December | May / June |
| VI | May / June | November / December |

Question paper pattern for end semester theory examinations

For 75 marks paper
(Answer all the questions)

I. Multiple Choice Questions (MCQs) = 20 X 1 = 20
I. Long Answers (Answer 2 out of 3) = 2 X 10 = 20
II. Short Answers (Answer 7 out of 9) = 7 X 5 = 35
III. **Total = 75 marks**

Question paper pattern for end semester practical examinations

I. Synopsis = 05
II. Experiments = 25
III. Viva voce = 05

**Total = 35 marks**

**Award of Ranks**

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the B.Pharm program shall not be eligible for award of ranks.Moreover, the candidates should have completed the B. Pharm program in minimum prescribed number of years, (four years) for the award of Ranks.

**Award of degree**
Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

## SYLLABUS OF III B.PHARM. (SEMESTER - V)

### BP501T. MEDICINAL CHEMISTRY – II (Theory)

**45 Hours**

**Scope:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Objectives:** Upon completion of the course the student shall be able to
1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

**Course Content:**
Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

**UNIT- I** 10 Hours

**Antihistaminic agents:** Histamine, receptors and their distribution in the human body
**H1–antagonists:** Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamine Succinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Cromolyn sodium H2-antagonists: Cimetidine*, Famotidine, Ranitidin.
Gastric Proton pump inhibitors: Omeprazole, Lansoprazole.
**Anti-neoplastic agents:**
**Alkylating agents:** Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa
**Antimetabolites:** Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine
**Antibiotics:** Dactinomycin, Daunorubicin, hydrochloride, Doxorubicin hydrochloride, Bleomycin
**Plant products:** Etoposide, Vinblastin sulphate, Vincristin sulphate
**Miscellaneous:** Cisplatin, Mitotane.

**UNIT – II** 10 Hours

**Anti-anginal**:
**Vasodilators:** Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.
**Calcium channel blockers:** Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

**Diuretics:**
**Carbonic anhydrase inhibitors**: Acetazolamide*, Methazolamide, Dichlorphenamide.

**Thiazides:** Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,
**Loop diuretics:** Furosemide*, Bumetanide, Ethacrynic acid.
**Potassium sparing Diuretics**: Spironolactone, Triamterene, Amiloride.
**Osmotic Diuretics**: Mannitol
**Anti-hypertensive Agents**: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide,Minoxidil, Reserpine, Hydralazine hydrochloride.

**UNIT- III** 10 Hours

**Anti-arrhythmic Drugs**: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol.
**Anti-hyperlipidemic agents**: Clofibrate, Lovastatin, Cholesteramine and Cholestipol
**Coagulant & Anticoagulants**: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel
**Drugs used in Congestive Heart Failure:** Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.

**UNIT – V** 07 Hours

**Antidiabetic agents:**
Insulin and its preparations
**Sulfonyl ureas:** Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride.
**Biguanides:** Metformin.
**Thiazolidinediones:** Pioglitazone, Rosiglitazone.
**Meglitinides:** Repaglinide, Nateglinide.
**Glucosidase inhibitors:** Acrabose, Voglibose.
**Local Anesthetics:** SAR of Local anesthetics
**Benzoic Acid derivatives**; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.
**Amino Benzoic acid derivatives**: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.
**Lidocaine/Anilide derivatives**: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.
**Miscellaneous**: Phenacaine, Diperodon, Dibucaine.

**Recommended Books (Latest Editions)**


1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.


## BP502T. INDUSTRIAL PHARMACY-I (Theory)

5 Hours

**Scope:** Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
**Objectives:** Upon completion of the course the student shall be able to
1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

**Course content:** **3 hours/ week**

**UNIT-I** **07 Hours**
**Preformulation Studies:** Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.
***a. Physical properties:*** Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism
***b. Chemical Properties:*** Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs & its significant Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

**UNIT-II** **10 Hours**
**Tablets:**
a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipment's and tablet tooling.
b. Tablet coating: Types of coating, coating materials, formulation of coating
composition, methods of coating, equipment employed and defects in coating.
c. Quality control tests: In process and finished product tests
**Liquid orals:** Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

**UNIT-III** **08 Hours**
**Capsules:**
a. ***Hard gelatin capsules:*** Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.
b. ***Soft gelatin capsules:*** Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.
**Pellets:** Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets.

**UNIT-IV** **10 Hours**
**Parenteral Products:**
a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity
b. Production procedure, production facilities and controls, aseptic processing
c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.
d. Containers and closures selection, filling and sealing of ampoules, vials and infusion
fluids. Quality control tests of parenteral products.
**Ophthalmic Preparations:** Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations.

**UNIT-V** **10 Hours**
**Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.
**Pharmaceutical Aerosols:** Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.
**Packaging Materials Science:** Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

**BP 506 P. Industrial Pharmacy I (Practical)** **4 Hours/week**

1. Preformulation studies on paracetamol/aspirin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Quality control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

**Recommended Books: (Latest Editions)**

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

## BP503T. PHARMACOLOGY-II (Theory)

45 Hours

**Scope:** This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

**Objectives:** Upon completion of this course the student should be able to

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

**Course Content:**

**UNIT-I** 10 hours

1. Pharmacology of drugs acting on cardio vascular system

a. Introduction to hemodynamic and electrophysiology of heart.
b. Drugs used in congestive heart failure
c. Anti-hypertensive drugs.
d. Anti-anginal drugs.
e. Anti-arrhythmic drugs.
f. Anti-hyperlipidemic drugs.

**UNIT-II** 10 hours

1. Pharmacology of drugs acting on cardio vascular system
a. Drug used in the therapy of shock.
b. Hematinics, coagulants and anticoagulants.
c. Fibrinolytics and anti-platelet drugs
d. Plasma volume expanders
2. Pharmacology of drugs acting on urinary system
a. Diuretics
b. Anti-diuretics.

**UNIT-III** 10 hours

3. Autocoids and related drugs
a. Introduction to autacoids and classification
b. Histamine, 5-HT and their antagonists.
c. Prostaglandins, Thromboxanes and Leukotrienes.
d. Angiotensin, Bradykinin and Substance P.
e. Non-steroidal anti-inflammatory agents
f. Anti-gout drugs
g. Antirheumatic drugs

**UNIT-IV** 08 hours

**4. Pharmacology of drugs acting on endocrine system**
a. Basic concepts in endocrine pharmacology.
b. Anterior Pituitary hormones- analogues and their inhibitors.
c. Thyroid hormones- analogues and their inhibitors.
d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.
d. Insulin, Oral Hypoglycemic agents and glucagon.
e. ACTH and corticosteroids.

**UNIT-V** 07 hours

**5. Pharmacology of drugs acting on endocrine system**
a. Androgens and Anabolic steroids.
b. Estrogens, progesterone and oral contraceptives.
c. Drugs acting on the uterus.
**6. Bioassay**
a. Principles and applications of bioassay.
b. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine,digitalis histamine and 5-HT
c. Types of bioassay

## BP507P. PHARMACOLOGY-II (Practical) 4Hrs/Week

1. Introduction to in-vitro pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.

9. Bioassay of serotonin using rat fundus strip by three-point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four-point bioassay.
11. Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

*Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares (Expharma, Excology etc.,) and videos*

**Recommended Books (Latest Editions)**


1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd,New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.


## BP504 T. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)

45 Hours

**Scope:** The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also, this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

**Objectives:** Upon completion of the course, the student shall be able

1. to know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. to understand the preparation and development of herbal formulation.
3. to understand the herbal drug interactions
4. to carryout isolation and identification of phytoconstituents

**Course Content:**

**UNIT-I** 7 Hours

**Metabolic pathways in higher plants and their determination**

a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway.
b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

**UNIT-II** 14 Hours

General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites:

**Alkaloids:** Vinca, Rauwolfia, Belladonna, Opium,
**Phenylpropanoids and Flavonoids:** Lignans, Tea, Ruta
**Steroids, Cardiac Glycosides & Triterpenoids**: Liquorice, Dioscorea, Digitalis
**Volatile oils**: Mentha, Clove, Cinnamon, Fennel, Coriander,
**Tannins:** Catechu, Pterocarpus
**Resins:** Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony
**Glycosides:** Senna, Aloes, Bitter Almond
**Iridoids, Other terpenoids & Naphthaquinones:** Gentian, Artemisia, taxus, carotenoids

**UNIT-III** 06 Hours

Isolation, Identification and Analysis of Phytoconstituents
a) Terpenoids: Menthol, Citral, Artemisin
b) Glycosides: Glycyrhetinic acid & Rutin
c) Alkaloids: Atropine,Quinine,Reserpine,Caffeine
d) Resins: Podophyllotoxin, Curcumin

**UNIT-IV** 10 Hours

Industrial production, estimation and utilization of the following phytoconstituents:
Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine

**UNIT V** 8 Hours

**Basics of Phytochemistry**

Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.

## BP 508 P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical)

4 Hours/Week

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
a. Caffeine - from tea dust.
b. Diosgenin from Dioscorea
c. Atropine from Belladonna
d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstitutents by TLC
6. Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v)Myrrh

**Recommended Books: (Latest Editions)**

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan,
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.

12. Text Book of Biotechnology by Vyas and Dixit.

## BP 505 T. PHARMACEUTICAL JURISPRUDENCE (Theory) 45 Hours

**Scope:** This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

**Objectives**: Upon completion of the course, the student shall be able to understand:

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

### Course Content:

**UNIT-I** 10 Hours

**Drugs and Cosmetics Act, 1940 and its rules 1945:**

Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties.

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

**UNIT-II** 10 Hours

**Drugs and Cosmetics Act, 1940 and its rules 1945.**

Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors

**UNIT-III** 10 Hours

**Pharmacy Act –1948**: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties

**Medicinal and Toilet Preparation Act –1955**: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.

**Narcotic Drugs and Psychotropic substances Act-1985 and Rules**: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

**UNIT-IV** 08 Hours

**Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties

**Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties

**National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)- 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

**UNIT-V** 07 Hours

**Pharmaceutical Legislations** – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee

**Code of Pharmaceutical ethics** D efinition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath

**Medical Termination of Pregnancy Act**

**Right to Information Act**

**Introduction to Intellectual Property Rights (IPR)**

**Recommended books: (Latest Edition)**

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9. Bare Acts of the said laws published by Government. Reference books (Theory)

# VI SEMESTER

**BP601T. MEDICINAL CHEMISTRY – III (Theory)** **45 Hours**

**Scope:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.

**Objectives:** Upon completion of the course student shall be able to

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

**Course Content:** Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)

**UNIT - I**

10 Hours

**Antibiotics**

Historical background, Nomenclature, stereochemistry, Structure activity relationship, chemical degradation classification and important products of the following classes.

- β-Lactam antibiotics: Penicillin, Cepholosporins, β- Lactamase inhibitors, Monobactams
- Aminoglycosides: Streptomycin, Neomycin, Kanamycin

- Tetracyclines: Tetracycline, Chlortetracycline, Minocycline, Doxycycline

**UNIT – II** 10 Hours

**Antibiotics**

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

**Macrolide:** Erythromycin Clarithromycin, Azithromycin.
**Miscellaneous:** Chloramphenicol*, Clindamycin.
**Prodrugs:** Basic concepts and application of prodrugs design.
**Antimalarials:** Etiology of malaria.
**Quinolines:** SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.
**Biguanides and dihydro triazines:** Cycloguanil pamoate, Proguanil.
**Miscellaneous:** Pyrimethamine, Artesunete, Artemether, Atovoquone.

**UNIT – III** 10 Hours

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycine, Capreomycin sulphate. Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid,Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents:

Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

**UNIT – IV** 08 Hours

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.

**Sulphonamides and Sulfones**

Historical development, chemistry, classification and SAR of Sulfonamides:

Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

**Folate reductase inhibitors:** Trimethoprim*, Cotrimoxazole.
**Sulfones:** Dapsone*.

**UNIT – V** 07 Hours

**Introduction to Drug Design**

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis.

Pharmacophore modeling and docking techniques.

