GANPAT UNIVERSITY
B. Pharm Semester-VII Program
Structure for B.Pharm Semester-VII 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	7A01 DFD	Dosage Form Design-I	3	3	10 X3 = 30	3	1.5	10 X1.5 =15	Core
02	7A02 PCT	Pharmaceutical Technology-I	3	3	10 X 3 = 30	3	1.5	10 X1.5 =15	Core
03	7A03 PAN	Pharmaceutical analysis-III	3	3	10 X 3 = 30	3	1.5	10 X1.5 =15	Core
04	7A04 PCM	Pharmaceutical Chemistry-IX (Medicinal Chemistry-III)	3	3	10 X 3 = 30	3	1.5	10X1.5 = 15	Core
05	7A05 PCG	Pharmacognosy-VI	2	2	10 X 2 = 20	3	1.5	10 X1.5 =15	Core
06	7A06 PCL	Pharmacology-III	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-VII 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	7A01 DFD	Dosage Form Design-I	3	3	45	45	30	70	30	70	200
2	7A02 PCT	Pharmaceutical Technology-I	3	3	45	45	30	70	30	70	200
3	7A03 PAN	Pharmaceutical analysis-III	3	3	45	45	30	70	30	70	200
4	7A04 PCM	Pharmaceutical Chemistry-IX (Medicinal Chemistry-III)	3	3	45	45	30	70	30	70	200
5	7A05 PCG	Pharmacognosy-VI	2	3	30	45	30	70	30	70	200
6	7A06 PCL	Pharmacology-III	3	3	45	45	30	70	30	70	200
		Total	17	18	255	270	180	420	180	420	1200

GANPAT UNIVERSITY
B. Pharm. Semester- VII
7A01DFD Dosage Form Design-I

Theory (3Hours / Week; 45 Hrs) Credit: 3

1	**Preformulation studies:** a) Study of physical properties of drug like physical form, particle size, shape, density, wetting, dielectric constant, solubility, dissolution and organoleptic property and their effect on formulation, stability and bioavailability. b) Study of chemical properties of drugs like hydrolysis, oxidation, reduction, polymorphisms, racemization, polymerization etc., and their influence on formulation and stability of products. c) Study of Prodrugs in solving problems related to stability, bioavailability and elegance of formulations.	***15***
2	**Pharmaceutical necessities:** Effect of following adjavunts on formulation of different pharmaceutical products: Antioxidants, preservatives, colours, flavours, diluents, binders, disintigrants, antifirctional agents, emulsifiers, suspending agents, ointment bases, solvents etc. and other formulation additives.	***5***
3	**Stabilityof pharmaceuticals:** a) Kinetic principles and stability testing: Reaction rate and order, acid base catalysis, decomposition reactions and stabilization of pharmaceuticals. b) Stability of formulation, factors affecting formulation stability, MKT, climatic zones, matrixing and bracketing instability study, accelerated stability testing, real time stability. Current WHO, USFDA and stability testing as per ICH guidelines for pharmaceutical drug substances and drug products. c) Product stability: Requirements, shelf-life, overages, containers, closures. d) Overage calculations	***8***
4	**Biopharmaceutics:** a) Introduction to biopharmaceutics and its role in formulation development. b) Passage of drugs across biological barriers (passive diffusion, active transport, facilitated diffusion and pinocytosis). c) Factors influencing absorption- physiochemical, physiological and pharmaceutical. d) Drug distribution in the body, plasma protein binding and drug excretion.	***12***
5	**Introduction to BCS and dissolution study:** Definition: BCS, Dissolution mechanisms, Factors affecting dissolution, Intrinsic dissolution rate measurement, Dissolution apparatus for various dosage forms, Dissolution profile comparison using model independent method (similarity factor, dissimilarity factor).	***5***

Practical (3hr\week; 45 Hours) Credit:1.5

Practical shall be conducted from the topics covered in theory explaining the principle involved in preformulation, stability of pharmaceuticals, biopharmaceutics and dissolution studies etc..

