SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11)
Syllabus with effect from the Academic Year 2023-2024

PROGRAMME STRUCTURE

Bachelor of Pharmacy (B. Pharm) Semester: VI

To Pass	At least 40% Marks in the aggregate of University and Internal examination in each course.							
Course Type	Course code	Name of the course	Credit	Contact Hours per Week	Exam Duration in Hrs	Component of Marks		
						Internal	End Semester	Total
Core Course	UP06CBPH01	Medicinal Chemistry III – Theory	4	4	3	25/10	75/30	100/40
	UP06CBPH02	Pharmacology III – Theory	4	4	3	25/10	75/30	100/40
	UP06CBPH03	Herbal Drug Technology – Theory	4	4	3	25/10	75/30	100/40
	UP06CBPH04	Pharmaceutical Biotechnology - Theory	4	4	3	25/10	75/30	100/40
	UP06CBPH05	Industrial Pharmacy I – Theory	4	4	3	25/10	75/30	100/40
	UP06CBPH06	Medicinal Chemistry III – Practical	2	4	4	15/6	35/14	50/20
	UP06CBPH07	Pharmacology III – Practical	2	4	4	15/6	35/14	50/20
	UP06CBPH08	Herbal Drug Technology – Practical	2	4	4	15/6	35/14	50/20
	UP06CBPH09	Industrial Pharmacy I – Practical	2	4	4	15/6	35/14	50/20
		Total:	**28**	**-**	**-**	**185**	**515**	**700/280**

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Bachelor of Pharmacy (B. Pharm) Semester: VI

To Pass	At least 40% Marks in the aggregate of University and Internal examination in each course.							
Course Type	Course code	Name of the course	Credit	Contact Hours per Week	Exam Duration in Hrs	Component of Marks		
						Internal	End Semester	Total
Core Course	UP06CBPH01	Medicinal Chemistry III – Theory	4	4	3	25/10	75/30	100/40
	UP06CBPH02	Pharmacology III – Theory	4	4	3	25/10	75/30	100/40
	UP06CBPH03	Herbal Drug Technology – Theory	4	4	3	25/10	75/30	100/40
	UP06CBPH04	Pharmaceutical Biotechnology - Theory	4	4	3	25/10	75/30	100/40
	UP06CBPH05	Industrial Pharmacy I – Theory	4	4	3	25/10	75/30	100/40
	UP06CBPH06	Medicinal Chemistry III – Practical	2	4	4	15/6	35/14	50/20
	UP06CBPH07	Pharmacology III – Practical	2	4	4	15/6	35/14	50/20
	UP06CBPH08	Herbal Drug Technology – Practical	2	4	4	15/6	35/14	50/20
	UP06CBPH09	Industrial Pharmacy I – Practical	2	4	4	15/6	35/14	50/20
		Total:	**28**	**-**	**-**	**185**	**515**	**700/280**

Semester VI

Schemes for internal assessments and end semester examinations

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
UP06CBPH01	Medicinal Chemistry III – Theory	10	15	1 Hr	25	75	3 Hrs	100
UP06CBPH02	Pharmacology III – Theory	10	15	1 Hr	25	75	3 Hrs	100
UP06CBPH03	Herbal Drug Technology – Theory	10	15	1 Hr	25	75	3 Hrs	100
UP06CBPH04	Pharmaceutical Biotechnology - Theory	10	15	1 Hr	25	75	3 Hrs	100
UP06CBPH05	Industrial Pharmacy I – Theory	10	15	1 Hr	25	75	3 Hrs	100
UP06CBPH06	Medicinal Chemistry III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
UP06CBPH07	Pharmacology III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
UP06CBPH08	Herbal Drug Technology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
UP06CBPH09	Industrial Pharmacy I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
Total		**70**	**115**	**21 Hrs**	**185**	**515**	**31 Hrs**	**700**