**Combinatorial Chemistry:** Concept and applications chemistry: solid phase and solution phase synthesis.

## BP607P. MEDICINAL CHEMISTRY- III (Practical)

**4 Hours / week**

**I Preparation of drugs and intermediates**

1 Sulphanilamide
2 7-Hydroxy, 4-methyl coumarin
3 Chlorobutanol
4 Triphenyl imidazole
5 Tolbutamide
6 Hexamine

**II Assay of drugs**

1 Isonicotinic acid hydrazide
2 Chloroquine
3 Metronidazole
4 Dapsone
5 Chlorpheniramine maleate
6 Benzyl penicillin

**III** Preparation of medicinally important compounds or intermediates byMicrowave irradiation technique

**IV** Drawing structures and reactions using chem draw®

**V** Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

**Recommended Books (Latest Editions)**


1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.


## BP602 T. PHARMACOLOGY-III (Theory)

**45 Hours**

**Scope:** This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition, emphasis on the principles of toxicology and chronopharmacology.

**Objectives:** Upon completion of this course the student should be able to:

1. understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. comprehend the principles of toxicology and treatment of various poisonings and
3. appreciate correlation of pharmacology with related medical sciences.

**Course Content:**

**UNIT-I** 10 hours

**1. Pharmacology of drugs acting on Respiratory system**

a. Anti -asthmatic drugs
b. Drugs used in the management of COPD
c. Expectorants and antitussives

d. Nasal decongestants
e. Respiratory stimulants

**2. Pharmacology of drugs acting on the Gastrointestinal Tract**

a. Antiulcer agents.
b. Drugs for constipation and diarrhoea.
c. Appetite stimulants and suppressants.
d. Digestants and carminatives.
e. Emetics and anti-emetics.

**UNIT-II** 10 hours

**3. Chemotherapy**

a. General principles of chemotherapy.
b. Sulfonamides and cotrimoxazole.
c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

**UNIT-III** 10 hours

**3. Chemotherapy**

a. Antitubercular agents
b. Antileprotic agents
c. Antifungal agents
d. Antiviral drugs
e.Anthelmintics
f. Antimalarial drugs
g. Antiamoebic agents

**UNIT-IV** 08 hours

**3. Chemotherapy**

l. Urinary tract infections and sexually transmitted diseases.
m. Chemotherapy of malignancy.

**4. Immunopharmacology**

a. Immunostimulants
b. Immunosuppressant
Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

**UNIT-V** 07 hours

**5. Principles of toxicology**

**a.** Definition and basic knowledge of acute, subacute and chronic toxicity.
**b.** Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity
**c.** General principles of treatment of poisoning
**d.** Clinical symptoms and management of barbiturates, morphine, organophosphosphorus compound and lead, mercury and arsenic poisoning.

**6. Chronopharmacology**

a. Definition of rhythm and cycles.
b. Biological clock and their significance leading to chronotherapy.

## BP 608 P. PHARMACOLOGY-III (Practical)

**4Hrs/Week**

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.

4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology (student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

**Experiments are demonstrated by simulated experiments/videos*

**Recommended Books (Latest Editions)**


1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams &Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.


## BP603 T. HERBAL DRUG TECHNOLOGY (Theory)

**45 hours**

**Scope:** This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

**Objectives:** Upon completion of this course the student should be able to:

1. understand raw material as source of herbal drugs from cultivation to herbal drug product
2. know the WHO and ICH guidelines for evaluation of herbal drugs
3. know the herbal cosmetics, natural sweeteners, nutraceuticals
4. appreciate patenting of herbal drugs, GMP .

### Course content:

**UNIT-I** 11 Hours

**Herbs as raw materials**

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs
Selection, identification and authentication of herbal materials Processing of herbal raw material

**Biodynamic Agriculture**

Good agricultural practices in cultivation of medicinal plants including Organic farming.
Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

**Indian Systems of Medicine**

a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy
b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika,Churna, Lehya and Bhasma.

**UNIT-II** 7 Hours

**Nutraceuticals**

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

**Herbal-Drug and Herb-Food Interactions:** General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

**UNIT-III** 10 Hours

**Herbal Cosmetics**

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

**Herbal excipients:**

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

**Herbal formulations :**

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

**UNIT- IV** 10 Hours

**Evaluation of Drugs** WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.

**Patenting and Regulatory requirements of natural products:**

a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy

b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

**Regulatory Issues -** Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

**UNIT-V** 07 Hours

**General Introduction to Herbal Industry**

Herbal drugs industry: Present scope and future prospects.

A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

**Schedule T – Good Manufacturing Practice of Indian systems of medicine**

Components of GMP (Schedule – T) and its objectives

Infrastructural requirements, working space, storage area, machinery and equipment's, standard operating procedures, health and hygiene, documentation and records.

## BP 609 P. HERBAL DRUG TECHNOLOGY (Practical)

**4 hours/ week**

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias

7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids

**Recommended Books: (Latest Editions)**

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

## BP 604 T. BIOPHARMACEUTICS AND PHARMACOKINETICS (Theory)

**45 Hours**

**Scope:** This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems raised therein.

**Objectives:** Upon completion of the course student shall be able to:

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. Understand various pharmacokinetic parameters, their significance & applications.

**Course Content:**

**UNIT-I** 10 Hours

**Introduction**

**Biopharmaceutics to Absorption**; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes, **Distribution** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

**UNIT- II** 10 Hours

**Elimination:** Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

**Bioavailability and Bioequivalence:** Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

**UNIT- III** 10 Hours

**Pharmacokinetics:** Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - KE ,t1/2,Vd,AUC,Ka, Clt and CLR-definitions methods of eliminations, understanding of their significance and Application

**UNIT- IV** 08 Hours

***Multicompartment models:*** Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and mainetnance doses and their significance in clinical settings.

**UNIT- V** 07 Hours

**Nonlinear Pharmacokinetics:** a. Introduction, b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

**Recommended Books: (Latest Editions)**

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition, Prentice-Hall Inernational edition. USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal, Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: ByMilo Glbaldi Donald, R. Mercel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and
9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania
11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
12. Remington's Pharmaceutical Sciences, ByMack Publishing Company, Pennsylvnia

## BP 605 T. PHARMACEUTICAL BIOTECHNOLOGY (Theory)

**45 Hours**

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
- Biotechnology has already produced transgenic crops and animals and the future promises lot more.
- It is basically a research-based subject.

**Objectives:** Upon completion of the subject student shall be able to;

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries
4. Appreciate the use of microorganisms in fermentation technology

**Unit I** 10 Hours

a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.
c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
d) Brief introduction to Protein Engineering.
e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.
f) Basic principles of genetic engineering.

**Unit II** 10 Hours

a) Study of cloning vectors, restriction endonucleases and DNA ligase.
b) Recombinant DNA technology. Application of genetic engineering in medicine.
c) Application of r DNA technology and genetic engineering in the production of:
i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.
d) Brief introduction to PCR

**Unit III** 10 Hours

Types of immunity- humoral immunity, cellular immunity
a) Structure of Immunoglobulins
b) Structure and Function of MHC
c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.
d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.
e) Storage conditions and stability of official vaccines
f) Hybridoma technology- Production, Purification and Applications
g) Blood products and Plasma Substitutes.

**Unit IV** 08 Hours

a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.
b) Genetic organization of Eukaryotes and Prokaryotes
c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.
d) Introduction to Microbial biotransformation and applications.
**e)** Mutation: Types of mutation/mutants.

**Unit V** 07 Hours

a) Fermentation methods and general requirements, study of media, equipment's, sterilization methods, aeration process, stirring.
b) Large scale production fermenter design and its various controls.
c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,
d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.

**Recommended Books (Latest edition):**

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi.

## BP606T PHARMACEUTICAL QUALITY ASSURANCE (Theory)

**45 Hours**

**Scope:** This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

**Objectives:** Upon completion of the course student shall be able to:

- understand the cGMP aspects in a pharmaceutical industry
- appreciate the importance of documentation
- understand the scope of quality certifications applicable to pharmaceutical industries
- understand the responsibilities of QA & QC departments

**Course content:**

**UNIT – I** 10 Hours

**Quality Assurance and Quality Management concepts:** Definition and concept of Quality control, Quality assurance and GMP

**Total Quality Management (TQM):** Definition, elements, philosophies

**ICH Guidelines**: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines
**Quality by design (QbD)**: Definition, overview, elements of QbD program, tools
**ISO 9000 & ISO14000**: Overview, Benefits, Elements, steps for registration
**NABL accreditation:** Principles and procedures

**UNIT - II** 10 Hours

**Organization and personnel:** Personnel responsibilities, training, hygiene and personal records.

**Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

**Equipments and raw materials:** Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

**UNIT – III** 10 Hours

**Quality Control:** Quality control test for containers, rubber closures and secondary packing materials.

**Good Laboratory Practices:** General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

**UNIT – IV** 08 Hours

**Complaints:** Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

**Document maintenance in pharmaceutical industry:** Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

**UNIT – V** 07 Hours

**Calibration and Validation:** Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

**Warehousing:** Good warehousing practice, materials management

**Recommended Books: (Latest Edition)**

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, SandyWeinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol IWHO Publications.
4. A guide to Total QualityManagement- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total QualityManagement – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

## DETAILS OF SUBJECT TEACHERS

| S. No | Name of the Subject | Name of the Teacher | Designation and Department | Mobile No. | e-mail |
|---|---|---|---|---|---|
| 1. | Medicinal Chemistry-II | Dr. S. Gomathi | Asoct. Professor, Dept. of Pharm. Chemistry | 9790095279 | gomathiswaminathan@jssuni.edu.in |
| 2. | Industrial Pharmacy-1 | Dr.V.Senthil | Professor, Dept. of Pharmaceutics | 9842650602 | senthil.v@jssuni.edu.in |
| 3. | Pharmacology-II | Mr.B.Shivarama krishnan | Asst. Professor, Dept. of Pharmacology | 9620001429 | shivaram.krishna@jssuni.edu.in |
| 4. | Pharmacognosy-II | Dr Kalakotla Shanker | Asst. Professor, Dept. of Pharmacognosy | 8374602737 | drshankar@jssuni.edu.in |
| 5. | Pharmaceutical Jurisprudence | Ms.S.Priyadarshini | Lecturer, Dept. of Pharmacognosy | 9443801876 | priya@jssuni.edu.in |
| 6. | Pharmaceutical Biotechology | Dr. P. Vasanth raj | Asst. Professor, Dept. of Pharmacy Practice | 9500793944 | vasanth@jssuni.edu.in |
| 7. | Medicinal Chemistry-III | Dr. S. Jubie | Asoct. Professor, Dept. of Pharm. Chemistry | 9894618588 | jubie@jssuni.edu.in |
| 8. | Biopharmaceutics and Pharmacokinetics | Mr. R.Arun | Lecturer, Dept. of Pharmaceutics | 7402222019 | arun.r@jssuni.edu.in |

| | |
|---|---|
| **Name of the Subject** | Medicinal Chemistry-II (Theory) |
| **Name of the Faculty** | Dr. Gomathy Subramanian , M. Pharm., Ph.D., |
| **Designation, Department** | Assistant Professor, Department of Pharmaceutical Chemistry |
| **Mobile Number** | 9486433876 |
| **E-Mail i.d.** | gomathys@jssuni.edu.in |

**Scope, Course Objectives and Course Outcomes**

**Scope:** This course is designed to impart knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on chemistry, mechanism, structure activity relationships and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Objectives:** The primary objectives of this course are to

1. To study the fundamentals of Medicinal Chemistry
2. To understand the chemistry of drugs with respect to their biological activity
3. To help the students to understand the mechanism, drug metabolic pathways and therapeutic value of drugs.
4. To know the general structural features of drugs and structural activity relationship of important class of drugs
5. To write the chemical synthesis of important drugs

**Course Outcomes (COs):** At completion of Medicinal Chemistry-II, students will be able to:

CO 1 : Recognize the structure of drugs
CO 2 : To predict the therapeutic action of drugs
CO 3 : Understand chemical synthetic reactions for selected drugs
CO 4 : Knowledge on the structural activity relationship and structural influences on pharmacological actions
CO 5 : Describe the mechanism, use and mode of application of the important drugs

**LECTURE PLAN – Abstract**

| Sessional | No. of Hours of Didactic Lecture | No. of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|
| I | 24 | 3 | 27 |
| II | 21 | 3 | 24 |
| **Total No. of Hours** | **45** | **6** | **51** |

