GANPAT UNIVERSITY
B. Pharm Semester-VIII Program
Structure for B.Pharm Semester-VIII Program

Sr. No.	Course Code	Course Title	Teaching Scheme Hrs/ week						Type of Course
			Theory	Credit	Weighted Credit Point	Practical	Credit	Weighted Credit Point	
01	8A01 DFD	Dosage Form Design-II	3	3	10 X3 = 30	3	1.5	10 X1.5 =15	Core
02	8A02 PCT	Pharmaceutical Technology-II	3	3	10 X 3 = 30	3	1.5	10 X1.5 =15	Core
03	8A03 PAN	Pharmaceutical analysis-IV	3	3	10 X 3 = 30	3	1.5	10 X1.5 =15	Core
04	8A04 PCM	Pharmaceutical Chemistry-X (Medicinal Chemistry)	3	3	10 X 3 = 30	3	1.5	10X1.5 = 15	Core
05	8A05 PCG	Pharmacognosy-VII	2	2	10 X 2 = 20	3	1.5	10 X1.5 =15	Core
06	8A06 CLP	Clinical Pharmacy-II	3	3	10 X 3 = 30	3	1.5	10X1.5 = 15	Core
		Total	17	17	170	18	9	90	
Total credit 17+9 =26 and Total weighted credit point 170+90 = 260									

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B. Pharm Semester-VIII Program

Teaching and Examination scheme

S. N	Course Code	Course Title	Teaching Scheme Hrs/Week		Total Hours		Examination				
			Th.	Pra.	Th.	Pra.	Theory		Practical		Total
							Int	Ext	Int	Ext	
1	8A01 DFD	Dosage Form Design-II	3	3	45	45	30	70	30	70	200
2	8A02 PCT	Pharmaceutical Technology-II	3	3	45	45	30	70	30	70	200
3	8A03 PAN	Pharmaceutical analysis-IV	3	3	45	45	30	70	30	70	200
4	8A04 PCM	Pharmaceutical Chemistry-X (Medicinal Chemistry)	3	3	45	45	30	70	30	70	200
5	8A05 PCG	Pharmacognosy-VII	2	3	30	45	30	70	30	70	200
6	8A06 CLP	Clinical Pharmacy-II	3	3	45	45	30	70	30	70	200
		Total	17	18	255	270	180	420	180	420	1200

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Bachelor of Pharmacy

Semester: VIII

8A01DFD Dosage Form Design – II

Theory (3 Hours / Week; 45Hrs)

1	**Controlled and sustained release dosage forms** Design of oral sustained release systems: Biological factors, Physicochemical factors Diffusional systems: - Reservoir system, Lag time, Burst effect, Matrix system, Effect of porosity and tortuosity Dissolution controlled system, Cube route dissolution equation, Diffusion layer controlled dissolution. Bioerodible and Combination of diffusion and dissolution systems. Design, development and evaluation of oral and parenteral controlled release formulations.	***8***
2	**Novel drug delivery system** (a) Modified drug delivery systems: Fundamentals, rational of modified release drug delivery, factors influencing the design and performance, pharmacokinetic and pharmacodynamic basis for modified drug delivery systems, estimation of loading and maintenance dose. (b) Design and development of oral modified release dosage forms: Matrix tablets, microspheres, hydrogels, osmotic pressure controlled systems, gastro retentive systems, colon targeting. (c) Fabrication of parenteral drug delivery systems: Parenteral emulsions & parenteral suspensions, microspheres, liposomes, niosomes, nanoparticles. (d) Formulation and evaluation of Transdermal drug delivery systems. (e) A brief study of site specific and targeted drug delivery systems, transmucosal and ocular drug delivery systems.	***20***
3	**Pharmacokinetics** (a) Definition and scope, significance of plasma drug concentration measurement. (b) Compartment model: Phamacokinetics of drug absorption Zero order and first order absorption rate constant using Wagner- Nelson and Loo-Riegelman method. (c) Volume of distribution and distribution coefficient. (d) Compartment kinetics- one compartment and two compartment models. Determination of pharmacokinetic parameters from plasma and urine data after drug administration by intra vascular and oral route. (e) Curve fitting (Method of Residuals), regression procedures. (f) Clearance concept, mechanism of renal clearance, clearance ratio, determination of renal clearance. (g) Hepatic elimination of drugs, first pass effect, extraction ratio, hepatic clearance, biliary excretion, extrahepatic circulation. (h) Non-linear pharmacokinetics with special reference to one compartment model after I.V. drug administration, Michaeles Menten Equation, detection of non- linearity (Saturation mechanism). (i) Numericals related to pharmacokinetic parameters using one compartmental model.	***10***

