

Semester V

BP 501 T. MEDICINAL CHEMISTRY- II (Theory)

Credit Points	04	Total Teaching Hours	45
No. of lectures per week	03	No. of tutorials per week	01

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 student shall be able to:

- Understand the chemistry of drugs with respect to their pharmacological activity.
- Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs.
- Know the Structural Activity Relationship of different class of drugs.
- Study the chemical synthesis of selected drugs.

Course Content:

Unit I	Antihistaminic agents: Histamine, receptors and their distribution in the humanbody H1-antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines 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, Levocetrazine Cromolyn sodium H2-antagonists: Cimetidine*, Famotidine, Ranitidin. Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole Anti-neoplastic agents: Alkylating agents: Meclorothamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepe Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate Miscellaneous: Cisplatin, Mitotan	10 hours
Unit II	Anti-anginal: Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol	10 hours

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	<p>tetranitrate, Isosorbide dinitrite*, Dipyridamole.</p> <p>Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.</p> <p>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 .</p> <p>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..</p>	
Unit III	<p>Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcaïnide hydrochloride, Amiodarone, Sotalol.</p> <p>Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol</p> <p>Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel</p> <p>Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.</p>	10 hours
Unit IV	<p>Drugs acting on Endocrine system Nomenclature, Stereochemistry and metabolism of steroids</p> <p>Sex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.</p> <p>Drugs for erectile dysfunction: Sildenafil, Tadalafil.</p> <p>Oral contraceptives: Mifepristone, Norgestril, Levonorgestrol</p> <p>Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone</p> <p>Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.</p>	08 hours
Unit V	<p>Antidiabetic agents: Insulin and its preparations</p> <p>Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin. Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide.</p> <p>Glucosidase inhibitors:</p>	07 hours

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<p>Acarbose, Voglibose. Local Anesthetics: SAR of Local anesthetics</p> <p>Benzoic Acid derivatives: Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.</p> <p>Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.</p> <p>Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.</p> <p>Miscellaneous: Phenacaine, Diperon, Dibucaine.</p>	
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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 to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel., 1987.

Course Description

Name of the Course: Medicinal Chemistry- II	
Course Code: BP501T	Semester: V B.Pharm.
Teaching hours: 45 hours	Maximum marks: Theory: 100
Teaching scheme: L-T: 3-1	
Examination scheme: Internal test: 15 Marks End Semester exam: 75 marks CAS: 10 marks Total: 100 marks	Examination duration: Theory: 03 hours

COURSE OUTCOMES (COs)

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At the end of the course, the student will be able to:

CO No.	COURSE OUTCOMES
BP501T1	To understand the Structural Activity Relationship of different class of drugs.
BP501T2	To understand the chemical synthesis of selected drugs.
BP501T3	To understand the synthetic route for selected category of drugs.
BP501T4	To understand the drug metabolic pathways, adverse effect and therapeutic value of various class of drug.

Course Articulation Matrix: Mapping of COs with POs

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BP501T1	3	-	-	-	-	-	-	-	2	-	2
BP501T2	2	-	2	2	-	-	-	-	2	-	2
BP501T3	3	-	3	-	-	2	-	-	-	-	3
BP501T4	3	-	-	-	-	-	-	-	-	-	2

PO1: Pharmacy Knowledge, PO2: Planning Abilities, PO3: Problem analysis, PO4: Modern tool usage, PO5: Leadership skills PO6: Professional identity, PO7: Pharmaceutical ethics, PO8: Communication, PO9: Pharmacist & society, PO10: Environment & sustainability, PO11: Life-long learning.