**I SESSIONAL: 24 Lectures + 3 Activities**

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **Unit-1: ANTI-HISTAMINIC AGENTS & ANTI-NEOPLASTIC AGENTS** | | **(10)** |
| 1. | **Anti-Histaminic Agents:** Histamine, receptors and their distribution | |
| 2. | **H1-antagonists**: Diphenhydramine HCl*, Dimenhydrinate, doxylamine succinate, clemastine fumarate, diphenylphyraline HCl, , | **05** |

| | | |
|---|---|---|
| *3.* | Tripelenamine HCl, chlorcyclizine HCl, meclizine HCl, buclizine HCl, Chlorpheniramine maleate. | |
| *Tutorial-1* | -- | |
| 3. | triprolidine HCl*, phenidamine tartarate, Promethazine HCl, trimeprazine tartarate, cyproheptadine HCl | |
| 4. | Azatidine maleate, astemizole, loratadine, cetirizine, cromolyn sodium | |
| 5. | **H2-antagonists:** Cimetidine*, famotidine, ranitidine | |
| 6. | **Gastric proton pump inhibitors:** omeprazole, lansoprazole | |
| 7. | **Anti-Neoplastic agents:**<br>**Alkylating agents**: Meclorethamine*, cyclophosphamide, melphalan, chlorambucil, busulfan, thiotepa. | **05** |
| 8. | **Antimetabolites**: mercaptopurine*, thioguanine, fluorouracil, floxuridine, cytarabine, methotrexate*, azathioprine. | |
| 9. | **Antibiotics**: Dactinomycin, Daunorubicin HCl, Doxorubicin HCl, Bleomycin | |
| 10. | **Plant products:** Etoposide, Vinblastin sulphate, vincristine sulphate<br>**Miscellaneous**: Cisplatin, Mitotane. | |
| **Unit-II: ANTI-ANGINAL AGENTS, DIURETICS & ANTI-HYPERTENSIVES** | | **(10)** |
| 1. | **Anti-anginal agents:**<br>**Vasodilators:** Amyl nitrite, Nitroglycerine*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, dipyridamole. | **03** |
| 2. | **Calcium channel blockers:** Verapamil, bepridil HCl, Diltiazem HCl, Nifedipine. | |
| 3. | Amlodipine, Felodipine, nicardipine, nimodipine | |
| 4. | **Diuretics: Carbonic anhydrase inhibitors**: Acetazolamide*, methazolamide, dichlorphenamide. | **04** |
| 5. | **Thiazides:** chlorthiazide*, hydrochlorthiazide, hydroflumethiazide, cyclothiazide. | |
| 6. | **Loop diuretics:** Furosemide*, bumetanide, Ethacrynic acid | |
| 7. | **Potassium sparing diuretics:** Spiranolactone, triamterene, amiloride. | |
| 8. | **Anti-hypertensive agents:**<br>Timolol, captopril, Lisinopril, enalapril, benzapril HCl, Quinapril HCl | **03** |
| 9. | Methyldopate HCl*, clonidine HCl, Guanethidine monosulphate Guanbenz acetate | |
| 10. | Sodium nitroprusside, diazoxide, Minoxidil, reserpine, hydralazine HCl. | |
| **Unit-III : ANTI-ARRHYTHMIC DRUGS, ANTI-HYPERLIPIDEMICS & CHF DRUGS** | | **(10)** |
| 1. | **Anti-arrhythmic drugs:**<br>Quinidine sulphate, procainamide HCl, | **04** |
| 2. | disopyramide phosphate* Phenytoin sodium | |
| 3. | lidocaine HCl, tocainide HCl | |
| 4. | Mexiletine HCl, Lorcainide HCl, Amiodarone, Sotalol. | |
| Activity1 | Descriptive Test | |
| Activity2 | MCQ Test (Unit-I) | |
| Activity3 | MCQ Test (Unit-II) | |

**I SESSIONAL: 21 Lectures + 3 Activities**

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| 5. | **ANTI-HYPERLIPIDEMIC AGENTS:** Clofibrate, lovastatin, cholesteramine and cholestipol. | **06** |
| 6. | **Coagulant:** Menodione, Acetomenadione | |
| 7. | **Anti-coagulant**: Warfarin*, Anisindione | |
| 8. | **DRUGS USED IN CONGESTIVE HEART FAILURE:** Digoxin | |
| 9. | Digitoxin, Nesiritide, | |
| 10. | bosentan, tezosentan | |
| **Unit-IV: DRUGS ACTING ON ENDOCRINE SYSTEM** | | **(08)** |

| | | |
|---|---|---|
| 1. | Sex hormones: testosterone, nandralone, progestrones | 02 |
| 2. | Oestriol, oestradiol, oestrione, diethyl stilbestrol | |
| 3. | Drugs for erectile dysfunction: Sildenafil, levonorgestrol | 04 |
| 4. | *Oral contraceptives:* Mifepristone, Norgestril, Levonorgestrol | |
| 5. | Corticosteroids: Cortisone, hydrocortisone, prednisolone | |
| 6. | Betamethasone, dexamethasone | |
| 7. | Thyroid and anti-thyroid drugs: L-thyroxine, L-thyronine | 02 |
| 8. | Propylthiouracil, methimazole | |
| **Unit-V: ANTI-DIABETIC AGENTS & LOCAL ANESTHETICS** | | **(07)** |
| 1. | **Anti-diabetic agents:** Insulin and its preparations<br>**Sulphonyl urea's:** Tolbutamide*, Chlorpropamide, glipizide, glimepiride | 03 |
| 2. | **Thiazolidinediones:** Pioglitazone, Rosiglitazone<br>**Meglitinides:** Repaglinide, Nateglinide | |
| 3. | **Glucosidase inhibitors:** Acrabose, Voglibose | |
| 4. | **Local anesthetics:** SAR of local anesthetics | 04 |
| 5. | **Benzoic acid derivatives:** Cocaine, hexylcaine, meprylcaine, cyclomethycaine, piperocaine | |
| 6. | **Amino benzoic acid derivatives:** Benzocaine*, butamben, procaine*, butacaine, propoxycaine, tertracaine, benoxinate | |
| 7. | **Lidocaine/anilide derivatives:** lignocaine, mepivacaine, prilocaine, etidocaine<br>**Miscellaneous:** Phenacaine, diperidon, dibucaine* | |
| Activity-1 | MCQ Test | |
| Activity-2 | MCQ Test | |
| Activity-3 | Descriptive Test | |

**Text Books**


1. Foye's Principles of Medicinal Chemistry, 5th Edition.
2. Burger's Medicinal Chemistry, Vol. I to IV.
3. Textbook of Medicinal Chemistry, Volume I by Ilango and Valentina


**Reference Books**


1. Wilson and Gisvold's Organic medicinal and Pharmaceutical Chemistry, 11th Edition.
2. Introduction to principles of drug design- Smith and Williams.
3. Remington's Pharmaceutical Sciences, 20th Edition.
4. Martindale's extra pharmacopoeia.
5. Organic Chemistry by I.L. Finar, Vol. II.
6. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1 to 5.
7. Indian Pharmacopoeia 1996 and 2007 Editions.


*** *** ***

| | |
|---|---|
| **Name of the Subject** | Pharmacology II (Theory) |
| **Name of the Faculty** | Mr. B. Shivaramakrishnan M.Pharm |
| **Designation, Department** | Assistant Professor, Department of Pharmacology |
| **Mobile Number** | +91-9620001429 |
| **e-Mail i.d.** | shivaram.krishna@jssuni.edu.in |

## Scope, Course Objectives and Course Outcomes

**Scope:** Pharmacology II provides an opportunity for the students to learn about different classes of drugs with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, routes of administration, precautions, contraindications and interaction with other drugs.

**Objectives:** The primary objectives of this course are to

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

**Course Outcomes (COs):** At completion of this course it is expected that the students will be able to

CO 1 : Identify and explain the pharmacodynamics and pharmacokinetic properties of drugs of various categories

CO 2 : Recognize the adverse effects of drugs

CO 3 : Avoid adverse drug reactions

CO 4 : Recognize indications of different drugs and avoid contraindications

CO 5 : Provide vital information to patients about drugs during patient counselling

CO 6 : Design & execute animal experiments to identify the pharmacological properties of known drugs and unknown samples.

### LECTURE PLAN – Abstract

| Sessional | No. of Hours of Didactic Lecture | No of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|
| I | 26 | 5 | 31 |
| II | 20 | 5 | 25 |
| Total No. of Hours | 46 | 10 | 56 |

I SESSIONAL: 26 Lectures + 5 Activity

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **Unit-1: Pharmacology of drugs acting on cardiovascular system** | | 10 |
| 1. | Introduction to haemodynamics & electrophysiology of heart | |
| 2. | Drugs used in congestive heart failure | |
| 3. | Anti-hypertensive drugs | |
| 4. | Anti-anginal drugs | |
| 5. | Anti-arrhythmic drugs | |
| 6. | Anti-hyperlipidemic drugs | |
| **Unit-2: Pharmacology of drugs acting on cardiovascular system** | | 06 |
| 1. | Drugs used in the therapy of shock | |
| 2. | Haematinics | |
| 3. | Coagulants | |
| 4. | Anti-coagulants | |
| 5. | Fibrinolytics | |
| 6. | Anti-platelet drugs | |
| 7. | Plasma volume expanders | |
| **Unit-3: Pharmacology of drugs acting on Urinary system** | | 04 |
| 1. | Diuretics | |
| 2. | Anti-diuretics | |
| **Unit-4: Autocoids & Related drugs** | | 06 |
| 1. | Introduction to autacoids and classification | |
| 2. | Histamine | |
| 3. | 5-HT and their antagonist | |
| 4. | Prostaglandins | |
| 5. | Thromboxanes and Leukotrienes | |
| 6. | Angiotensin | |
| Activity-1 | MCQ Test | |
| Activity-2 | MCQ Test | |
| Activity-3 | MCQ Test | |
| Activity-4 | MCQ Test | |
| Activity-5 | Revision | |

II SESSIONAL: 20 Lectures + 5 Activities

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **Unit-4: Autocoids & Related drugs** | | 04 |
| 1. | Bradykinin and Substance P | |
| 2. | Non-steroidal Anti-inflammatory agents | |
| 3. | Anti-gout drugs | |
| 4. | Anti-rheumatic drugs | |
| **Unit- 5: Pharmacology of drugs acting on endocrine system** | | 08 |
| 1. | Basic concepts in endocrine pharmacology | |
| 2. | Anterior pituitary hormones- analogues and their inhibitors | |
| 3. | Thyroid hormones- analogues and their inhibitors | |
| 4. | Hormones regulating plasma calcium level- Parathormone, Calcitonin & Vitamin-D | |
| 5. | Insulin and Glucagon | |
| 6. | ACTH and Corticosteroids | |
| 7. | Oral Hypoglycemic agents | |
| **Unit- 5: Pharmacology of drugs acting on endocrine system** | | 04 |
| 8. | Androgens and Anabolic steroids | |
| 9. | Estrogen & progesterone | |
| 10. | Oral contraceptives | |
| 11. | Drugs acting on uterus | |
| **Unit-6: Bioassay** | | 04 |
| 1. | Principles and Applications of bioassay | |
| 2. | Types of bioassay | |
| 3. | Bioassay of Insulin, Oxytocin, Vasopressin, ACTH | |
| 4. | Bioassay of d-tubocurarine, Digitalis, Histamine and 5-HT | |
| Activity-1 | MCQ Test | |
| Activity-2 | MCQ Test | |
| Activity-3 | Class Test | |
| Activity-4 | Revision | |
| Activity-5 | Exam Preparation & Time management skills | |

**Text Books**


1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.


**Reference Books**


1. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill.
2. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
3. K.D.Tripathi. Essentials of Medical Pharmacology. JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
4. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher


*** *** ***

| | |
|---|---|
| **Name of the Subject** | Industrial Pharmacy-1 (BP502T) |
| **Course/ Semester** | B.Pharm, Vth Semester |
| **Name of the Faculty** | Dr V.Senthil, M.Pharm, Ph.D, PGDCA |
| **Designation, Department** | Professor, Pharmaceutics |
| **Mobile Number** | 9842650602 |
| **e-Mail i.d.** | senthil.v@jssuni.edu.in |

## Scope, Course Objectives and Course Outcomes

**Scope**: Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

**Objectives:** Upon completion of the course the student shall be able to

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

**Course Outcomes (COs):** At completion of this course it is expected that the students will be able to
CO 1: Define the important of preformulation
CO 2: The students to understand the formulation and manufacturing aspects of various dosage forms
CO 3: The students will learn how to use the physicochemical properties of the drug/ excipients
CO 4: To development of pharmaceutical dosage forms.
CO5: Describe the common measure use in quality.

