

GANPAT UNIVERSITY

B. Pharm Semester-IV Program

Structure for B. Pharm Semester-IV 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	4A01DPH	Dispensing Pharmacy-I	3	3	10 X 3 = 30	2	1.0	10 X 1.0 = 10	Core
02	4A02FPH	Forensic Pharmacy	3	3	10 X 3 = 30	-	-	-	Core
03	4A03PCO	Pharmaceutical Chemistry-IV (Organic Chemistry)	3	3	10 X 3 = 30	3	1.5	10 X 1.5 = 15	Core
04	4A04PAN	Pharmaceutical Analysis-II	3	3	10 X 3 = 30	3	1.5	10 X 1.5 = 15	Core
05	4A05PCL	Pharmacology-I	2	2	10 X 2 = 20	3	1.5	10 X 1.5 = 15	Core
06	4A06PCG	Pharmacognosy-III	2	2	10X 2 = 20	3	1.5	10 X 1.5 = 15	Core
07	4B07EPC	Environment and Pollution Control	3	3	10 X 3 = 30	-	-	-	Common
		Total	19	19	190	14	7.0	70	
Total Credit 19+7.0 = 26 and Weighted Credit Point 190 + 70 = 260									

GANPAT UNIVERSITY
B. Pharm Semester-IV Program
Teaching and Examination scheme for B. Pharm Semester-IV Program

Sr. No	Course Code	Course Title	Teaching Scheme Hrs/Week		Total Hours		Examination				
			Theory	Practical	Theory	Practical	Theory		Practical		Total
							Int	Ext	Int	Ext	
1	4A01DPH	Dispensing Pharmacy-I	3	2	45	30	30	70	30	70	200
2	4A02FPH	Forensic Pharmacy	3	-	45	-	30	70	-	-	100
3	4A03PCO	Pharmaceutical Chemistry-IV (Organic Chemistry)	3	3	45	45	30	70	30	70	200
4	4A04PAN	Pharmaceutical Analysis-II	3	3	45	45	30	70	30	70	200
5	4A05PCL	Pharmacology-I	2	3	30	45	30	70	30	70	200
6	4A06PCG	Pharmacognosy-III	2	3	30	45	30	70	30	70	200
7	4B07EPC	Environment and Pollution Control	3	-	45	-	30	70	-	-	100
Total			19	14	285	210	210	490	150	350	1200

GANPAT UNIVERSITY
B. Pharm. Semester- IV
4A01DPH Dispensing Pharmacy-I

Theory: (3 Hours / Week; 45 Hrs)

Credit:3

1. Definition and scope, Sources of information required by pharmacist **01**
2. **The prescription:** Handling of prescription, source of errors in prescription, care, required in dispensing procedures including labelling at dispensed products **04**
3. **Dispensing techniques:** Compounding and dispensing procedures, packaging, storage and stability of medicines, labeling of dispensed products. **05**
4. **Pharmaceutical calculations:** Posology and metrology: Calculations of doses for infants, adults and elderly patients, enlarging and reducing recipes, percentage solutions, allegation, alcohol dilution, proof spirit, isotonic solutions, displacement values, etc **15**
5. Principles involved and procedures adopted in dispensing of: **20**
Mixtures, Solutions like simple solutions, draughts, drops, linctus, syrups, elixirs, suspensions, emulsions, etc., Powders/granules for oral use; oral unit dosage forms like tablets, capsules, lozenges, pestilles etc., Inhalations.

Practical (2 Hours/week; 30 Hours)

Credit: 1

The students shall be asked to perform the practical related to the topics mentioned under theory.

Reference Books:

1. Pharmaceutical Practice by Diana M. Collett and Michale E. Aulton, ELBS Publishers
2. Dispensing Pharmaceutical for students by Cooper and Gunn, 12th ed. CBS Publishers & Distrubuters, New Delhi, 2000.
3. Pharmaceutical Calculations by Ansel ,Howard C.,13th ed., Walter Kluwer (India) Pvt. Ltd., New Delhi., 2009.
4. Ansel's Pharmaceutical Dosage forms and Drug delivery systems by Allen, Loyd V., 9th ed., Walter Kluwer (India) Pvt. Ltd., New Delhi., 2009.
5. Pharmaceutical Practice, Edited by A.J. Winfield and R.M.E. Richards, 3rd ed., Edinburgh : Churchill Livingstone, 2004
6. Hospital pharmacy by Hassan, Henry, 5th ed.,Lea & Febiger, Philadelphia, 1986
7. Hospital Organization and management by Kurt Dan and Jonathan S. Ratich, 4th ed. CBS Publishers
8. Remington: The science and practice of Pharmacy Remington by Reminston, 21th ed. Lippincott W. W.,Philadelphia, 2009