References & Text Books:

1.	The Theory and Practice of Industrial Pharmacy by L Lachman, H Lieberman and J Kanig.
2.	Pharmaceutical Preformulation by Carstensen JT, Technomic Publishing Company, Inc., New Holland Avenue, Lancaster, Pennysylvania, USA.
3.	Remington's Pharmaceutical Sciences, Mack Publishing Company, Easton, Pennsylvania.
4.	Hanbook of Pharmaceutical excipients, Royal society of Great Britain, U.K.
5.	Stability Studies, Marcel Dekker.
6.	Pharmaceutical dissolution testing by Umesh V. Banker, Marcel Dekker Inc
7.	Applied Biopharmaceutics and Pharmacokinetics by Leon Shargel, Susanna Wu-Pong and Andrew B. C. Yu.

GANPAT UNIVERSITY
B. Pharm. Semester- VII
7A02PCT Pharmaceutical Technology-I

Theory (3Hours / Week; 45 Hrs) Credit: 3

Sr. No	Course Content	Total Hrs.
1	**Liquid dosage forms:** Introduction, advantages and disadvantages, types of additives used- vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colors, flavors,etc; manufacturing, packaging and evaluation of clear liquids, suspensions and emulsions (including microemulsion and multiple emulsion) and brief outline of other liquid products such as extracts, tincture, infusion etc., I.P. Products.	*8*
2	**Semisolid dosage forms:** Definition, Advantages and disadvantages, types, mechanisms of drug penetration through skin, factors influencing penetration, semisolid bases, their selection and ideal requirements of bases. General formulation of semisolids, clear gels, suppositories; Manufacturing procedure, evaluation and packaging. I.P. products.	*8*
3	**Pharmaceutical aerosols:** Definition, propellants, general formulation of aerosols, containers, manufacturing (cold filling and pressure filling technique) and packaging methods, pharmaceutical applications, evaluation of aerosol.	*7*
4	**Sterile dosage forms:** Definitions, Advantages, Disadvantages, Ideal requirements and Formulation of sterile dosage forms, Water for injection-Preparation and quality control, Design and requirements for production area- Aseptic techniques, sources of contamination and methods of prevention, design of aseptic area, laminar flow benches, services and maintenance, containers and closures, methods of filling including form fill and seal technology. Evaluation of sterile dosage forms, Parentral suspensions, Prefilled syringes, Parentral nutrients, Freeze dried products, Nanosuspensions etc, I.P. Products. Opthalmic preparations: Requirements, formulations, methods of preparations, containers and evaluation. I.P. Products.	*15*
5	**Good Manufacturing Practice for Pharmaceuticals and validation** Brief Introduction to GMP (schedule M) and quality assurance, practice of GMP- Procedure (SOPs), Building, Equipment, Personnel, Components, Documentation, Containers,Labeling, Laboratory Control,Distribution R Introduction to validation, validation of selective unit operations (e.g. granulation, compression) used in tablet manufacturing and steam sterilizer.	*7*

Practical (3hr\week; 45 Hours) Credit:1.5

Practical shall be conducted from the topics covered in theory explaining the principle involved in formulation and evaluation of liquid, semisolid, sterile preparations etc..

References & Text 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.	Gennaro, Alfonso R., Remington: The Science and Practice of Pharmacy, Vol-I & II, Lippincott Williams & Wilkins, New York.
4.	Pharmaceutical Dosage Forms: Disperse systems: Vol.1, Vol. 2 and Vol.3, Ed. by Lieberman, Leon Lachman and Joseph B. Schwartz, Marcel Dekker Inc., New York.
5.	Pharmaceutical Dosage Forms: Parenteral Medication: Vol.1, Vol. 2 and Vol.3, Ed. by Lieberman, Leon Lachman and Joseph B. Schwartz, Marcel Dekker Inc., New York.
6.	Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes, Marcel Dekker, Inc., New York.
7.	GMP for Pharmaceuticals by Willig and Storker.
8.	R A Nash, Pharmaceutical process validation, marcel dekker Inc., new York.
9.	The Theory and Practice of Industrial Pharmacy by L Lachman, H Lieberman and J Kanig.