Degree of compliance: 1-low 2-medium 3- high

Semester V

BP 502 T. INDUSTRIAL Pharmacy I (Theory)

Credit Points	04	Total Teaching Hours	45
No. of lectures per week	03	No. of tutorials per week	01

Scope:

Course enables the students 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 student shall be able to:

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

Course Content:

Unit I	Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances. <i>a Physical Properties:</i> Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism <i>b Chemical Properties:</i> Hydrolysis, oxidation, reduction, racemization, 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.	7 hours
Unit II	Tablets: a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments	10 hours

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	<p>and tablet tooling.</p> <p>b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.</p> <p>c. Quality control tests: In process and finished product tests</p> <p>Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia</p>	
Unit III	<p>Capsules:</p> <p>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.</p> <p>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.</p> <p>Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets</p>	8 hours
Unit IV	<p>Parenteral Products:</p> <p>a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity</p> <p>b. Production procedure, production facilities and controls, aseptic processing</p> <p>c. Formulation of injections, sterile powders, large volumes parenterals and lyophilized products.</p> <p>d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.</p> <p>Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye</p>	10 hours

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	lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations	
Unit V	<p>Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.</p> <p>Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.</p> <p>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</p>	07 hours

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, 5th edition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

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BP 503 T. PHARMACOLOGY II (Theory)

Credit Points	04	Total Teaching Hours	45
No. of lectures per week	03	No. of tutorials per week	01

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 the course student shall be able to:

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

Course Content:

Unit I	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.	10 hours
Unit II	Pharmacology of drugs acting on cardio vascular system: a. Drug used in the therapy of shock. b. Hematinic, coagulants and anticoagulants. c. Fibrinolytics and anti-platelet drugs d. Plasma volume expanders Pharmacology of drugs acting on urinary system a. Diuretics b. Anti-diuretics.	10 hours
Unit III	Autocoids and related drugs a. Introduction to autocoids 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 drug	10 hours

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Unit IV	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. e. Insulin, Oral Hypoglycemic agents and glucagon. f. ACTH and corticosteroids.	08 hours
Unit V	Pharmacology of drugs acting on endocrine system: a. Androgens and Anabolic steroids. b. Estrogens, progesterone and oral contraceptives. c. Drugs acting on the uterus. Bioassay: a. Principles and applications of bioassay. b. Types of bioassay c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT	07 hours

Recommended Books: (Latest Editions)

11. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
12. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
13. Goodman and Gilman's, The Pharmacological Basis of Therapeutics.
14. 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.
15. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews Pharmacology.
16. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
17. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher.
18. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.
19. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
20. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan

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Course Description

Name of the Course: Pharmacology II	
Course Code: BP503T	Semester: V B.Pharm.
Teaching hours: 45 hours	Maximum marks: Theory: 100
Teaching scheme: L-T: 3-1	
Examination scheme: Internal test: 15 Marks End Semester exam: 75 marks CAS: 10 marks Total: 100 marks	Examination duration: Theory: 03 hours

COURSE OUTCOMES (COs)

At the end of the course, the student will be able to:

CO No.	COURSE OUTCOMES
BP503T1	Discuss pharmacology drugs acting on cardiovascular system including Diuretics.
BP503T2	Discuss pharmacology of autacoids and related drugs.
BP503T3	Discuss pharmacology drugs acting on endocrine system.
BP503T4	Acquaint with basics of bioassay including few examples.

Course Articulation Matrix: Mapping of COs with POs

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BP503T1	3	-	1	1	2	3	1	2	3	1	3
BP503T2	3	1	-	-	1	1	-	2	1	1	3
BP503T3	3	1	-	-	1	1	-	2	1	1	3
BP503T4	3	2	2	2	2	2	2	1	-	2	2

PO1: Pharmacy Knowledge, PO2: Planning Abilities, PO3: Problem analysis, PO4: Modern tool usage, PO5: Leadership skills PO6: Professional identity, PO7: Pharmaceutical ethics, PO8: Communication, PO9: Pharmacist & society, PO10: Environment & sustainability, PO11: Life-long learning.

Degree of compliance: 1-low 2-medium 3- high

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BP 504 T. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)

Credit Points	04	Total Teaching Hours	45
No. of lectures per week	03	No. of tutorials per week	01

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 student shall be able to:

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 carry out isolation and identification of phytoconstituents

Course Content:

Unit I	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.	07 hours
Unit II	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	14 hours
Unit III	Isolation, Identification and Analysis of Phytoconstituents	06 hours

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	a) Terpenoids: Menthol, Citral, Artemisin b) Glycosides: Glycyrrhetic acid & Rutin c) Alkaloids: Atropine, Quinine, Reserpine, Caffeine d) Resins: Podophyllotoxin, Curcumin	
Unit IV	Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastin	10 hours
Unit V	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.	08 hours

Recommended Books: (Latest Editions)

1. W.C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhale (2007), 37th Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr. S.H. Ansari, 2nd 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
13. Text Book of Biotechnology by R.C. Dubey.