**LECTURE PLAN – Abstract**

| Sessional | No. of Hours of Didactic Lecture | No of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|
| I | 23 | 3 | 23 |
| II | 22 | 3 | 22 |
| Total No. of Hours | 45 | 6 | 51 |

**I SESSIONAL** **LECTURE PLAN 23 Lectures+ 3 Activities**

| Lecture No. | Lecture Details | |
|---|---|---|
| UNIT-1 | Preformulation Studies (08) | Hours |
| 1. | **Introduction** | 08 |
| 2. | **Preformulation Studies:** Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances. | |
| 3. | ***a. Physical properties:*** particle size, shape | |
| 4. | flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism | |
| 5. | **b. Chemical Properties:** Hydrolysis, oxidation, reduction, Racemisation, polymerization, | |

| | | |
|---|---|---|
| 6. | BCS classification of drugs | |
| 7. | Application of preformulation considerations in the development of ***solid, liquid dosage*** forms and its impact on stability of dosage forms. | |
| 8. | Application of preformulation considerations in the development of ***oral and parenteral dosage*** forms and its impact on stability of dosage forms. | |
| UNIT-2 | Tablets (10) | |
| 9. | **Tablets: a. Introduction** | 10 |
| 10. | Ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets | |
| 11. | Granulation methods, compression and processing problems | |
| 12. | Equipment's and tablet tooling. | |
| 13. | **b. Tablet coating:** Types of coating, coating materials, formulation of coating materials, | |
| 14. | Method of coating, equipment employed and Defects in coating. | |
| 15. | **c. Quality control tests:** In process and finished product tests | |
| 16. | **Liquid orals:** Formulation and manufacturing consideration of solutions, suspensions and emulsions; Filling and packaging | |
| 17. | evaluation of liquid orals official in pharmacopoeia | |
| Activity1 | MCQ Test | |
| Activity2 | MCQ Test | |
| UNIT-3 | Capsules (08) | |
| 18. | **Capsules:** a. Hard gelatin capsules: Introduction, Extraction of gelatin and production of hard gelatin capsule shells. Filling, | 06 |
| 19. | Finishing and special techniques of formulation of hard gelatin capsules. | |
| 20. | In process and final product quality control tests for capsules. | |
| 21. | **b. Soft gelatin capsules:** Nature of shell and capsule content, importance of base adsorption and minimum/gram factors, production, | |
| 22. | In process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules | |
| Activity 3 | MCQ Test | |

**II SESSIONAL: 22 Lectures + 3 Activities**

| | | |
|---|---|---|
| 23. | **Pellets:** Introduction, formulation requirements, pelletization process, | 02 |
| 24. | equipment's for manufacture of pellets | |
| UNIT-4 | Parenteral Products (10) | 10 |
| 25. | **Parenteral Products: a. Definition**, types, advantages and limitations. | |
| 26. | Preformulation factors and essential requirements, vehicles, importance of isotonicity | |
| 27. | **b. Production procedure**, production facilities and controls | |

| | | |
|---|---|---|
| 28. | **c. Formulation** of injections, sterile powders | |
| 29. | **Formulation** of injections, emulsions, suspensions | |
| 30. | large volume parenteral and lyophilized products | |
| 31. | Sterilization. | |
| 32. | **d. Containers and closures** selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests. | |
| 33. | **Ophthalmic Preparations:** Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; | |
| 34. | Evaluation of ophthalmic preparations | |
| UNIT-5 | Cosmetics (10) | |
| 35. | **Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream | |
| 36. | vanishing cream, tooth pastes, | 10 |
| 37. | Hair dyes and sunscreens. | |
| 38. | **Packaging Materials Science:** Materials used for packaging of pharmaceutical products | |
| 39. | factors influencing choice of containers, | |
| 40. | legal and official requirements for containers | |
| 41. | Stability aspects of packaging materials, Quality control tests | |
| 42. | **Pharmaceutical Aerosols:** Definition, propellants, containers | |
| 43. | Valves, Types of aerosol systems; | |
| 44. | formulation and manufacture of aerosols; | |
| Activity1 | MCQ Test | |
| Activity1 | MCQ Test | |
| Activity1 | MCQ Test | |

**Recommended Books: (Latest Editions)**


1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman& Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman& Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman& Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice


*** *** ***

| | |
|---|---|
| **Name of the Subject** | Pharmacognosy and Phytochemistry - II |
| **Name of the Faculty** | Dr Kalakotla Shankar |
| **Designation, Department** | Assistant Professor, Department of Pharmacognosy |
| **Mobile Number** | 8374602737 |
| **e-Mail i.d.** | drshankar@jssuni.edu.in |

## Scope, Course Objectives and Course Outcomes

**Scope:** The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

**Objectives:** The primary objectives of this subject are,

6. To be familiar with the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
7. To understand the preparation and development of herbal formulation.
8. To understand the herbal drug interactions
9. To carryout isolation and identification of phytoconstituents

**Course Outcomes (COs):** At completion of this subject, it is expected that the students will be able to

CO 1: Define the basic metabolic pathways in higher plants and their role in the production of secondary metabolites

CO 2: Define the general introduction, composition, chemistry & chemical classes, bio sources, therapeutic uses and commercial applications of secondary metabolites.

CO 3: Isolate, Identify and Analysis of various significant Phytoconstituents present in herbals

CO 4: Produce, estimate and utilize the phytoconstituents at Industrial level

CO 5: Extract, isolate, purify, and identify the phytoconstituents by applying the latest techniques like Spectroscopy, chromatography and electrophoresis.

## LECTURE PLAN – Abstract

| Sessional | No. of Hours of Didactic Lecture | No of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|
| I | 27 | 03 | 30 |
| II | 18 | 03 | 21 |
| Total No. of Hours | 45 | 06 | 51 |

I SESSIONAL : 24 Lectures + 3 Activities

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **METABOLIC PATHWAYS** | | **(07)** |
| **Unit-1: Metabolic pathways in higher plants and their determination** | | **07** |
| 1. | Introduction to Pharmacognosy II & Metabolic pathways | |
| 2. | Shikimic acid pathway and formation of different secondary metabolites | |
| 3. | Acetate pathways- Acetate melonate pathway and formation of different secondary metabolites | |
| 4. | Acetate-Mevolanate pathway and its secondary metabolities | |
| 5. | Amino acid pathway and formation of different secondary metabolites | |
| 6. | Study of utilization of radioactive isotopes in the investigation of Biogenetic studies | |
| **METABOLITES** | | **(14)** |
| **Unit-2: General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial application of metabolities** | | **14** |
| 3. | General introduction about alakaloids, Vinca and Rauwolfia | |
| 4. | Belladonna, Opium. | |
| 5. | Phenyl Propanoids and Flavonoids- Lingans, Tea and Ruta. | |
| 6. | Steroids, Cardiac glycosides,& Triterpenoids - Liquorice | |
| 7. | Dioscorea, Digitalis | |
| 8. | Volatile oils: Mentha, clove | |
| 9. | Cinnamon, Fennel, Coriander | |
| 10. | Tannins: Catechu, Pterocarpus | |
| 11. | Resins: Benzoin, Guggul, Ginger | |
| 12. | Asafoetida, Myrrh, Colophony | |
| 13. | Glycosides: Senna, Aloes | |
| 14. | Bitter almond | |
| 15. | Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia | |
| 16. | Taxus, Carotenoids | |
| **PHYTOCONSTITUENTS** | | **(06)** |
| **Unit-3: Isolation, identification and analysis of phytoconstituents** | | **06** |
| 1. | Terpenoids: Menthol, Citrol, Artemisin | |
| 2. | Glycosides: Glycyrhetinic acid & Rutin | |
| 3. | Alkaloids: Atropine, Quinine | |
| 4. | Reserpine, Caffeine, Podophyllotoxin, Curcumin | |
| Activity1 | MCQ Test ( Metabolic pathways) | |
| Activity2 | MCQ Test (Metabolites) | |
| Activity3 | MCQ Test ( Phytoconstituents) | |

II SESSIONAL : 17 Lectures + 2 Activities

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **INDUSTRIAL ASPECTS OF PHYTOCONSTITUENTS** | | **(10)** |
| **Unit-4: Industrial production, estimation and utilization of phytoconstituents** | | |
| 5. | Forskolin | |

| | | |
|---|---|---|
| 6. | Sennoside | 10 |
| 7. | Artemisinin | |
| 8. | Diosgenin | |
| 9. | Digoxin | |
| 10. | Atropine | |
| 11. | Podophyhllotoxin | |
| 12. | Caffeine | |
| 13. | Taxol | |
| 14. | Vincristine and vinblastin | |
| **PHYTOCHEMISTRY** | | **(08)** |
| **Unit-5: Basics of Phytochemistry** | | **08** |
| 9. | Modern methods of extraction: General Extraction techniques | |
| 10. | Soxhlet extraction, SCFE | |
| 11. | Counter current extraction, Micro oven assisted extraction | |
| 12. | Extraction of volatile oils | |
| 13. | Application of spectroscopy in the isolation, purification identification of crude drugs - UV, IR | |
| 14. | Application of spectroscopy in the isolation, purification identification of crude drugs - NMR, MS | |
| 7. | Chromatography in the isolation, purification and identification of drugs | |
| Activity-1 | MCQ Test (Industrial aspects of Phytoconstituents) | |
| Activity-2 | MCQ Test (Phytochemistry) | |
| Activity-3 | MCQ Test | |

**Text Books**


1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
4. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007


**Reference Books**


1. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
2. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
3. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
4. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
5. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
6. The formulation and preparation of cosmetic, fragrances and flavours.
7. Remington's Pharmaceutical sciences.
8. Text Book of Biotechnology by Vyas and Dixit.
9. Text Book of Biotechnology by R.C. Dubey.


*** *** ***

| | |
|---|---|
| **Name of the Subject** | Pharmaceutical Jurisprudence |
| **Name of the Faculty** | Ms S.Priyadharshini M.Pharm |
| **Designation, Department** | Lecturer, Department of Pharmacognosy |
| **Mobile Number** | 9443801876 |
| **e-Mail i.d.** | priya@jssuni.edu.in |

## Scope, Course Objectives and Course Outcomes

**Scope:** This course is designed to impart basic knowledge on several important legislations related to the profession of pharmacy in India.

**Objectives:** The primary objectives of this course are to gain knowledge about:
1. The Pharmaceutical legislations and their implications in the development and marketing
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

**Course Outcomes (COs):** At completion of this course it is expected that the students will be able to
CO 1: Define the rules and regulations laid under Drugs and Cosmetics Act, 1940
CO 2: Define the Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.
CO 3: Detail different Schedules of Drugs and Cosmetics and how various acts and rules are administered
CO 4: Understand the pharmacy education regulations, registration process and various rules and regulations implemented on narcotic drugs, medicinal and toilet preparations and Magic remedies.
CO 5: To understand the process of Drug Price Control, Intellectual Property Rights and Right to information.
CO 6: Follow various ethics related to Pharmacy Profession.