GANPAT UNIVERSITY
B. Pharm. Semester- VII
7A03PAN Pharmaceutical analysis-III

Theory (3Hours / Week; 45 Hrs) Credit: 3

1.	**Fundamentals of Spectroscopy:** Classification of spectra i.e. line, band, cont absorption, emission spectra; Wave properties of electromagnetic radiation; properties of electromagnetic radiation; Electromagnetic spectrum.	03
2.	**UV-VIS spectroscopy:** Theory; Beer and Lambert's law - limitations and deviations from the law; Terminologies associated with absorption measurements; Types of transitions; Factors affecting spectral characteristics (structural and nonstructural); Effect of conjugation; Wood ward Fieser rule; Photometric titrations; Instrumentation, applications (in analysis of organic compounds and inorganic complexes), advantages and limitations of UV Visible spectroscopy; Quantitative analysis of binary mixtures of absorbing substances by simultaneous equation method; Calibration of UV Visible Spectrophotometer as per Pharmacopoeia	10
3.	**Atomic spectroscopy (AAS and AES):** Basics of atomic spectroscopy; Principle of atomic absorption spectroscopy; Instrumentation (including radiation sources like hollow cathode lamp, EDL), applications, advantages and limitations of atomic absorption spectroscopy. Interferences in atomic spectroscopy with remedies, principle, instrumentation and applications of Atomic emission spectroscopy	08
4.	**Flame Photometry (FP) OR Flame Emission Spectroscopy (FES)** Introduction, principle and limitations of FP, Instrumentation of flame photometry with various burners used in the techniques, Applications of flame photometry with quantitative determination using FP, Interferences in FP with remedies	07
5.	X-ray spectroscopy	03
6.	Overview of Radio Immuno Assay (RIA)	03
7.	Overview of Scattering Spectroscopy like Raman spectroscopy, Nephlometry and turbidimetry.	03
8.	GLP, ISO, WHO and ICH guidelines for Pharmaceutical analysis. Analytical Method development and Validation, Process validation, Quality audit and self inspection.	08

Practical (3hr\week; 45 Hours) Credit:1.5

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
4. Pharmaceutical Analysis: Modern methods Part A, Part B, James W. Munson.
5. G. H. Jeffery, J. Basset, J. Mendham, R. C. Denny (Rev. by) Vogel's Text Book of Quantitative Chemical Analysis, Longman, London
6. A Textbook of Pharmaceutical Analysis. Connors K.A.
7. A.H. Beckett and J.B. Stenlake, Practical Pharmaceutical chemistry, part 1&2, the athlone press, London.
8. Pharmacopoeia of India, Govt. of India, Ministry of Health.
9. British Pharmacopoeia, ministry of health and social welfare, UK.
10. The United States Pharmacopeia–National Formulary (USP–NF)
11. Instrumental Analysis by Ashutosh Khar
12. Instrumental Analysis by Vidyasagar Part – II
13. Instrumental analysis by Chatwal and Anand

GANPAT UNIVERSITY
B. Pharm. Semester- VII
7A04PCM Pharmaceutical Chemistry-IX (Medicinal Chemistry-III)

Theory (3Hours / Week; 45 Hrs) Credit: 3

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 be covered.			
1.	**Chemotherapeutic Agents:**		
	a.	**Synthetic Antibacterial Agents / Antimicrobial Agents:** •SAR: Sulfonamides, Quinolones • Synthesis: Sulfacetamide, Sulfadoxin, Sulfamethoxazole, Sulfasalazine, Trimethoprim, Norfloxacin, Ofloxacin, Ciprofloxacin.	**05**
	b.	**β-Lactam Antibiotics:** •SAR: Cephalosporins, Penicillins • Synthesis of Penicillin-G	**06**
	c.	**Tetracyclines, Aminoglycosides, Macrolides and Miscellaneous Antibiotics:** • SAR: Aminoglycosides, Tetracyclines, Macrolides. • Synthesis of Chloramphenicol	**05**
	d.	**Antimycobacterial Agents:** • Synthesis: Ethambutol, Isoniazid, Pyrazinamide, Clofazimine, PAS.	**03**
	e.	**Antifungal Agents:** • Synthesis: Clotrimazole, Ketoconazole, Fluconazole	**02**
	f.	**Antimalarial, Antiamoebic and Anthelmintic Agents** • SAR: Quinolines • Synthesis: Metronidazole, Ornidazole, Chloroquine, Primaquine, Pyrimethamine, Albendazole, Mebendazole.	**04**
	h.	**Antiviral and Anti-HIV Agents:** • Synthesis:Amantadine	**04**
	i.	**Antineoplastic agents:** Synthesis of Chlorambucil, Cyclophosphamide, Thiotepa, Methotrexate, Fluorouracil, Tamoxifen.	**06**
2.	**Drug Design and Development**		
	a.	**Drug design** • Basics of drug design, • Computer aided Drug Design, • Molecular modeling	**04**
	b.	**Lead Discovery** • Methods and Process of Lead discovery • Optimization of Lead	**04**
	c.	**Brief introduction to Combinatorial Chemistry and Parallel Synthesis**	**02**