4	**Clinical Pharmacokinetics** a) Definition and scope b) Dosage adjustment in patients with and without renal and hepatic failure. c) Pharmacokinetic drug interactions and their significance in combination therapy	***3***
5	**Bioavailability and Bioequivalence:** a) Measures of bioavailability, Cmax, tmax and area under the curve (AUC). b) Design of single dose bio-equivalence study and relevant statistics. c) Review of regulatory requirements for conduction of bio-equivalent studies.	***4***

Practical (3hr\week; 45 Hours)

Practical shall be conducted from the topics covered in theory explaining the principle involved in design and development of controlled and Novel Drug Delivery Systems etc..

References Books:

1.	Remington's Pharmaceutical Sciences, Mack Publishing Company, Easton, Pennsylvania.
2.	Clinical Pharmacokinetics: Concepts and Applications by Rowland and Tozar, Lippincott Williams & Wilkins.
3.	Controlled Drug delivery, Fundamentals and Applications by J.R. Robinson & Uinvent Lee, Marcel Dekkar Inc.
4.	Noval Drug Delivery Systems by Y. W. Chian Ed. James Swarbrick, Marcel Dekker.
5.	Applied Biopharmaceutics and Pharmacokinetics by Leon Shargel, Susanna Wu- Pong and Andrew B. C. Yu.
6.	Pharmacokinetics by Milo Gibaldi and Donald Perrier.

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Semester: VIII

8A02PCT Pharmaceutical Technology – II

Theory (3 Hours / Week; 45 Hrs)

1	**Tablet** (a) Definition, Advantages and disadvantages, Introduction to types of tablets**,** formulation of different types of tablets; excipients, granulation techniques, machinery for large scale granulation and compression, physics of tablet making, In process controls, processing problems and remedies, (b) Evaluation (Pharmacopoeial and nonpharmacopoeial test) and equipments. Brief outline on manufacturing method and evaluation of mouth dissolving tablets, buccal tablets, floating tablets, tablets of colon drug delivery, matrix tablets. (C) **Coating Of Tablets:** objectives, types of coating, film forming materials, formulations of coating solution, equipments for coating, coating process, evaluation of coated tablets , coating defects, specialized coating processes. (d) **Pharmaceutical Tablet Compression Tooling:** Terminology, tablet design, specification and information required, use and care of the tooling, problem solving.	***18***
2	**Capsules** **Hard Capsules:** Definitions, Advantages, disadvantages, Ideal requirements, Production of Hard capsules (Gelatin and nongelatin e.g. vegetable), Capsule storage, size of capsules, formulation and methods of capsule filling, problems and remeadies, quality control, climatic control in capsule department, I.P capsules. **Soft Gelatin Capsules:** Formulation of shell and capsule coat, quality control with special emphasis on current dissolution testing. **Microcapsules/Microspheres:** Importance of microcapsule and microsphere in pharmacy, methods of preparation: Phase separation, coacervation, multiorifice centrifugal methods, spray congelling, polymerisation, complex emulsion, Air suspension technique, coating pan and other techniques, evaluation of microcapsules, Applications of biodegradable and nonbiodegradable polymers in Microcapsules/Microspheres.	***15***
3	**Cosmeticology and cosmetic preparations** Fundamentals of cosmetic science, structure and functions of skin and hair, formulation, preparation and packaging of cosmetics for skin - Sunscreen, moisturizers, cold cream, and vanishing cream, hair - Shampoo and conditioners, dentifrice- powders, gels, paste and manicure preparations like- nail polish, lipsticks, eye lashes, brief introduction to cosmaceuticals, baby care products, shaving cream, hygienic products.	***6***
4	**Pharmaceutical Packaging** Definition, Packaging components, types, specifications and methods of evaluation, stability aspects of packing. Primary and secondary packaging, packaging materials, containers and closures; and tamper-evident packaging, packaging equipments. Regulatory requirements in pharmaceutical packaging.	***6***