### LECTURE PLAN

| Sessional | No. of Hours of Didactic Lecture | No of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|
| I | 28 | 11 | 39 |
| II | 38 | 22 | 60 |
| Total No. of Hours | 66 | 33 | 99 |

### I SESSIONAL : 25 Lectures + 3 Activity + 8 Tutorials

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| PHARMACEUTICAL JURISPRUDENCE | | |
| Unit-1: | Drugs and Cosmetics Act, 1940 and its rules 1945 | |
| 1. | Objectives, Definitions, Legal definitions of schedules to the act and rules | |

| | | |
|---|---|---|
| 2. | Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties | 10 |
| 3. | Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,v | |
| 4. | Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license. | |
| **Unit-2:** | **Drugs and Cosmetics Act, 1940 and its rules 1945.** | |
| 8. | Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA) | 09 |
| 9. | Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties | |
| 10. | Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties. | |
| 11. | Administration of the act and rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors | |
| **Unit-3** | **Pharmacy Act –1948** | |
| 17. | Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; its constitution and functions, Registration of Pharmacists, Offences and Penalties | |
| **Medicinal and Toilet Preparation Act –1955** | | |
| 1. | Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties. | |
| **Activity** | | 03 |

**II SESSIONAL - 24 Lectures + 14 Activity + 9 Tutorials**

| | | |
|---|---|---|
| **Unit 3: Narcotic Drugs and Psychotropic substances Act-1985 and Rules:** | | |
| 1. | Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties | 04 |
| **Unit 4:** | **Study of Salient Features of Drugs and magic remedies Act and its rules** | 10 |
| 1. | Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties | |
| **Prevention of Cruelty to animals Act-1960:** | | |
| 1. | Objectives, Definitions, Institutional Animal Ethics Committee, Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties | |
| **National Pharmaceutical Pricing Authority** | | |
| 1. | Drugs Price Control Order (DPCO)2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM) | |
| **Unit 5:** | **Pharmaceutical Legislations** | |
| 1. | A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee | |
| **Code of Pharmaceutical ethics** | | |

| | | |
|---|---|---|
| 1. | D efinition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath **08** | |
| **Medical Termination of pregnancy act** | | |
| **Right to information Act** | | |
| **Introduction to Intellectual Property Rights (IPR)** | | **02** |
| **ACTIVITY** | | **14** |
| **Seminars** | | |
| **Mind mapping** | | |
| **Flow chart reading** | | |
| **Assignments** | | |
| **Tests** | | |
| **Mind games on schedules and years** | | |

**Text Books**

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9. Bare Acts of the said laws published by Government. Reference books (Theory)

**Reference Books**

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain

*** *** ***

# VI - SEMESTER

| | |
|---|---|
| **Name of the Subject** | Medicinal Chemistry III (Theory) |
| **Name of the Faculty** | Dr.Jubie S M.Pharm., Ph.D |
| **Designation, Department** | Associate Professor, Department of Pharmaceutical Chemistry |
| **Mobile Number** | 9894618588 |
| **e-Mail i.d.** | jubie@jssuni.edu.in |

**Scope, Course Objectives and Course Outcomes**

**Scope:** This course is designed to impart fundamental knowledge on the structure,chemistry and therapeutic value of drugs.the subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR).Prodrug concept,combinatorial chemistry and Computer aided drug design

(CADD).The subject also emphasized on the chemistry,mechanism of action,metabolism,adverse effects,structure activity relationships (SAR), therapeutic uses and synthesis of important drugs..

**Objectives:** The primary objectives of this course are to

1. Study the concepts of drug design and QSAR.
2. Learn the mechanism of action and pharmacokinetic properties of drugs.
3. Outline the synthesis of drugs.
4. Learn the SAR of drugs
5. Study the applications of prodrugs

**Course Outcomes (COs):** At completion of this course it is expected that the students will be able to

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the concept of prodrugs and their applications.
5. Acquire the knowledge about the SAR of drugs.

## LECTURE PLAN – Abstract

| Sessional | No. of Hours of Didactic Lecture | No of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|
| I | 23 | - | 23 |
| II | 22 | - | 22 |
| Total No. of Hours | 45 | - | 45 |

## I SESSIONAL : 23 Lectures

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **Unit-1: Antibiotics** | | 10 |
| 1. | Beta lactam antibiotics-Penicillins | |
| 2. | Beta lactam antibiotics-Cephalosporins | |
| 3. | Beta lactam antibiotics-Cephalosporins | |
| 4. | Beta lactamase inhibitors | |
| 5. | Monobactams | |
| 6. | Amino glycosides | |
| 7. | Streptomycin, Neomycin, Kanamycin | |
| 8. | Tetracyclines | |
| 9. | Tetracycline,Oxytetracycline, | |
| 10. | Chlortetracycline, Minocycline, Doxycycline | |
| **Unit-2: Antibiotics,Prodrugs & Antimalarials** | | 10 |
| 18. | Macrolides- Erythromycin, Clarithromycin & Azithromycin | |
| 19. | Miscellaneous- Chloramphenicol*, Clindamycin. | |
| 20. | Prodrugs-Basic concepts | |
| 21. | Applications of Prodrugs | |
| 22. | Applications of Prodrugs (cont…) | |
| 23. | Antimalarials- Etiology of Malaria &SAR | |
| 24. | Quinolines- Quinine sulphate, Chloroquine*, Amodiaquine, | |
| 25. | Quinolines- Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine | |
| 26. | Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil. | |
| 10. | Miscellaneous- Pyrimethamine, Artesunete, Artemether, Atovoquone | |
| **Unit-3: Anti-tubercular Agents, Urinary tract anti-infective agents, Antiviral** | | |

| | | |
|---|---|---|
| **agents** | | **03** |
| 1. | Anti tubercular agents | |
| 2. | Synthetic anti tubercular agents-Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.* | |
| 3. | Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycine, Capreomycin sulphate. | |

**II SESSIONAL : 22 Lectures**

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **Unit-3: Anti-tubercular Agents, Urinary tract anti-infective agents, Antiviral agents (cont…)** | | |
| 1. | Urinary Tract Anti-infective agents-Quinolones: SAR of quinolones, Nalidixic Acid,Norfloxacin, Enoxacin, | **07** |
| 2. | Quinolones: Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin | |
| 3. | Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine. | |
| 4. | Antiviral agents: Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride | |
| 5. | Anti viral agents- Acyclovir*, Gancyclovir, Zidovudine, Didanosine, | |
| 6. | Anti viral agents- Zalcitabine, Lamivudine, Loviride, Delavirding, | |
| 7. | Anti viral agents Ribavirin, Saquinavir, Indinavir, Ritonavir. | |
| **Unit-4: Antifungal agents, Anti-protozoal Agents, Anthelmintics** | | |
| 8. | Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin. | **08** |
| 9. | Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*. | |
| 10. | Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine. | |
| 11. | Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin | |
| 12. | Sulphonamides and Sulfones Historical development, chemistry, classification and SAR of Sulfonamides: | |
| 13. | Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine. | |
| 14. | Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole. | |
| 15. | Sulfones: Dapsone*. | |
| **Unit-5: Introduction to Drug Design** | | |
| 12. | Introduction to drug design- various approaches in drug design | **07** |
| 13. | Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient | |
| 14. | Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. | |
| 15. | Pharmacophore modeling. | |
| 16. | Docking techniques | |
| 17. | Combinatorial Chemistry: Concept and applications chemistry | |
| 18. | Solid phase and solution phase synthesis. | |

**Text books**

1. Wilson and Gisvold's Organic Medicinal and Pharmaceutical chemistry.
2. Foye's Principles of Medicinal Chemistry.

**Reference books**

1. Burger's Medicinal Chemistry, Vol I to IV istry
2. Introduction to principles of drug design-Smith and Williams
3. Remington's Pharmaceutical Sciences. 4. Martindale's extra pharmacopoeia

*** *** ***

| | |
|---|---|
| **Name of the Subject** | Pharmacology III (Theory) |
| **Name of the Faculty** | Mr. B. Shivaramakrishnan M.Pharm |
| **Designation, Department** | Assistant Professor, Department of Pharmacology |
| **Mobile Number** | +91-9620001429 |
| **e-Mail i.d.** | shivaram.krishna@jssuni.edu.in |

## Scope, Course Objectives and Course Outcomes

**Scope:** Pharmacology III provides an opportunity for the students to learn about different classes of drugs with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, routes of administration, precautions, contraindications and interaction with other drugs.

**Objectives:** The primary objectives of this course are to

1. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. Comprehend the principles of toxicology and treatment of various poisonings and
3. Appreciate correlation of pharmacology with related medical sciences.

**Course Outcomes (COs):** At completion of this course it is expected that the students will be able to

CO 1 : Identify and explain the pharmacodynamics and pharmacokinetic properties of drugs of various categories
CO 2 : Recognize the adverse effects of drugs
CO 3 : Avoid adverse drug reactions
CO 4 : Recognize indications of different drugs and avoid contraindications
CO 5 : Provide vital information to patients about drugs during patient counselling
CO 6 : Design & execute animal experiments to identify the pharmacological properties of known drugs and unknown samples.

## LECTURE PLAN – Abstract

| Sessional | No. of Hours of Didactic Lecture | No of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|
| I | 28 | 1 | 29 |
| II | 25 | 5 | 30 |
| Total No. of Hours | 53 | 06 | 59 |

### I SESSIONAL: 28 Lectures + 1 Activity

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **Unit-1: Pharmacology of drugs acting on Respiratory system** | | **05** |
| 7. | Anti-asthmatic drugs | |
| 8. | Expectorants and Anti-tussives | |
| 9. | Nasal decongestants | |
| 10. | Respiratory stimulants | |
| **Unit-2: Pharmacology of drugs acting on Digestive system** | | **05** |
| 12. | Anti-ulcer agents | |
| 13. | Drugs for Constipation and Diarrhea | |
| 14. | Appetite stimulants and Suppressants | |
| 15. | Digestants and Carminatives | |
| 16. | Emetics and Anti-emetics | |
| **Unit-3: Chemotherapy** | | **18** |
| 27. | General Principles of Chemotherapy | |
| 28. | Sulfonamides and Cotrimoxazole | |
| 29. | Antibiotics - Penicillins & Cephalosporins | |
| 30. | Chloramphenicol & Macrolide antibiotics | |
| 31. | Quinolones & Fluoroquinolones | |
| 32. | Tetracylines | |
| 33. | Aminoglycosides | |
| 34. | Antitubercular drugs | |
| 35. | Antileprotic drugs | |
| 36. | Anti-amoebic drugs | |
| 37. | Antiviral drugs | |
| 38. | Antimalarial drugs | |
| 39. | Anti-amoebic drugs | |
| 40. | Antifungal drugs | |
| Activity1 | Class Test | |

## II SESSIONAL: 25 Lectures + 5 Activities

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **Unit-4: Chemotherapy & Immunopharmacology** | | **10** |
| 15. | Anthelmentics | |
| 16. | Urinary tract infections and sexually transmitted diseases | |
| 17. | Chemotherapy of malignancy | |
| 18. | Immunostimulants | |
| 19. | Immunosupressants | |
| 20. | Protein Drugs, Monoclonal Antibodies | |
| 21. | Target drugs to antigen, Biosimilars | |
| **Unit-5: Principles of Toxicology** | | |

| | | |
|---|---|---|
| 16. | Acute, subacute and chronic toxicity- Definitions &Basics | 07 |
| 17. | Genotoxicity, Carcinogenicity, Teratogenicity & Mutagenicity- Definitions &Basics | |
| 18. | General principles of treatment of poisoning,<br>Clinical symptoms and management of Barbiturate poisoning | |
| 19. | Clinical symptoms and management of Morphine, organophosphorus compound poisoning | |
| 20. | Clinical symptoms and management of lead, mercury and arsenic poisoning | |
| **Unit-6 : Chronopharmacology** | | |
| 19. | Definition of rhythms and cycles | |
| 20. | Biological clock and their significance leading to chronotherapy | 03 |
| **Revision** | | 05 |
| Activity-1 | MCQ Test | |
| Activity-2 | MCQ Test | |
| Activity-3 | Class Test | |
| Activity-4 | Class Test | |
| Activity-5 | Exam Preparation & Time management skills | |

**Text Books**


3. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
4. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.


**Reference Books**


5. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill.
6. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
7. K.D.Tripathi. Essentials of Medical Pharmacology. JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
8. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher


*** *** ***

| | |
|---|---|
| **Name of the Subject** | Herbal Drug Technology |
| **Name of the Faculty** | Ms S Priyanka M.Pharm, PhD |
| **Designation, Department** | Assistant Professor, Department of Pharmacognosy |
| **Mobile Number** | 9486604970 |
| **e-Mail i.d.** | rajendirankrish@jssuni.edu.in |

## Scope, Course Objectives and Course Outcomes

**Scope:** This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

**Objectives:** The primary objectives of this subject are,

1. To understand raw material as source of herbal drugs from cultivation to herbal drug product
2. To know the WHO and ICH guidelines for evaluation of herbal drugs
3. To know the herbal cosmetics, natural sweeteners, nutraceuticals
4. To appreciate patenting of herbal drugs, GMP.