Practical (3hr\week; 45 Hours) Credit:1.5

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

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.	L. Finar. Organic chemistry Vol. I and Vol. II. ELBS/Longman, London
6.	Vogel's Text books practical organic chemistry, ELBS/Longman, London

GANPAT UNIVERSITY
B. Pharm. Semester- VII
7A05PCG Pharmacognosy-VI

Theory (2Hours / Week; 30 Hrs) Credit: 2

1	Principle of extraction of herbal drugs, different methods of extraction, Factors affecting extraction of herbal drugs, different types of extracts, concept of standardized extracts and their preparation, General method of extraction of alkaloids, Gycosides (anthraquinone, saponin, cardiac, flavonoid), Tannins, volatile oil etc.	5
2	Sources, Biogenesis, chemistry, isolation and production, utilization and estimation of phytoconstituents such as Aklaloids: Cinchona, Tropane, Ergot, Vinca, Opium, Rauwolfia Glycosides: Sennosides, Diosgenin, Solasodine, Glycerhhizin Terpenoids: Citral, Menthol, Limonene, Vitamin A Flavanoids: Rutinoids Iridoids and Podophylotoxin	15
3	Introduction, classification, principle of separation of different chromatographic methods. Applications of GC, HPLC, HPTLC in evaluation of herbal drugs.	4
4	Marine Pharmacognosy – Studies on novel natural products from marine source	3
5	Chemotaxonomy of medicinal plants	1
6	A brief account of plant based industries & institutions involved in work of medicinal & aromatic plants in India.	2

Practical (3hr\week; 45 Hours) Credit: 1.5

Practicals based on extraction, isolation, estimation and chromatographic studies of various phytoconstituents.

References Books:

1	Mukherjee Pulok, Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business horizons, New Delhi
2	Wagner Hildebert , Bladt Sabine , Plant Drug Analysis: A Thin Layer Chromatography Atlas, Springer.
3	Brain K. R. & Turner T. D., The Practical Evaluation Of Phytopharmaceuticals Wright Scientechnica, 1975
4	Agrawal S. S., Herbal Drug technology, University press, Hydrabad
5	Atal C. K. and Kapoor B. M.,Cultivation and Utilization of Aromatic and Medicinal Plants, , Regional Research Lab, Jammu.
6	Trease E. and Evans W.C., Pharmacognosy, 16th edition, Balliere Tindall. Eastbourne, U.K.
8	Agrawal O. P., Chemistry of Organic Natural Products, Vol I & II, Goel Publishing House, Meerut, 2004
9	Kokate C. K. Purohit, A. P. and Gokhale S. B.,Pharmacognosy, Nirali Prakashan, Pune
10	Brunetion,Jean, Pharmacognosy Phytochemistry Medicinal Plants, Tec & Doc,Paris
11	Paul M Dewick, Medicinal Natural Products :A Biosynthetic Approach John Willey & Sons,Chichester
12	Kalia A.N., Textbook of industrial Pharmacognosy, C.B.S. Publisher, New Delhi.