GANPAT UNIVERSITY
B. Pharm. Semester- IV
4A02FPH Forensic Pharmacy

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

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| 1. Pharmaceutical Legislation in India-brief review. | 01 |
| 2. Drug & Pharmaceutical industries in India- brief review. | 01 |
| 3. Pharmaceutical education in India- brief review. | 01 |
| 4. Pharmaceutical Ethics: | 02 |
| Principles and significance of professional Ethics. Critical study of the Code of Pharmaceutical Ethics drafted by Pharmacy Council of India. Pharmacist's oath. | |
| 5. Pharmacy Act 1948: | 06 |
| Objective of the Act , Definitions, Pharmacy Education Regulations. Working of State and Central Councils, Constitution & functions of Councils. Registration procedures for Pharmacist under the Act and its renewal. Offence & Penalties. | |
| 6. Drug and Cosmetic act | 10 |
| 7. Medicinal & Toilet Preparations [Excise Duties] Act1955 | 03 |
| Objective, definitions, licensing procedures for manufacturing of different preparation in bonded and non-bonded laboratory, Offences & Penalties. | |
| 8. Narcotic Drugs & Psychotropic Substance Act 1985 & Rules | 04 |
| Objective, definitions, constitution and functions of narcotic and psychotropic consultative committee, national fund for controlling the drug abuse, prohibition, control and regulation for import, manufacture and transshipments of these drugs. Power of Inspector. Offences and Penalties. | |
| 9. Drug Price Control Order 1995 | 03 |
| General study of the order with its Objectives, Definitions, Fixation price of bulk drugs and retail price of formulations. Powers of Central Govt. Records to be maintain. DPEA. Offence & Penalties. | |
| 10. Prevention of cruelty to Animals Act 1960. | 03 |
| Objectives, definitions and provisions of Act like constitution of committee. Breeding of animals, maintenance of records. Detail of forms. | |
| 11. States shops & Establishment Act 1960. | 03 |
| Introduction, objectives, definitions and provisions of Act like registration of establishment, hours of work, wages, appointment, inspection, offences and penalties. | |
| 12. Factories Act 1948. | 03 |
| Introduction, objectives, definition and provisions of Act like licensing procedure, health, safety & welfare of workers, working hours, employment of women and young children, leaves. Offences and Penalties. | |
| 13. Drug and Magic Remedy act, Medical Termination of Pregnancy | 03 |
| 14. Drug Policy 2002 | 02 |

Reference Books:

1. A text Book of Forensic Pharmacy by- N.K.Jain
2. A text Book of Forensic Pharmacy by- B.M.Mithal
3. A text Book of Forensic Pharmacy by- G.K.Jani.
4. The Drugs & Cosmetics Act 1940 & rules-1945-By Vijay Malik
5. Latest Governments Publications Regarding Specific Law
6. Drug and Cosmetic act and Rules by Vijay Malik

GANPAT UNIVERSITY
B. Pharm. Semester- IV
4A03PCO Pharmaceutical Chemistry-IV
(Organic Chemistry)

Theory: (3 Hours / Week; 45 Hrs)

Credit: 3

1. Stereochemistry **10**
Chirality, optical activity, stereoisomerism, nomenclature and associated physicochemical properties, specification of configuration, resolution of racemic mixture, reactions involving stereoisomers, stereoselective and stereospecific reactions, conformations – alkanes and cycloalkanes, chiral reagents, stereochemistry of biphenyls, allenes, and spirans – specification of their configuration
2. Structure, properties, nomenclature, preparation and reactions of the following **28**
class of functional groups
Benzene, polynuclear aromatic compounds, arenes, amines, phenols, aldehydes and ketones, carboxylic acids and their derivatives.
3. α,β -unsaturated carbonyl compounds, conservation of orbital symmetry and **04**
rules, Nucleophilic aromatic substitution
4. Introduction to nanochemistry, microwave synthesis and green chemistry. **03**

Practical (3 hr/week; 45 Hours)