**Course Outcomes (COs):** At completion of this subject, it is expected that the students will be able to

CO1: Define the principal involved in Indian Systems of Medicine, Preparation and standardization of Ayurvedic formulations

CO2: Define the Market, growth, scope of nutraceuticals and significance of herbal-drug and herb-food Interactions

CO 3: Define Herbal Cosmetics, Herbal excipients Herbal formulations

CO 4: Patenting and Regulatory requirements of natural products, Regulatory Issues WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.

CO 5: Present scope and future prospects of Herbal industry, Good Manufacturing Practice of Indian systems of medicine

## LECURE PLAN – Abstract

| Sessional | No. of Hours of Didactic Lecture | No of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|
| I | 21 | 03 | 24 |
| II | 24 | 03 | 27 |
| Total No. of Hours | 45 | 05 | 51 |

## I SESSIONAL : 21 Lectures + 3 Activities

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **INDIAN SYSTEMS OF MEDICINE** | | **(11)** |
| **Unit-1: Herbs as raw materials** | | **11** |
| 7. | Herbs as raw materials: Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation | |
| 8. | Source of Herbs | |
| 9. | Selection, identification and authentication of herbal materials | |
| 10 | Processing of herbal raw material | |
| 11 | Biodynamic Agriculture: Good agricultural practices in cultivation of medicinal plants including Organic farming | |
| 12 | Pest and Pest management in medicinal plants | |
| 13 | Biopesticides/Bioinsecticides | |
| 14 | Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy | |
| 15 | Preparation of Ayurvedic formulations | |
| 16 | Standardization of Ayurvedic formulations | |
| 17 | Standardization of Ayurvedic formulations | |
| **NUTRACEUTICALS** | | **(07)** |
| **Unit-2: Nutraceuticals and Herbal-Drug and Herb-Food Interactions** | | **07** |
| 41. | General aspects, market, growth, scope of nutraceuticals | |
| 42. | Health benefits and role of Nutraceuticals in Diabetes, CVS diseases, Cancer | |
| 43. | Health benefits and role of Nutraceuticals in Irritable bowel syndrome and various Gastro intestinal diseases. | |
| 44. | Study of Alfaalfa, Chicory, Ginger, Fenugreek, Garlic as health food | |

| | | |
|---|---|---|
| 45. | Study of Honey, Amla, Ginseng, Ashwagandha, Spirulina as health food | |
| 46. | General introduction to Herbal-Drug and Herb-Food Interactions | |
| 47. | Study of Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra and their possible side effects and interactions | |
| **HERBAL COSMETICS** | | **(10)** |
| **Unit-3: Herbals used in cosmetics** | | |
| 5. | Sources and description of fixed oils, waxes, gums used in cosmetics | |
| 6. | Sources and description of colours, perfumes used in cosmetics | |
| 7. | Sources and description of protective agents, bleaching agents, antioxidants used in cosmetics | **03** |
| Activity1 | MCQ Test (Indian Systems of Medicine) | |
| Activity2 | MCQ Test (Nutraceuticals) | |
| Activity3 | MCQ Test (Herbal Cosmetics) | |

**II SESSIONAL : 24 Lectures + 3 Activities**

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **HERBAL COSMETICS** | | |
| **Unit-3: Herbals used in cosmetics (Continued for II Sessional)** | | |
| 22. | Significance of substances of natural origin as excipients | |
| 23. | Colorants and sweeteners | |
| 24. | Binders and diluents | |
| 25. | Viscosity builders and disintegrants | |
| 26. | Flavors & perfumes | |
| 27. | Conventional herbal formulations: Syrups, mixtures and tablets | **07** |
| 28. | Novel dosage forms: Phytosomes | |
| **EVALUATION OF DRUGS** | | **(10)** |
| **Unit-4: Regulatory Issues** | | |
| 15. | WHO guidelines for the assessment of herbal drugs | |
| 16. | ICH guidelines for the assessment of herbal drugs | |
| 17. | Stability testing of herbal drugs. | **10** |
| 18. | Patenting of natural products | |
| 19. | Regulatory requirements of natural products | |
| 20. | Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy | |
| 21. | Patenting aspects of Traditional Knowledge and Natural Products. | |
| 22. | Case study of Curcuma | |
| 23. | Case study of Neem | |
| 24. | Cosmetics Act for ASU drugs. | |
| **HERBAL INDUSTRY** | | **(07)** |
| **Unit-5: Regulatory Issues** | | |
| 1. | General Introduction to Herbal Industry | |
| 2. | Present scope and future prospects of Herbal Industry | |
| 3. | A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India | |
| 4. | Schedule T – Good Manufacturing Practice of Indian systems of medicine | |
| 5. | Components of GMP (Schedule – T) and its objectives | |

| | | |
|---|---|---|
| 6. | Infrastructural requirements, working space, storage area, machinery and equipments of Herbal Industry | |
| 7. | Standard operating procedures, health and hygiene, documentation and records of of Herbal Industry | |
| Activity-1 | MCQ Test (Herbal Cosmetics) | |
| Activity-2 | MCQ Test (Evaluation of Drugs) | |
| Activity-3 | MCQ Test (Herbal Industry) | |

## Text Books


1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
3. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
4. Pharmacognosy & Phytochemistry by V.D.Rangari


## Reference Books


1. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
2. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.


*** *** ***

| | |
|---|---|
| **Name of the Subject** | Biopharmaceutics and Pharmacokinetics (Theory) |
| **Name of the Faculty** | Mr. Arun R M.Pharm., |
| **Designation, Department** | Lecturer, Department of Pharmacy Practice |
| **Mobile Number** | 7402222019 |
| **e-Mail i.d.** | arun.r@jssuni.edu.in |

## Scope, Course Objectives and Course Outcomes

**Scope:** This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply biopharmaceutics theories in practical problem solving. Basic theoretical discussions of the principles of biopharmaceutics and pharmacokinetics are provided to help the students to clarify the concepts.

**Objectives:** The primary objectives of this course are to

1. Discuss the fundamentals of biopharmaceutics and pharmacokinetics
2. Explain how various physicochemical characteristics of drugs, physiological characteristics and dosage form factors impact the biopharmaceutics and pharmacokinetic parameters
3. Help the students to understand the concepts of bioavailability and bioequivalence
4. Equip the students to calculate all possible pharmacokinetic parameters by using various pharmacokinetic models for any given data
5. Enable the students to apply the theoretical knowledge into clinical practice

6. Familiarize and train the students with software and electronic computational tools for pharmacokinetic calculations

**Course Outcomes (COs):** At completion of this course it is expected that the students will be able to

CO 1 : Define the basic concepts in biopharmaceutics and pharmacokinetics

CO 2 : Critically interpret biopharmaceutic studies including drug product equivalency

CO 3 : Use raw data and derive the pharmacokinetic models and parameters that best describe the process of drug absorption, distribution, metabolism and excretion

CO 4 : Design and evaluate dosage regimens of the drugs using pharmacokinetic andbiopharmaceutic parameters

CO 5 : Identify potential clinical pharmacokinetic problems and apply basic pharmacokinetic principles to solve them

CO 6 : Use software for various pharmacokinetic data analysis

**LECTURE PLAN – Abstract**

| Sessional | No. of Hours of Didactic Lecture | | No of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|---|
| | Biopharmaceutics | Pharmacokinetics | | |
| I | 17 | 14 | 3 | 34 |
| II | 10 | 15 | 2 | 27 |
| III | 06 | 13 | 9 | 28 |
| Total No. of Hours | 33 | 42 | 14 | 89 |

**I SESSIONAL : 31 Lectures + 3 Activities**

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **BIOPHARMACEUTICS** | | **(09)** |
| **Unit-1: Introduction to Biopharmaceutics** | | **01** |
| | Orientation to the subject | |
| 1. | Introduction to Biopharmaceutics | |
| **Unit-2: Absorption of Drug** | | **08** |
| 1. | Oral Drug Absorption: Introduction, Rate limiting step in bioavailability, Anatomical and physiological consideration of the GIT | |
| 2. | Introduction to Biopharmaceutics | |
| 3. | Carrier mediated transport – active transport, Facilitated diffusion, Ion-pair formation, Pore transport, Endocytosis | |
| 4. | Physiological factors governing GI drug absorption | |
| 5. | Physicochemical factors governing GI drug absorption (cont…) | |
| 6. | Formulation factors governing GI drug absorption | |
| 7. | Absorption of drug from Non *per* OS extra-vascular routes | |
| 8. | Absorption of drug from Non *per* OS extra-vascular routes (cont…) | |
| **PHARMACOKINETICS** | | **(14)** |
| **Unit-6: Introduction to Pharmacokinetics** | | **05** |
| 1. | Introduction, Mathematical model | |
| 2. | Drug levels in blood | |
| 3. | Pharmacokinetic models | |
| 4. | Compartment models | |

| | | |
|---|---|---|
| 5. | Noncompartmental models, Physiological model | |
| **Unit-7: One Compartment Open Model** | | |
| 1. | Intravenous injection – bolus – plasma data | **09** |
| 2. | Intravenous injection – bolus – plasma data (cont…) | |
| 3. | Intravenous injection – bolus – urine data | |
| 4. | Intravenous injection – bolus – urine data (cont…) | |
| 5. | Intravenous injection – bolus – urine data (cont...) | |
| 6. | Intravenous injection – infusion | |
| 7. | Intravenous injection – infusion (cont…) | |
| 8. | Intravenous injection – infusion (cont…) | |
| 9. | Intravenous injection – infusion (cont…) | |
| **BIOPHARMACEUTICS** | | **(08)** |
| **Unit-3: Distribution of Drugs** | | |
| 1. | Tissue permeability of drugs, Binding of drugs | **08** |
| 2. | Apparent volume of distribution | |
| 3. | Apparent volume of distribution (cont...) | |
| 4. | Protein binding of drugs, factors Affecting protein – drug binding | |
| 5. | Protein binding of drugs, factors Affecting protein – drug binding (cont...) | |
| 6. | Kinetics of protein binding | |
| 7. | Kinetics of protein binding (cont...) | |
| 8. | Clinical significance of protein – drug binding | |
| Activity1 | Mind Mapping on Selected Topic(s) | |
| Activity2 | MCQ Test (Biopharmaceutics) | |
| Activity3 | MCQ Test (Pharmacokinetics) | |

**II SESSIONAL : 25 Lectures + 2 Activities**

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **BIOPHARMACEUTICS** | | **(10)** |
| **Unit-5: Bioavailability and Bioequivalence** | | **10** |
| 29. | Introduction, Objectives of Bioavailability studies, Relative and Absolute Bioavailability, Bioavailability study protocol | |
| 30. | Bioequivalence studies | |
| 31. | Bioequivalence studies (cont…) | |
| 32. | Methods of assessment of bioavailability | |
| 33. | Methods to enhance bioavailability | |
| 34. | Methods to enhance bioavailability (cont…) | |
| 35. | in-vitro drug dissolution: mechanisms (theories) of dissolution, measurement of dissolution rates | |
| 36. | Official and unofficial methods of dissolution, control of variables in dissolution testing | |
| 37. | *in-vitro* and *in-vivo* Correlation, limitations of dissolution test | |
| 38. | Factors influencing the rate of dissolution | |
| **PHARMACOKINETICS** | | **(15)** |
| **Unit-7: One Compartment Open Model: (cont…)** | | |
| 25. | Extravascular administration | |
| 26. | Extravascular administration (cont…) | |

| | | |
|---|---|---|
| 27. | Extravascular administration (cont…) | 06 |
| 28. | Extravascular administration (cont…) | |
| 29. | Extravascular administration (cont…) | |
| 30. | Extravascular administration (cont…) | |
| **Unit-10: Nonlinear Pharmacokinetics** | | |
| 21. | Introduction, Factors causing non-linearity | |
| 22. | Michaelis - Menton method of estimating parameters | |
| 23. | Michaelis-Menton method of estimating parameters (cont…) | 05 |
| 24. | Michaelis-Menton method of estimating parameters (cont…) | |
| 25. | Michaelis-Menton method of estimating parameters (cont…) | |
| **Unit-11: Noncompartmental Pharmacokinetics** | | |
| 21. | Introduction, Statistical Moment Theory | |
| 22. | Mean Residence Time (MRT) for various compartment models | 04 |
| 23. | Mean Residence Time (MRT) for various compartment models (cont…) | |
| 24. | Physiological pharmacokinetic model | |
| Activity-1 | MCQ Test (Biopharmaceutics) | |
| Activity-2 | MCQ Test (Pharmacokinetics) | |