Practical (3hr\week; 45 Hours)

Practical shall be conducted from the topics covered in theory explaining the principle involved in formulation and evaluation of tablet, capsule and cosmetic preparations etc..

References Books:

1.	Pharmaceutical Dosage Forms and Drug Delivery Systems by Ansel & others.
2.	Pharmaceutics: The Science of Dosage Form Design by Michael E. Aulton
3.	Pharmaceutical Dosage Forms: Tablets: Vol.1, Vol. 2 and Vol.3, Ed. by Lieberman, Leon Lachman and Joseph B. Schwartz, Marcel Dekker Inc., New York.
4.	Cosmetics by Poucher
5.	The Theory and Practice of Industrial Pharmacy by L Lachman, H Lieberman & J Kanig.
6.	Gennaro, Alfonso R., Remington: The Science and Practice of Pharmacy, Vol-I & II, Lippincott Williams & Wilkins, New York.

GANPAT UNIVERSITY
B. Pharm. Semester- VIII
8A03PAN Pharmaceutical Analysis IV

Theory (3 Hours / Week; 45 Hrs)

1.	**Gas Chromatography:** Introduction; Theory and Principle of Gas-Chromatography; Mobile phase, Stationary phases for GSC and GLC; Instrumentation (including temperature programming and derivatization) and applications of GC; Overview of GC-MS.	05
2.	**High Performance Liquid Chromatography (HPLC):** Introduction; Theory, Classification and Principle of HPLC; Mobile phase, Stationary phases for normal and reversed phase HPLC; Instrumentation (including significance of guard column) and applications of HPLC; Comparison of HPLC with GC; Overview of LC-MS, LC-MS/MS. Basic principle, theory and applications of partition, adsorption, ion-exchange, size exclusion, Super critical fluid and Affinity chromatography.	08
3.	**HPTLC:** Principle; Comparison with HPLC; Instrumentation, applications, advantages and limitations of HPTLC.	02
4.	**IR spectroscopy:** Theory of absorption of Infrared radiation by molecules; Molecular vibrations; Factors influencing vibrational frequencies; Calculation of vibrational frequencies (Hooke's law); Sample handling techniques; Instrumentation (Dispersion and FTIR spectrometer) and applications of IR Spectroscopy; Calibration of IR Spectrophotometer as per Pharmacopoeia.	06
5.	**Mass spectrometry:** Theory; Ionization techniques, Ion separating techniques; Different types of ions and their significance in mass spectra, Fragmentation rules and rearrangements; Instrumentation and applications of mass spectrometry.	06
6.	**Nuclear Magnetic Resonance spectroscopy:** Fundamental Principles–nuclear spin, magnetic moment; Proton NMR spectroscopy - theory, chemical shift and factors affecting chemical shift, spin- spin coupling, coupling constant, relaxation process, Instrumentation and applications of PMR; Brief overview of C13 NMR.	08
7.	Structure elucidation by joint application of UV, IR, NMR and Mass spectrometry	03
8.	**Fluorescence spectroscopy:** Introduction, principle and theory of fluorescence and phosphorescence, comparison of fluorimetry and UV, types of fluorescence, Factors affecting fluorescence intensity (structural and nonstructural), quenching and types, Instrumentation, applications and limitations of fluorescence spectroscopy	07

Practical: (3hrs/week; 45 Hours)

Practicals based on instrumental techniques eg. Pharmacopoeial or other methods for analysis of various drugs using different analytical techniques

Reference books:

1	Principles of Instrumental Analysis by skoog, holler, Nieman, 5th edition.
2	Instrumental methods of Analysis, H.H. Willard, L.L. Meritt, J.A. Dean and F.A. Settle Wadsworath, New York
3	Pharmaceutical Analysis: Modern methods Part A, Part B, James W. Munson.
4	G. H. Jeffery, J. Basset, J. Mendham, R. C. Denny (Rev. by) Vogel's Text Book of Quantitative Chemical Analysis, Longman, London
5	A Textbook of Pharmaceutical Analysis. Connors K.A.
6	A.H. Beckett and J.B. Stenlake, Practical Pharmaceutical chemistry, part 1&2, the athlone press, London.
7	Pharmacopoeia of India, Govt. of India, Ministry of Health.
8	British Pharmacopoeia, ministry of health and social welfare, UK.
9	The United States Pharmacopeia–National Formulary (USP–NF)
10	Instrumental Analysis by Ashutosh Khar
11	Instrumental Analysis by Vidyasagar Part – II
12	Instrumental analysis by Chatwal and Anand
13	Quality Assurance Guide by Organization of Pharmaceutical Products of India.
14	Quality Assurance of Pharmaceuticals – A compendium of guidelines and related materials – Vol. I – WHO Publications.

GANPAT UNIVERSITY
B. Pharm. Semester- VIII
8A04PCM Pharmaceutical Chemistry-X (Medicinal Chemistry)
Theory (3 Hours / Week; 45 Hrs)

	Introduction, classification, nomenclature, mechanism of action, adverse effects, therapeutic uses, structure activity relationship (SAR) and synthetic procedures of selected drugs and recent developments of following categories to		
1.	**Drugs acting on Cardiovascular System:**		
	a.	**Cardiotonic Agents** SAR: Cardiac glycosides Synthesis: Dobutamine	**4**
	b.	**Antihypertensive Agents** SAR: ACE Inhibitors, Dihydropyridnes Synthesis: Nifedipine, Amlodipine, Atenolol, Metoprolol, Captopril, Hydralazine.	**8**
	c.	**Antiarrhythmic Agents** Synthesis: Lignocaine, Flecainide.	**4**
	d.	**Antianginal Agents** Synthesis: Glyceryl trinitrate, Isosorbide dinitrate	**2**
	e.	**Antihyperlipidemic agents:** SAR: HMG CoA Reductase inhibitors Synthesis of Clofibrate	**3**
	f.	**Coagulants and Anticoagulants:** Synthesis of warfarin	**2**
	g.	**Antiplatelet Agents**	**1**
	h.	**Thrombolytic Agents**	**1**
	i.	**Plasma expanders**	**1**
2	**Diuretics:** SAR: Thiazide diuretics, 5-Sulfamoyl benzoic acid derivatives. Synthesis: Hydrochlorthiazide, Acetazolamide, Furosemide, Dihydroflumethiazide, Ethacrinic acid		**4**
3	**Antiobesity Drugs**		**1**
4	**QSAR: Introduction, Physicochemical parameters and Mathematical models**		**4**
	Hansch Linear Free Energy Relationship (LFER) and Free Wilson Mathematical Model		
5	**Hormones and Related drugs:**		
	a.	**Antidiabetic agents:** Synthesis: Glipizide, Metformin, Pioglitazone, Tolbutamide, Glimipride.	**3**
	b.	**Thyroid Hormones and Antithyroid Drugs** Synthesis: Thyroxine, Methimazole, Carbimazole.	**2**
	c.	**Steroids and Therapeutically related compounds** Nomenclature and stereochemistry of steroids (ii) Adrenocorticoids – Mineralocorticoids, Glucocorticoids (iii) Estrogens, Progestins and Androgens SAR: Estrogens and Adrenocorticoids, Progestins, Androgens	**5**

Practicals (3 Hours/week' 45 Hours)

A.	Synthesis and purification of organic compounds based on theory syllabus:
B.	Reaction monitoring and characterization of synthesized compounds with the help of TLC, UV and IR spectroscopy.
C.	Demonstration of QSAR Study.