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Bachelor of Pharmacy
B. Pharm Semester VI

Course Code	UP06CBPH01	Title of the Course	MEDICINAL CHEMISTRY III - Theory
Total Credits of the Course	4	Hours per Week	3 + 1 (Tutorial)

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 this course the student should 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	Description	Hours
I	**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, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline	**10**
II	**Antibiotics** Historical background, Nomenclature, Stereochemistry, Structure	**10**

	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.	
III	**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, **Miscellaneous:** Furazolidine, Nitrofurantoin*, Methanamine. **Antiviral agents:** Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.	**10**
IV	**Antifungal agents:** **Antifungal antibiotics:** Amphotericin-B, Nystatin, Natamycin, Griseofulvin. **Synthetic Antifungal agents:** Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine	**08**

	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*.	
V	**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.	**07**

Suggested References:	
Sr. No	**References**
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

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B. Pharm Semester VI

Course Code	UP06CBPH02	Title of the Course	PHARMACOLOGY III - Theory
Total Credits of the Course	4	Hours per Week	3 + 1 (Tutorial)

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 poisoningsand 3. appreciate correlation of pharmacology with related medical sciences.

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	Description	Hours
I	**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.	**10**
II	**Chemotherapy** a. General principles of chemotherapy. b. Sulfonamides and cotrimoxazole.	**10**

	c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides	
III	**Chemotherapy** a. Antitubercular agents b. Antileprotic agents c. Antifungal agents d. Antiviral drugs e. Anthelmintics f. Antimalarial drugs g. Antiamoebic agents	**10**
IV	**Chemotherapy** Urinary tract infections and sexually transmitted diseases. m. Chemotherapy of malignancy. **Immunopharmacology** a. Immunostimulants b. Immunosuppressant Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars	**08**
V	**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.	**07**

Suggested References:	
Sr. No	**References**
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

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Bachelor of Pharmacy
B. Pharm Semester VI

Course Code	UP06CBPH03	Title of the Course	HERBAL DRUG TECHNOLOGY - Theory
Total Credits of the Course	4	Hours per Week	3 + 1 (Tutorial)

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	Description	Hours
I	**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.	11
II	**Nutraceuticals** General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals	7

	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.	
III	**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	**10**
IV	**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.	**10**
V	**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 equipments, standard operating procedures, health and hygiene, documentation and records.	**07**

Suggested References:	
Sr. No	**References**
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.

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Bachelor of Pharmacy
B. Pharm Semester VI

Course Code	UP06CBPH04	Title of the Course	PHARMACEUTICAL BIOTECHNOLOGY - Theory
Total Credits of the Course	4	Hours per Week	3 + 1 (Tutorial)

Scope	• 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

Course Content

Unit	Description	Hours
I	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.	10
II	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.	10

	d. Brief introduction to PCR	
III	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 Substituties	**10**
IV	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	**08**
V	a. Fermentation methods and general requirements, study of media, equipments, 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 Substituties	**07**

Suggested References:

Sr. No	References
1	B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: 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

Bachelor of Pharmacy
B. Pharm Semester VI

Course Code	UP06CBPH05	Title of the Course	INDUSTRIAL PHARMACY I - Theory
Total Credits of the Course	4	Hours per Week	3 + 1 (Tutorial)

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 this course the student should 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 Content:		
Unit	**Description**	**Hours**
I	**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.	**7**
II	**Tablets:** a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling. b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.	**10**

	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	
III	**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	**8**
IV	**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	**10**
V	**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.	**10**

Suggested References:	
Sr. No	**References**
1	Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2	Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
3	Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
4	Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
5	Theory and Practice of Industrial Pharmacy by Liberman & Lachman
6	Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
7	Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
8	Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107
9	Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman

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B.Pharm Semester VI

Course Code	UP06CBPH06	Title of the Course	MEDICINAL CHEMISTRY III (Practical)
Total Credits of the Course	2	Hours per Week	4

Objectives:	Upon completion of this course the student should be able to: 1. Understand the importance of reaction steps for preparation of drugs and intermediates. 2. Learn the analytical techniques for assay of drugs. 3. Learn the different software used for drawing the structure and reaction.