**III SESSIONAL : 19 Lectures + 9 Activities**

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **BIOPHARMACEUTICS** | | **(06)** |
| **Unit-4: Drug Elimination** | | |
| 1. | Biotransformation of drugs | |
| 2. | Biotransformation of drugs (cont…) | |
| 3. | Renal excretion of dugs | 06 |
| 4. | Factors affecting renal excretion of dugs | |
| 5. | Renal clearance | |
| 6. | Non renal routes of excretion of drugs | |
| **PHARMACOKINETICS** | | **(13)** |
| **Multiple – Dosage Regimens** | | |
| 1. | Repetitive intravenous injections – One compartment open model | |
| 2. | Repetitive intravenous injections – One compartment open model (cont…) | |
| 3. | Repetitive extravascular dosing – One compartment open model | 05 |
| 4. | Repetitive extravascular dosing – One compartment open model (cont…) | |
| 5. | Multiple Dosage Regimen – Two compartment open model | |
| **Multicompartment Models** | | |
| 1. | Two compartment open model – i.v. bolus (cont.) | |
| 2. | Two compartment open model – i.v. bolus (cont.) | |
| 3. | Two compartment open model – i.v. bolus (cont.) | |
| 4. | Two compartment open model – i.v. infusion (cont.) | 08 |
| 5. | Two compartment open model – i.v. infusion (cont.) | |
| 6. | Two compartment open model – oral administration | |
| 7. | Two compartment open model – oral administration (contd.) | |
| 8. | Two compartment open model – oral administration (contd.) | |
| Activity 1 | Unit Test – 1 | |
| Activity 2 | Unit Test – 2 | |
| Activity 3 | Unit Test – 3 | |
| Activity 4 | Unit Test – 4 | |

| | |
|---|---|
| Activity 5 | Unit Test – 5 |
| Activity 6 | MCQ Test -1 |
| Activity 7 | MCQ Test -2 |
| Activity 8 | MCQ Test -3 |
| Activity 9 | Revision Exam – 1 |

**Text Books**


5. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
6. Biopharmaceutics and Pharmacokinetics; By Robert F Notari.
7. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition, Prentice-Hall Inernationaledition.USA.
8. Biopharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal, VallabhPrakashanPitampura, Delhi.
9. Biopharmaceutics and Pharmacokinetics, V Venkateswarulu, Pharma Book Syndicate.


**Reference Books**


1. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
2. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
3. Biopharmaceutics; By Swarbrick.
4. Cilincal Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Toezer.
5. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
6. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
7. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
8. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia


*** *** ***

| | |
|---|---|
| **Name of the Subject** | Pharmaceutical Quality Assurance (Theory) |
| **Name of the Faculty** | Dr. Jeyaprakash MR M.Pharm., Ph.D |
| **Designation, Department** | Associate Professor, Department of Pharmaceutical Analysis |
| **Mobile Number** | 9952335392 |
| **e-Mail i.d.** | jpvis7@jssuni.edu.in |

**Scope, Course Objectives and Course Outcomes**

**Scope:** This course conveys the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It also explains the current requirement of Quality standards, cGMP, QC tests, ICH guidelines, Complaints and documentation requirements. It also deals with the packing material quality and requirement as per the regulatory affairs requirement.

**Objectives:** The primary objectives of this course are to

1. It reveals the basic aspects of quality assurance
2. Explain the various types of quality requirements.
3. It helps the young community to understand the concept of GLP
4. The subject concept detail the raw materials and warehouse management process

**Course Outcomes (COs):** At completion of this course it is expected that the students will be able to
CO 1: Different types of Quality Management system
CO2: GMP and its individual criterion requirements
CO3: Good Laboratory Practices requirements
CO4: Complaints and Document maintenance and its handling procedure in pharmaceutical industry
CO5: Different types of analytical instruments and calibration procedures

## LECTURE PLAN – Abstract

| Sessional | No. of Hours of Didactic Lecture<br>Pharmaceutical Quality Assurance | No of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|
| I | 20 | 04 | 24 |
| II | 25 | 04 | 29 |
| Total No. of Hours | 45 | 08 | 53 |

### I SESSIONAL : 31 Lectures + 2 Activities

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **Unit 1: Quality Assurance and Quality Management concepts, Total Quality Management (TQM), ICH Guidelines, Quality by design (QbD), Quality by design (QbD), ISO 9000 & ISO14000, NABL accreditation** | | **10** |
| 1 | Orientation towards subject and syllabus **(Activity 1)** | |
| 2 | Definition and concept of Quality control, Quality assurance and GMP | |
| 3 | (TQM):Definition, elements, philosophies | |
| 4 | ICH Guidelines: purpose, participants, process of harmonization | |
| 5 | Brief overview of QSEM | |
| 6 | Special emphasis on Q-series guidelines, ICH stability testing guidelines | |
| 7 | QbD: Definition, overview, Elements of QbD program, tools | |
| 8 | ISO 9000 & ISO14000: Overview, Benefits, Elements, | |
| 9 | Steps for ISO registration | |
| 10 | NABL Principles and procedure | |
| 11 | Assignment 1 | 02 |
| **Unit 2: Organization and personnel, Premises, Equipments and raw materials** | | **10** |
| 1 | Personnel responsibilities, training, | |
| 2 | Hygiene and personal records | |
| 3 | Premises:Design, construction and plant layout, maintenance, | |
| 4 | Sanitation, | |
| 5 | Environmental control, | |
| 6 | Utilities and maintenance of sterile areas, | |
| 7 | Control of contamination | |

| | | |
|---|---|---|
| 8 | Equipments selection, | |
| 9 | Purchase specifications | |
| 10 | Maintenance of stores for raw materials, | |
| 11 | ASSIGNMENT 1 | 02 |

**II SESSIONAL : 25 Lectures + 3 Activities**

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| **Unit-3: Quality Control and Good Laboratory Practices** | | **10** |
| 1 | Quality control test for containers | |
| 2 | Rubber closures and secondary packing materials | |
| 3 | GLP General Provisions | |
| 4 | Organization and Personnel, Facilities, | |
| 5 | Equipment, | |
| 6 | Testing Facilities Operation, | |
| 7 | Test and Control Articles, | |
| 8 | Protocol for Conduct of a Nonclinical Laboratory Study | |
| 9 | Records and Reports | |
| 10 | Disqualificationof Testing Facilities | |
| | Assignment 3 | 02 |
| **Unit 4: Complaints and Document maintenance in pharmaceutical industry** | | **08** |
| 1 | Complaints and evaluation of complaints, | |
| 2 | Handling of return good | |
| 3 | Recalling and waste disposal | |
| 4 | Batch Formula Record | |
| 5 | Master Formula Record | |
| 6 | SOP | |
| 7 | Quality audit , Quality Review | |
| 8 | Quality documentation, Reports and documents, distribution records | |
| 9 | Assignment 4 | |
| **Unit 5: Calibration and Validation, Warehousing** | | **07** |
| 1 | Introduction, definition and general principles of calibration | |
| 2 | qualification and validation, importance and scope of validation | |
| 3 | types of validation | |
| 4 | validation master plan. Calibration of pH meter | |
| 5 | Qualification of UV-Visible spectrophotometer | |
| 6 | General principles of Analytical method Validation. | |
| 7 | Good warehousing practice, Materials management | |
| 8 | Assignment 5 | 02 |

**Recommended Books: (Latest Edition)**


1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines


*** *** ***

| | |
|---|---|
| **Name of the Subject** | Pharmaceutical Biotechnology (Theory) |
| **Name of the Faculty** | Dr. P. Vasanth raj M.Pharm., Ph.D |
| **Designation, Department** | Asst. Professor, Department of Pharmaceutical |

| | |
|---|---|
| | Biotechnology |
| **Mobile Number** | 9500793944 |
| **e-Mail i.d.** | vasanth@jssuni.edu.in |

## Scope, Course Objectives and Course Outcomes

**Scope:** This course aims to provide knowledge that includes a multidisciplinary approach in which students can follow the requirements of large-scale industry-related operations as well as high-end independent research on Biotechnology. The course covers a broad range of competencies required to understand different biological concepts of rDNA technology, genomics, proteomics, protein engineering, fermentation and immunology.

**Objectives:** The primary objectives of this course are to

Explain how genomes are structured in higher species

1. Describe functional classes of the DNA and Gene families.
2. Understand how recombinant DNA technology works
3. Explain the development and implementation of the DNA and cDNA libraries.
4. Get an insight into primary and secondary organs of the Immune system.
5. Describe different technologies for microorganism to produce useful commodity.

**Course Outcomes (COs):** At completion of this course it is expected that the students will be able to

CO 1: Gain insight into the theory and manipulation of genomes.
CO 2 : Classify and explain the structure and general characteristics of genes.
CO 3 : Understand various basic concepts about fermentation technology
CO 4 : Get insight into the role and function of diverse immune cells
CO 5 : Describe antigenicity and its influencing factors.
CO 6 : Explain immunity mediated by cell, development of monoclonal antibody, and hypersensitivity.

## LECTURE PLAN – Abstract

| Sessional | No. of Hours of Didactic Lecture | No of Hours of other Activities | Total No. of Lecture Hours |
|---|---|---|---|
| I | 28 | 03 | 31 |
| II | 17 | 02 | 19 |
| Total No. of Hours | 45 | 05 | 50 |

## I SESSIONAL: 28 Lectures + 3 Activities

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| Unit-1 | | 10 |
| | Orientation to the subject | |
| 1. | Brief introduction to Pharmaceutical Biotechnology | |
| 2. | Enzyme Biotechnology-Methods of enzyme immobilization and applications | |
| 3. | Enzyme Biotechnology-Methods of enzyme immobilization and applications (Cont...) | |
| 4. | Biosensors-Working and applications of biosensors in Pharmaceutical Industries | |
| 5. | Biosensors-Working and applications of biosensors in Pharmaceutical Industries (Cont...) | |
| 6. | Brief introduction to Protein Engineering | |

| | | |
|---|---|---|
| 7. | Use of microbes in industry-Production of Amylase, Catalase | |
| 8. | Use of microbes in industry-Production of Peroxidase, Lipase | |
| 9. | Use of microbes in industry-Production of Protease, Penicillinase | |
| 10. | Basic principles of genetic engineering | |
| | | |
| **Unit-2** | | |
| 17. | Study of cloning vectors | |
| 18. | Study of restriction endonucleases | |
| 19. | Study of DNA ligase | |
| 20. | Application of genetic engineering in medicine | |
| 21. | Interferon by r DNA technology | **10** |
| 22. | Hepatitis -B by r DNA technology | |
| 23. | Insulin by r DNA technology | |
| 24. | Brief introduction to PCR | |
| 25. | Types of immunity and Humoral immunity | |
| 26. | Cellular immunity | |
| **Unit-3** | | |
| 48. | Structure of Immunoglobulin's | |
| 49. | Structure and Function of MHC | |
| 50. | Hypersensitivity reactions | **10** |
| 51. | Immune stimulation and Immune suppressions | |
| 52. | General method of the preparation of vaccines and other products | |
| 53. | General method of the preparation of vaccines and other products (Cont...) | |
| 54. | General method of the preparation of vaccines and other products (Cont...) | |
| 55. | General method of the preparation of vaccines and other products (Cont...) | |
| Activity1 | MCQ Test | |
| Activity2 | MCQ Test | |
| Activity3 | MCQ Test | |