Reference Books:

1	J. N. Delagado and W. A. R. Remers, 11th ed, Wilson and Giswolds Textbook of organic medicinal and pharmaceutical chemistry, J. Lippincott Co. Philadelphia.
2	W. C. Foye, Principles of medicinal chemistry, Lea and Febiger, Philadelphia.
3	H. E. Wolff, edn, Burgers Medicinal chemistry, John Wiley and sons, New York Oxford University Press, Oxfords.
4	Daniel Lednicer, Strategies for organic drug synthesis and design, John Wiley and Sons USA
5	G. L. Patrick. An Introduction to Medicinal Chemistry, 4th Edition, Oxford University Press.
6	Vogel's Text books practical organic chemistry, ELBS/Longman, London.
7	Arthur Vogel, Elementary Practical Organic Chemistry, Part-I and II, Second edition, CBS Publisher.

GANPAT UNIVERSITY
B. Pharm. Semester- VIII
8A05PCG Pharmacognosy–VII

Theory (2 Hours / Week; 30 Hrs)

1	The holistic concept for drug administration in traditional systems of medicine. Introduction to Ayurvedic preparation and evaluation of Churna, Kwath, Gutika, Taila, Ghrita, Lehya, Asavas and Arista, Bhasma and Pisti with example.	8
2	Plant Tissue Culture: Introduction, Basic requirements, Types of culture, Nutritional requirements, & Application plant tissue culture with special emphasize in production of secondary plant metabolites.	8
3	Insecticides, pesticides and herbicides	2
4	Plant Sweeteners (Stevia) & Bitters (Picorrihiza, Gentian, Swertia, Andrographis)	2
5	Formulation and Evaluation of Herbal formulations such as Tablet, Capsule, Cream, Syrup etc with special reference to processing of raw materials and their inclusion in the formulation.	4
6	Herbal Cosmetics: Special role of herbals in cosmetics, preparation and evaluation of herbal skin care cream, herbal shampoo, herbal hair oil.	4
7	Regulatory requirements for manufacturing of AYUSH product as per Schedule T.	2

Practical (3 hr/week; 45 hrs)

1. Practicals based on preparation and evaluation of Ayurvedic formulations like churna, Avleha, kwath and gutika.
2. Practicals based on formulation and evaluation of herbal formulations such as Tablet, Capsule, Cream, Syrup etc.
3. Practicals based on preparation and evaluation of herbal based cosmetics.

References Books:

1	Devraj T L., Ayurveda for healthy living UBSPD, New Delhi
2	Anonymous, Ayurvedic Pharmacopoeia of India, Govt. of India.
3	Anonymous, Ayurvedic Formulary of India, Part- I and II.
3	Kumar U. Methods in plant tissue culture, Agrobios India, Jodhpur
	Ciddi Veeresham, Medicinal Plant Biotechnology, CBS Publisher, New Delhi.
4	Kalia A.N., Textbook of industrial Pharmacognosy, C.B.S. Publisher, New Delhi.
5	Mukherjee Pulok, Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals, Horizons,New Delhi
6	Trease E. and Evans W.C., Pharmacognosy, 16th edition, Balliere Tindall. Eastbourne, U.K.
7	Rajpal V., Standardization of botanicals: testing and extraction methods of medicinal herbs vol-1 & 2, Eastern Publisher, New Delhi.
8	Panda H., Herbal Cosmetics Hand Book, Asia pacific business press
9	Chaudhary, R D., Herbal Drug Industry, Eastern Publication New Delhi.
10	Anonymous, Handbook on Herbal Products (Cosmetics, Toiletories, Medicine and Perfumes), National Institute of Industrial Research, New Delhi

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B.Pharm Semester: VIII

8A06CLP Clinical Pharmacy-II

Theory (3 Hours / Week; 45 Hrs)