Course Content	
Sr. No.	**Description**
I	**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 **Benzyl penicillin**
III	Preparation of medicinally important compounds or intermediates by Microwave 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)

Suggested References:	
Sr. No	**References**
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

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Bachelor of Pharmacy
B.Pharm Semester VI

Course Code	UP06CBPH07	Title of the Course	PHARMACOLOGY III (Practical)
Total Credits of the Course	2	Hours per Week	4

Objectives:	1. To study effects of drugs 2. To perform calculations such as dose, pharmacokinetic parameters and statistical treatments to pharmacological data. 3. To study toxicological parameters of drugs.

Course Content	
Sr. No.	**Description**
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*

Suggested References:	
Sr. No	**References**
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

SARDAR PATEL UNIVERSITY

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Syllabus with effect from the Academic Year 2023-2024

Bachelor of Pharmacy
B. Pharm Semester VI

Course Code	UP06CBPH08	Title of the Course	HERBAL DRUG TECHNOLOGY (Practical)
Total Credits of the Course	2	Hours per Week	4

Objectives:	1. To evaluate crude drugs and herbal products 2. To prepare and standardize the plant extract 3. To analyse the herbal drugs as per pharmacopoeial standards.

Course Content	
Sr. No.	**Description**
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

Suggested References:

Sr. No	References
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.

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Bachelor of Pharmacy
B. Pharm Semester VI

Course Code	UP06CBPH09	Title of the Course	INDUSTRIAL PHARMACY I (Practical)
Total Credits of the Course	2	Hours per Week	4

Objectives:	Upon completion of this course the student should be able to 1. To learn various preformulation parameters for dosage form development. 2. To learn the techniques of manufacturing solid orals, semi solids, injectables and ophthalmic dosage forms. 3. To learn various quality control parameters of solid orals.

Course Content	
Sr. No.	**Description**
1	Preformulation studies on paracetamol/asparin/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	Qulaity 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)

Suggested References:	
Sr. No	**References**
1	Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2	Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
3	Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
4	Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)

5	Theory and Practice of Industrial Pharmacy by Liberman & Lachman
6	Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
7	Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
8	Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107
9	Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman

Enclosure-B/5

Sardar Patel University

Vallabh Vidyanagar

Guidelines for Awarding Credit Points for Co-curricular Activities

Sr. No.	Name of Activity	Maximum Credit Points Eligible per Activity
1	Participation and Presentation (Poster, Oral or Model) in National Level Seminar/ Conference/ Workshop/ Symposium/ Training Programs/ Technical Fest/ Events related to Pharmaceutical Science.	01
2	Participation and Presentation (Poster, Oral or Model) in International Level Seminar/ Conference/ Workshop/ Symposium/ Training Programs/ Technical Fest/ Events related to Pharmaceutical Science.	02
3	Academic Award/Research Award from State Level/National Agencies	01
4	Academic Award/Research Award from International Agencies	02
5	Research/ Review Publication in National Journals (UGC Approved/ Indexed in Scopus/ Web of Science)	01
6	Research/ Review Publication in International Journals (UGC Approved/ Indexed in Scopus/ Web of Science)	02
7	Successful completion of MOOCs related to research methodology or subject of specialization.	01

Note:

1. International Conference: Held Outside India; International Journal: The Editorial Board Outside India
2. Every PG student shall participate in the co-curricular and extra-curricular activities and submit the documentary proof to the designated Faculty Member appointed by Head of the Department
3. The PG programme committee will discuss and finalize the activity credit points for each student.
4. The credit points assigned for extracurricular and co-curricular activities shall be given by the Head of the Department and same shall be submitted to the University.