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Course Description

Name of the Course: Pharmacognosy and Phytochemistry II	
Course Code: BP504T	Semester: V B.Pharm.
Teaching hours: 45 hours	Maximum marks: Theory: 100
Teaching scheme: L-T: 3-1	
Examination scheme: Internal test: 15 Marks End Semester exam: 75 marks CAS: 10 marks Total: 100 marks	Examination duration: Theory: 03 hours

COURSE OUTCOMES (COs)

At the end of the course, the student will be able to:

CO. No.	COURSE OUTCOMES
BP504T1	Acquired knowledge of metabolic pathways in plants and ways to investigate them. Significance of these pathways and its benefits to the mankind.
BP504T2	Possess the knowledge on the botanical, chemical, macroscopical, microscopical and pharmacological aspects of selected secondary metabolites.
BP504T3	Explain the isolation and analysis of secondary metabolites, its industrial production, estimation and utilization of natural drugs
BP504T4	Acquired understanding on modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents

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Course Articulation Matrix: Mapping of COs with POs

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BP504T1	3	-	-	3	-	-	-	-	3	3	3
BP504T2	3	-	-	3	-	-	-	-	3	3	3
BP504T3	3	3	3	3	-	-	-	-	3	3	3
BP504T4	3	-	-	3	-	-	-	-	3	3	3

PO1: Pharmacy Knowledge, PO2: Planning Abilities, PO3: Problem analysis, PO4: Modern tool usage, PO5: Leadership skills PO6: Professional identity, PO7: Pharmaceutical ethics, PO8: Communication, PO9: Pharmacist & society, PO10: Environment & sustainability, PO11: Life-long learning.

Degree of compliance: 1-low 2-medium 3- high

Semester V

BP 505T. PHARMACEUTICAL JURISPRUDENCE (Theory)

Credit Points	04	Total Teaching Hours	45
No. of lectures per week	03	No. of tutorials per week	01

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 student shall be able to:

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	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.	10 hours
Unit II	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,	10 hours

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	Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors	
Unit III	<ul style="list-style-type: none"> • 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 	10 hours
Unit IV	<ul style="list-style-type: none"> • 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) 	08 hours
Unit V	<ul style="list-style-type: none"> • 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 Definition, 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) 	07 hours

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Recommended Books: (Latest Editions)

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)

Course Description

Name of the Course: Pharmaceutical Jurisprudence	
Course Code: BP505T	Semester: V B.Pharm.
Teaching hours: 45 hours	Maximum marks: Theory: 100
Teaching scheme: L-T: 3-1	
Examination scheme: Internal test: 15 Marks End Semester exam: 75 marks CAS: 10 marks Total: 100 marks	Examination duration: Theory: 03 hours

COURSE OUTCOMES (COs)

At the end of the course, the student will be able to:

CO No.	COURSE OUTCOMES
BP604T1	Explain and implement the objectives, import and manufacture requirements of drugs as per Drugs and Cosmetics Act, 1940 and its rules 194
BP604T2	Explain and implement the objectives and requirements of sale, labeling & packing of drugs and administration of drugs as per Drugs and Cosmetics Act, 1940 and its rules 1945
BP604T3	Explain and implement the objectives and requirements of Pharmacy Act –1948, Medicinal and Toilet Preparation Act –1955, Narcotic Drugs and Psychotropic substances Act-1985 and Rule
BP604T4	Explain and implement the objectives and requirements of Drugs and Magic Remedies Act and its Rules, Prevention of Cruelty to animals Act-1960, and National Pharmaceutical Pricing Authority

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Course Articulation Matrix: Mapping of COs with POs

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BP505T1	3	2	-	-	-	1	3	1	3	3	3
BP505T2	3	2	-	-	-	1	3	-	3	3	3
BP505T3	3	-	-	-	-	1	3	-	3	3	2
BP505T4	3	-	-	-	-	1	3	-	2	3	2

PO1: Pharmacy Knowledge, PO2: Planning Abilities, PO3: Problem analysis, PO4: Modern tool usage, PO5: Leadership skills PO6: Professional identity, PO7: Pharmaceutical ethics, PO8: Communication, PO9: Pharmacist & society, PO10: Environment & sustainability, PO11: Life-long learning.