1.	**Pathophysiology, risk factors, diagnosis, complications, treatment & prognosis of the following diseases/conditions:**	
	Respiratory: Bronchial asthma, COPD	**04**
	Gastrointestinal: Peptic Ulcer Disease, Inflammatory Bowel Disease, Hepatitis	**05**
	Endocrine: Diabetes mellitus, Thyroid disorders, Parathyroid disorders, Osteoporosis, Hormone Replacement Therapy	**08**
	Rheumatoid arthritis and gout	**03**
	Neoplastic : Leukemia, Lymphomas, Breast Cancer, Cervical Cancer, Prostrate Cancer	**07**
	Infections: Tuberculosis, Urinary Tract Infections, Enteric Infections, Meningitis, Respiratory Tract Infections, Septicemia, Skin And Soft Tissue Infections (Cellulites, Bed Sores, Diabetic Foot Infection), Leptospirosis, Syphillis, Nosocomial Infection, Filariasis, Leishmaniasis, Gonorrhoea, Viral Infections (AIDS, Bird Flu, Swine Flu, Congo Fever, Chickenguniya, SARS (Sub Acute Respiratory Syndrome), Surgical Antibiotics Prophylaxis	**18**

Practical (3 hrs/week)

1.	To audit given prescription for format of prescription, essentiality and rationality and suggest carry home message (three experiments containing three prescriptions each, covering various diseases or organ-systems)
2.	To evaluate formulations on anemia, diarrhoea and cough for their essentiality and rationality and also provide carry home message (two experiments containing five formulations each for anemia, diarrhoea and cough).
3.	To suggest appropriate parenteral nutrition for hospitalized patients after proper nutritional assessments in different conditions, and enlist importance of medications necessary in a pharmacy for Intensive Care Unit management.
4.	To evaluate drug-drug interactions for the type of drug interaction, the mechanism responsible for drug interactions, possible outcomes or clinical manifestations of interaction and suggestion corrective measure to overcome or prevent the drug interaction (at-least 25 drug-drug interactions).
5.	To evaluate cases for Interpretation of laboratory data (Min. six full cases with clinical and other relevant findings)
6.	To evaluate two cases involving skills of pharmacist for patient counselling.
7.	To evaluate for dose adjustment in geriatrics, pediatrics and pregnant women (Min. three cases each)
8.	To evaluate cases for Therapeutic Drug Monitoring (TDM) (Min. two cases)
9.	Collecting information for a given drug (Preferably recently approved drugs) regarding adverse drug reactions, drug interactions and contraindications using authenticated sources (Recent text books, Latest Journals and online drug data bases such as medscape and other scientific search engines).

Reference Books:

1.	Roger Walker and Clive Edwards, Clinical Pharmacy and Therapeutics (2008), 4th ed. reprint, Churchill Livingstone, Edinburgh.
2.	Russell J. Greene and Norman F. Harris, Pathology & Therapeutics for Pharmacists (1994), 1st edn., Chapman & Hall, London, Madras.
3.	Eric T. Herfindal et al., Text Book of Therapeutics: Drug and Disease Management (2006). 8th edn., Williams and Wilkins, Philadelphia
4.	Boon Nicholas A., Davidson's Principle and Practice of Medicine (2006), 20th edn., Churchill Livingstone, Edinburgh.
5.	Brian S. Katcher et al., Applied Therapeutics: The Clinical Use of Drugs (2004), Applied Therapeutics Inc.
6.	George S., Melmon and Morrelli's Clinical Pharmacology (2008), 4th edn., McGraw Hill Medical.
7.	Dipiro, Joseph, Pharmacotherapy: A Pathophysiological Approach (2011), 8th edn., McGraw-Hill, New Delhi
8.	R.K. Goyal et al., Elementals of Clinical Pharmacy (2009-10), 5th Edn., B.S.Prakashan Ahmedabad.
9.	G. Parthasarhi et al., A text book of Clinical Pharmacy Practice (Essential concepts and skills) (2007), 1st Edn., University Press impression
10.	Christopher R.W. Edwards & Ian A.D., Davidson's Principle and Practice of Medicine (2006), 20th Edn., Boucher ELBS with Churchill Livingstone, Edinburgh.