GANPAT UNIVERSITY
B. Pharm. Semester- VII
7A06PCL Pharmacology-III

Theory (3Hours / Week; 45 Hrs) Credit: 3

1.	**Chemotherapy** • General principles of chemotherapy • Sulfonamides, cotrimoxazole and quinolones • Beta lactam antibiotics • Tetracycline and chloramphenicol • Aminoglycoside antibiotics • Macrolides • Antitubercular drugs • Antileprosy drugs • Antifungal drugs • Antiviral drugs • Antiprotozoal (Antimalarial, Antiamoebic etc.) drugs • Anthelmintic drugs • Anticancer drugs	**22**
2.	**Pharmacology of Endocrine system** • Hypothalamic & pituitary hormones • Thyroid and antithyroid drugs, parathormone, calcitonin and vitamin D • Glucagon, insulin and oral hypoglycaemic drugs • Corticosteroids • Androgens and anabolic steroids • Estrogens, progesterone and oral contraceptives • Oxytocics and Tocolytics	**12**
3.	**Pharmacology of drugs acting on Respiratory system** • Drugs used in bronchial asthma • Antitussive agents • Expectorants	**03**
4.	**Drug Acting on the Gastrointestinal Tract** • Anti-ulcer drugs (Antacids, Anti-secretory agents etc.) • Laxatives and antidiarrhoeal drugs • Emetics and anti-emetics	**03**
5.	**Drugs acting on immune system** • Immunosuppressive agents • Immunostimulant Agents	**03**
6.	**Pharmacology of nitric oxide**	**02**

Practical (3hr\week; 45 Hours) Credit:1.5

1.	Introduction to general principles of bioassay, pharmacopoeial bioassays and biostandardization of various drugs
2.	Introduction to cell based assay: Definition, Types, Advantages, limitations of cell based assay, and application to High throughput screening
3.	Bioassay of Acetylcholine using Rat ileum by Graphical, Matching, Three point and Four point method.
4.	Bioassay of Histamine using Guinea pig by Matching, Three point and Four point method.
5.	Bioassay of Atropine using Rat ileum by Graphical method
6.	Bioassay of Mepyramine using Guinea pig by Graphical method
7.	Demonstration experiments: • To demonstrate effect of antihistaminic drugs on guinea pigs • To demonstrate effect of antiulcer drugs using rats • To demonstrate the effect of anti-motility drugs using mice/rat • To demonstrate bioassay of oxytocin using rat uterus • To demonstrate effect of l-thyronine on respiration rate • To demonstrate the effect of hypoglycemic agents on blood sugar level (metformin, glibenclamide/Insulin) using experimental animals.

Reference Books:

1.	Rang H.P., Dale M.M., et al- Rang and Dale's Pharmacology (2007) 6th Edn. Churchill livingstone Elsevier, USA.
2.	Satoskar R.S., et al- Pharmacology and Pharmacotherapeutics (2005) 20th Edn. Popular Prakashan, Mumbai.
3.	Goodman and Gilman's- The Pharmacological basis of Therapeutics, 11th Edn., 2005, Mc Graw Hill Companies, Pergamon Press, Singapore.
4.	Seth S.D. Text Book of pharmacology,2nd Edn., B.I. Churchill Livingstone Pvt. Ltd., New Delhi, 2000.
5.	Goyal R.K, et al- Elements of Pharmacology, 19th Edn., B.S. Shah Prakashan, Ahmedabad
6.	Tripathi K.D.- Essentials of Medical Pharmacology (2008), 6th Edn, Jaypee Brothers Medical Publishers (P) Ltd, Ahmedabad
7.	Richard Finkel- Lippincott's Pharmacology (2010), 4th Edn. Reprint, Wolter Kluwer (I) Pvt. Ltd., New Delhi
8.	Katzung B.G. et al.,- Basic and Clinical Pharmacology (2009), 11th Edn., Tata Mc Graw Hill Edition Pvt. Ltd., New Delhi
9.	Goyal R.K.-Practicals in Pharmacology (2010),9th Edn., B. S. Shah Prakashan,Ahmedabad.
10.	Kulkarni S.K.- Handbook of Experimental Pharmacology (2009), 3rd Edn. Reprint, Vallabh Prakashan, New Delhi.
11.	Ghosh M.N.–Fundamentals of Experimental Pharmacology (2008), 4th Edn., Hilton & Company, Kolkata.