Degree of compliance: 1-low

2-medium

3- high

Semester V

BP506P. Industrial Pharmacy I (Practical)

Credit Points	02	Total Teaching Hours	04/week
No. of practical per week	04	No. of tutorials per week	00

Scope:

Course enables the students 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 student shall be able to:

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

Course Content:

Sr. No.	Course Contents
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 tablets/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)

Semester V

Recommended Books: (Latest Editions)

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

Semester V

Course Description

Name of the Course: Industrial Pharmacy I (Practical)	
Course Code: BP506P	Semester: III B. Pharm.
Teaching hours: 04 Hours per week	Maximum marks: 50 Marks
Examination scheme: Internal Assessment (I.A.): 15 Marks End Semester Examination (E.S.E.): 35 Marks Total: 50 Marks	Examination duration: 04 Hours

COURSE OUTCOMES (COs)

At the end of the course, the student will be able to:

CO No.	COURSE OUTCOMES
BP506P1	To gain knowledge of various unit operations and processes carried out during development of various pharmaceutical dosage forms.
BP506P2	State the correct use of various equipments in Pharmaceutics laboratory relevant to tablets, capsules & coating and Cosmetic creams parental dosage forms.
BP506P3	Understand formulation and evaluation of different dosage forms like parenteral, Ophthalmic dosage form, Cosmetic and liquid.
BP506P4	Understand evaluation of glass container

Course Articulation Matrix: Mapping of COs with POs

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BP506P1	3	2	1	1	2	1	1	-	2	1	3
BP506P2	3	2	1	1	2	1	1	-	2	1	3
BP506P3	3	2	1	1	2	-	1	-	2	1	3
BP506P4	3	2	1	1	2	-	1	-	2	1	3

PO1: Pharmacy Knowledge, PO2: Planning Abilities, PO3: Problem analysis, PO4: Modern tool usage, PO5: Leadership skills PO6: Professional identity, PO7: Pharmaceutical ethics, PO8: Communication, PO9: Pharmacist & society, PO10: Environment & sustainability, PO11: Life-long learning.

Degree of compliance: 1-low

2-medium

3- high

Semester V

BP507P. PHARMACOLOGY (Practical)

Credit Points	02	Total Teaching Hours	04/week
No. Of practicals per week	04	No. of tutorials per week	00

Scope: The scope of the pharmacology practical focuses on equipping students with essential laboratory skills for handling lab animals as per CPCSEA guidelines, Experimental pharmacology deals with effects of various test substances studied on different animal species which is aimed at finding out safe therapeutic agent suitable for public health as well as mechanism and site of action of a test substance.. Understand the effect of drugs on various activities such as antianxiety, anticonvulsant, local anaesthetic, etc. in animal models using software.

Objectives:

Upon completion of the course student shall be able to:

1. Explain various instruments used in pharmacology lab and characteristics and handling of laboratory animals as per CPSCEA guidelines
2. Understand the effects of drugs on various activities such as Hypertension, Anti-Inflammatory, Analgesic.
3. To learn the effects of drugs on DRC by using animal models.
4. To study the bioassay of various drugs by methods of bioassay, that is by matching method, interpolation method, and three point assay.

Course Content:

Sr. No.	Course Contents
12.	Introduction to in-vitro pharmacology and physiological salt solutions,
13.	Effect of drugs on isolated frog heart.
14.	Effect of drugs on blood pressure and heart rate of dog.
15.	Study of diuretic activity of drugs using rats/mice.
16.	DRC of acetylcholine using frog rectus abdominis muscle.
17.	Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
18.	Bioassay of histamine using guinea pig ileum by matching method.
19.	Bioassay of oxytocin using rat uterine horn by interpolation method.