## II SESSIONAL: 17 Lectures + 2 Activities

| Lecture No. | Lecture Details | Hours |
|---|---|---|
| 56. | Storage conditions and stability of official vaccines | |
| 57. | Hybridoma technology-Production, Purification and Applications | |
| **Unit-4** | | |
| 31. | Immuno blotting techniques | |
| 32. | Genetic organization of Eukaryotes | |
| 33. | Genetic organization of Prokaryotes | **08** |
| 34. | Microbial genetics | |
| 35. | Plasmids | |
| 36. | Transposons | |
| 37. | Microbial biotransformation and applications | |
| 38. | Mutation | |
| **Unit-5** | | |
| 26. | Types of mutation/mutants | |
| 27. | General requirements of fermentation | |
| 28. | General requirements of fermentation (Cont...) | **07** |
| 29. | Large scale production fermenter design and its various controls | |

| | | |
|---|---|---|
| 30. | Study of the production of Penicillin's and Griseofulvin | |
| 31. | Study of the production of Citric acid and Glutamic acid | |
| 32. | Study of the production of Vitamin B12 | |
| Activity-1 | MCQ Test | |
| Activity-2 | MCQ Test | |

**Text Books**

1. Biotechnology by Singh B.D.
2. B.R. Glick and J.J.Pasternak: Molecular Biotechnology:Principles and Applicationsof RecombinantDNA: ASM Press Washington D.C.
3. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio

**Reference Books**

1. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell ScientificPublication
2. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology,2ndedition, Aditya books Ltd., New Delhi

*** *** ***

**JSS Academy of Higher Education & Research, Mysuru**
*(Accredited 'A+' Grade by NAAC)*
**JSS College of Pharmacy, Ooty – 643 001**
(*An ISO 9001:2015 certified Institution*)

**III B. PHARM, V Semester (AY- 2021-22)** (First Half: July - Dec 2021)

| Day | 9-10 AM | 10-11 AM | 11-12 PM | 12-1 PM | 1-2 PM | 2-5 PM (PRACTICAL) |
|---|---|---|---|---|---|---|
| Monday | | PC-II (T) ***(SRK)*** | IP (T) ***(VS)*** | MC II (T) ***(GS)*** | LUNCH BREAK | Batch I -PC-II ***(SRK)*** (P) Batch V- IP ***(VS)*** (P) Batch II- PCOG **(*KS*)** (P) (Batch-III & IV-Library) |
| Tuesday | PJ (*Tu*) **(SP)** | IP(T) ***(VS)*** | PJ (T) ***(SP)*** | PC-II (T) ***(SRK)*** | | Batch II- PC-II ***(SRK)*** (P) Batch III-IP ***(VS)*** (P) Batch I-PCOG **(*KS*)** (P) (Batch-IV & V-Library) |
| Wednesday | | IP (T) ***(VS)*** | PCOG(T) ***(KS)*** | PC-II (*Tu*) ***(SRK)*** | | Batch III-PC-II ***(SRK)*** (P) Batch IV- IP ***(KGR)*** (P) Batch V-PCOG **(*KS*)** (P) (Batch-I & II-Library) |
| Thursday | IP *(Tu)* ***(VS)*** | PJ (T) ***(SP)*** | MC-II (T) ***(GS)*** | PCOG (T) ***(KS)*** | | Batch IV-PC-II ***(SRK)*** (P) Batch II-IP ***(KGR)*** (P) Batch III-PCOG **(*KS*)** (P) (Batch-I & V-Library) |
| Friday | | PJ (T) ***(SP)*** | MC-II (T) ***(GS)*** | PC-II (T) ***(SRK)*** | | Batch V-PC-II ***(SRK)*** (P) Batch I-IP ***(VS)*** (P) Batch IV-PCOG **(*KS*)** (P) (Batch-II & III-Library) |
| Saturday | | MC-II (*Tu*) ***(GS)*** | PCOG (T) ***(KS)*** | PCOG (*Tu*) **(*KS*)** | | Sports/Library |

T- Theory, P- Practical, *Tu-Tutorial*

**Subject in charge:**

1. Medicinal Chemistry-II (BP501T) **(MC-II)** : Dr. Gomathi S ***(GS)*** (T)
2. Industrial Pharmacy-I (BP502T) **(IP)** : Dr.V.Senthil ***(VS)*** (T&P)
3. Pharmacology-II (BP503T) **(PC-II)** : Mr.B.Shivaramakrishnan ***(SRK)*** (T&P)
4. Pharmacognosy & Phytochemistry II (BP504T) **(PCOG)** : Dr. Kalakotla Shankar ***(KS)*** (T&P)
5. Pharmaceutical Jurisprudence (BP505T) **(PJ)** : Ms S. Priyadharshini ***(SP)*** (T)

**Class-in-Charge:** Dr.V.SENTHIL**,** Professor, Dept. of Pharmaceutics [senthil.v@jssuni.edu.in, Mob: 9842650602]

**JSS Academy of Higher Education & Research, Mysuru**
*(Accredited 'A$^{+}$' Grade by NAAC)*
**JSS College of Pharmacy, Ooty – 643 001**
(*An ISO 9001:2015 Certified Institution*)

III B. PHARM (VI Semester AY- 2021-22)

| Day | 9-10 AM | 10-11 AM | 11-12 PM | 12-1 PM | 1-2 PM | 2-5 PM (PRACTICAL) |
|---|---|---|---|---|---|---|
| **Monday** | PB **(T)** **(PV)** | PC-III(T) ***(SRK)*** | BP(T) ***(RA)*** | QA(T) ***(MRJ)*** | **LUNCH BREAK** | Batch I-PC-III ***(SRK)*** Batch III-MC-III ***(SJ)*** Batch II-HDT ***(SP)*** (Batch-IV & V-Library) |
| **Tuesday** | PB (T) **(PV)** | PC-III*(Tu)* ***(SRK)*** | BP(T) ***(RA)*** | MC-III(T) ***(SJ)*** | | Batch II-PC-III ***(SRK)*** Batch IV-MC-III ***(SJ)*** Batch I-HDT ***(SP)*** (Batch-III & V-Library) |
| **Wednesday** | PB **(T)** **(PV)** | HDT(T) ***(SP)*** | PB (T) (PV) | PC-III(T) ***(SRK)*** | | Batch III-PC-III ***(SRK)*** Batch I-MC-III ***(SJ)*** Batch V-HDT ***(SP)*** (Batch-IV & II-Library) |
| **Thursday** | BP*(Tu)* ***(RA)*** | QA(T) ***(MRJ)*** | MC-III(T) ***(SJ)*** | HDT(T) ***(SP)*** | | Batch IV-PC-III ***(SRK)*** Batch V-MC-III ***(SJ)*** Batch III-HDT ***(SP)*** (Batch-I & II-Library) |
| **Friday** | HDT*(Tu)* ***(SP)*** | QA(T) ***(MRJ)*** | HDT(T) ***(SP)*** | MC-III(T) ***(SJ)*** | | Batch V-PC-III ***(SRK)*** Batch II-MC-III ***(SJ)*** Batch IV-HDT ***(SP)*** (Batch-I & III-Library) |
| **Saturday** | QA*(Tu)* ***(MRJ)*** | PC-III(T) ***(SRK)*** | BP(T) ***(RA)*** | MC-III*(Tu)* ***(SJ)*** | | Sports/Library |

**Subject in charge:**

1. Medicinal Chemistry-III **(MC-III)** : Dr. S. Jubie ***(SJ)*** (T&P)
2. Pharmacology -III **(PC-III)** : Mr. B.Shivaramakrishnan ***(SRK)*** (T&P)
3. Herbal Drug Technology **(HDT)** : Dr. S.Priyanka ***(SP)*** (T&P)
4. Biopharmaceutics and Pharmacokinetics **(BP)** : Mr. R. Arun ***(RA)*** (T)
5. Quality Assurance **(QA)** : Dr. M.R.Jeyprakash ***(MRJ)*** (T)
6. Pharmaceutical Biotechology **(PB)** : Dr. P. Vasanth raj ***(PV)*** (T)

**Class-in-Charge:** Dr.V.SENTHIL**,** Professor, Dept. of Pharmaceutics [senthil.v@jssuni.edu.in, Mob: 98426 50602]

## 7.STUDENT SUPPORT SERVICES

| Student Services | Person/s Responsible | Responsibilities |
|---|---|---|
| Principal | Dr. Dhanabal S Palaniswamy | ❖Making decisions on behalf of the faculty, staff, students and alumni to achieve the stated mission and vision of the college.<br>❖Effectively organizing and allocating the human and financial resources of the college to achieve the stated mission and vision of the college.<br>❖Implementing and enforcing the policies of the College and the university.<br>❖Representing and advocating on behalf of the faculty, staff, students and alumni to the university. |
| Vice Principal | Dr. Afzal A Mohammed | ❖Supervision, coordination and delivery of teaching programs<br>❖Management of programs to improve the knowledge, skill and attitude of staff<br>❖Responsibility for general discipline matters of students<br>❖Centre for continuous learning for professional excellence (CCLPE)<br>❖Contribute to the overall management of the college |
| Administrative Officer | Mr. Basavalinga Deveru H K | ❖Coordinating a range of functions, such as finance, human resources and other support areas that contributes significantly to the management function within the college.<br>❖Managing the delivery of a particular service or function (e.g. finance, library, human resources, facilities)<br>❖Performing routine administrative activities<br>❖Providing basic physical and emotional care for students<br>❖Assisting with coordination and planning of student routines<br>❖Providing routine customer service tasks such as reception and providing straightforward advice about the college<br>❖Providing routine support tasks with respect to college maintenance<br>❖Coordinating the day to day routine operational requirements of a college office<br>❖Assuming responsibilities for the general cleanliness and maintenance of the college |

## 10. GRIEVANCE REDRESSAL COMMITTEE

| S. No. | Name | Position | Contact No. |
|---|---|---|---|
| 1. | Dr. S Ponnusankar, Professor | Chairman | 9489613428 |
| 2. | Dr. Afzal A Mohammed, Vice Principal | Co-Chairman | 9486687029 |
| 3. | Dr.K.Gowthamrajan, Professor, | Member | 9443089812 |
| 4. | Dr. Krishnaveni Nagappan, Professor | Member | 9442083447 |
| 5. | Dr. K P.Arun, Associate Professor | Member | 9994934663 |
| 6. | Dr A Justin, Assistant Professor, | Member | 9942932150 |
| 7. | Dr. S Saravanan, Assistant Professor | Member | 9585625948 |
| 8. | Mr.Basavanna, Administrative Officer | Member | 9489044575 |

## 11.ANTI – RAGGING COMMITTEE

As per the decision of the Hon'ble Supreme Court of India in writ petition No. (C) 656 / 1998, "RAGGING IS PROHIBITED". If an incident of ragging comes to the notice of the authority concerned, the accused student(s) will be given an opportunity to explain and if the explanation is not satisfactory the authority will expel him / her from the institution. In this view, an anti – ragging committee is constituted in our institution (as per the regulation notified by AICTE, New Delhi vide F. NO. 37-3/Legal/IACTE/2009 dated July 1, 2009) with the following members. The details of their names and telephone numbers are given here for your assistance. In case of any untoward incidents pertaining to ragging must be immediately brought to the knowledge of the members to curb ragging at its inception stage itself.

| Name of the Staff | Designation | Mobile Phone Number | E-mail. i.d. |
|---|---|---|---|
| Dr. S.P. Dhanabal | Principal & Chief Warden | 94890 44577 | spdhanabal@jssuni.edu.in |
| Dr. Afzal Azam | Vice-Principal & Deputy Chief Warden | 09486687029 | afzal@jssuni.edu.in |
| Dr. S. Ponnusankar | Professor | 94896 13428 | drsponnusankar@jssuni.edu.in |
| Dr. N. Krishnaveni | Professor & Warden (Girl's Hostel) | 94420 83447 | krisath@jssuni.edu.in |
| Dr. GNK Ganesh | Associate Professor | 94421 91918 | gnk@jssuni.edu.in |
| Dr. Arun K P | Associate Professor & Warden (Boy's Hostel) | 99949 34663 | kparun@jssuni.edu.in |
| Mr. H.K. Basavalingadevaru | Administrative Officer & Residential Warden (Boy's Hostel) | 94890 44575 | basavanna@jssuni.edu.in |
| Dr. JSK. Nagarajan | Assistant Professor | 9443257841 | jsk.nagarajan@jssuni.edu.in |
| Dr. B. Gowramma | Associate Professor | 94421 11172 | gowramma@jssuni.edu.in |
| Dr. S Gomathy Subramanian | Assistant Professor | 9486433876 | gomathys@jssuni.edu.in |

SAY NO TO RAGGING – MAKE OUR CAMPUS RAGGING FREE