Semester V

20.	Bioassay of serotonin using rat fundus strip by three point bioassay.
21.	Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
22.	Determination of PA ₂ value of prazosin using rat anococcygeus muscle (by Schild's plot method).
23.	Determination of PD ₂ value using guinea pig ileum.
24.	Effect of spasmogens and spasmolytics using rabbit jejunum.
25.	Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
26.	Analgesic activity of drug using central and peripheral methods

Semester V

Course Description

Name of the Course: Pharmacology (Practical)	
Course Code: BP507P	Semester: IV
Teaching hours: 04 Hours per week	Maximum marks: 50 Marks
Examination scheme: Internal Assessment (I.A.): 15 Marks End Semester Examination (E.S.E.): 35 Marks Total: 50 Marks	Examination duration: 04 Hours

COURSE OUTCOMES (COs)

At the end of the course, the student will be able to:

CO No.	COURSE OUTCOMES
BP507P1	Understand and design In-vitro Pharmacological experiment set-up by using isolated animal tissue.
BP507P2	Quantitative estimation of biological samples using isolated tissue preparation, their interpretation and efficiency assessment
BP507P3	Understand receptor mediated responses and to determine EC50 value of agonist and antagonist by graphical representation.
BP507P4	Understand the effect of CNS mediated drugs, diuretics and analgesic drugs on animals and learn to calculate the effective dose

Course Articulation Matrix: Mapping of COs with POs

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
BP507P1	3	3	2	3	2	1	3	2	3	-	3
BP507P2	3	2	2	3	1	2	1	-	3	-	3
BP507P3	3	2	2	2	1	2	1	-	3	-	3
BP507P4	3	2	2	3	1	1	1	-	3	-	3

PO1: Pharmacy Knowledge, PO2: Planning Abilities, PO3: Problem analysis, PO4: Modern tool usage, PO5: Leadership skills PO6: Professional identity, PO7: Pharmaceutical ethics, PO8: Communication, PO9: Pharmacist & society, PO10: Environment & sustainability, PO11: Life-long learning.

Semester V

Degree of compliance: 1-low	2-medium	3- high
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Semester V

BP508P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical)

Credit Points	02	Total Teaching Hours	04/week
No. Of practicals per week	04	No. of tutorials per week	00

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 student shall be able to:

5. to know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
6. to understand the preparation and development of herbal formulation.
7. to understand the herbal drug interactions
8. to carry out isolation and identification of phytoconstituents

Course Content:

Sr. No.	Course Contents
27.	To study morphology, histology and powder characteristics of Senna leaves.
28.	To study morphology, histology and powder characteristics of Clove bud
29.	To study morphology, histology and powder characteristics of Cinchona
30.	To study morphology, histology and powder characteristics of Cinnamon bark.
31.	To study morphology, histology and powder characteristics of Ephedra.
32.	To study morphology, histology and powder characteristics of Fennel
33.	To study morphology, histology and powder characteristics of Coriander
34.	To analyse the given crude drugs by using chemical test
35.	To isolate caffeine from tea dust and estimation by TLC method

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36.	To perform TLC of given herbal extract of Curcuma longa
37.	To extract Atropine from Belladonna and identify by TLC method
38.	To perform the experiment of separation of active constituents of clove by TLC
39.	To extract Diosgenin from Dioscorea and identify by Thin layer chromatography
40.	To perform the experiment on extraction of sennosides from senna.
41.	To perform separation of sugar sample by paper chromatography.

Course Description

Name of the Course: Pharmacognosy and Phytochemistry II (Practical)	
Course Code: BP508P	Semester: III B.Pharm.
Teaching hours: 04 Hours per week	Maximum marks: 50 Marks
Examination scheme: Internal Assessment (I.A.): 15 Marks End Semester Examination (E.S.E.): 35 Marks Total: 50 Marks	Examination duration: 04 Hours