Credit:1.5

1. Qualitative analysis of unknown organic compound.
2. Introduction and detailed demonstration to various synthetic techniques and apparatus used therein. Heating and cooling methods, distillation, reaction work-up, filtration, extraction, purification, identification.
3. Synthesis of selected organic compounds
Synthesis of selected compounds based on various reaction mechanisms like halogenation, nitration, alkylation, hydrolysis, oxidation, condensation, diazotization. Purification of the synthesized compound using precipitation or recrystallization. Monitoring progress of reaction by thin layer chromatography.
4. Introduction to the use of stereomodels

Reference Books:

1. Organic Chemistry, Robert T. Morrison and Robert N. Boyd, 6th ed., PH I Learning Pvt. Ltd., New Delhi, 2008
2. Organic Chemistry by G. Marc Loudon, 4th ed., Oxford University Press, 2004.
3. Organic Chemistry, Vol I and II by I. L. Finar, 6th ed., Pearson Education, New Delhi 2000.
4. Advanced Organic Chemistry, by Jerry March, 4th ed., Wiley India, 2007.
5. Vogel's textbook of practical organic chemistry, by Furniss, Brain S., 5th ed., Pearson Education, Delhi, 2005
6. Experimental Organic Chemistry : Standard and Microscale by L. M. Harwood, 2nd ed., Blackwell Science, 1991.
7. Techniques and Experiment of Organic Chemistry, Addison Ault, 6th Edition, University Science Books, 1998.
8. Introduction to Organic Laboratory Techniques, A Microscale Approach, Donald L. Pavia, Gary M. Lampman, George S. Kriz, 4th ed., Thomson Books, 2006.

GANPAT UNIVERSITY
B. Pharm. Semester- IV
4A04PAN Pharmaceutical Analysis-II

Theory: (3 Hours / Week; 45 Hrs)

Credit:3.0

Following topics should be covered with due consideration of pharmacopoeial applications and numerical

1. Basics of instrumental analytical methods: Advantages and limitations. **03**
2. Chromatography: Classification, theories, retention mechanism, separation efficiency, methodology and pharmacopoeial applications of column, paper and thin layer chromatography. **12**
3. Electroanalytical methods: Basics of electroanalytical methods. **03**
- 3.1 Conductometry: Conductance, factors affecting conductance, Kohlrausch law, conductivity cells, applications. **05**
- 3.2 Potentio and pH metric methods: Standard reduction potentials, various electrodes, electrodes and cell potential, applications of potentiometry and pH metry. **06**
- 3.3 Polarography, amperometry, biamperometry: Basics of current flow in polarography, dropping mercury electrode, diffusion current, half wave potential, modifications like pulsed and differential pulse polarography, stripping voltametry, biamperometric titrations, amperometric titrations **09**
4. Calorimetry: Types, thermogravimetric analysis, differential scanning calorimetry, differential thermal analysis, melting point, etc. and their applications. **05**
5. Polarimetry: Polarimeter, qualitative and quantitative applications. **02**

Practical (3 hr/week; 45 Hours)

Credit:1.5

Quantitative analysis of different compounds involving techniques such as Conductometry, Potentiometry, pH metry, Polarimetry, Column chromatography, Thin layer chromatography, Paper chromatography and Karl – Fischer titration

Reference Books:

1. Pharmacopoeia: USP, B.P., I.P.
2. Practical Pharmaceutical Chemistry, Vol. I & II by Backett, A. H., 1st ed., CBS Publishers & Distrubuters, New Delhi, 1997.
3. Pharmaceutical Analysis Part I & II by J. W. Munson, International Medical Book Dist., Mumbai, 2001
4. Fundamentals of Analytical Chemistry by Skoog, Douglas A., 8th ed., Harcourt College Publishers, 2004
5. Quantitative chemical analysis by Mendham, J. 6th ed., Pearson Education, New Delhi, 2009
6. Text Book of Pharmaceutical Analysis by K. A. Connor, 3rd ed., John Willey & Sons, Delhi, 2009.
7. Instrumental method of analysis by Willard Hobart H., 7th ed., CBS Publishers & Distrubuters, New Delhi, 1986.

GANPAT UNIVERSITY
B. Pharm. Semester- IV
4A05PCL Pharmacology-I

Theory: (2 Hours / Week; 30 Hrs)

Credit: 2

- 1. General pharmacology** **16**
Introduction and scope of pharmacology, Sources of drugs and nomenclature of drugs, Dosage forms and routes of administration, Factors modifying drug action, tolerance and dependence, **Pharmacokinetics**: Drug absorption and bio-availability of a drug Distribution, Biological half life and its significance, drug distribution, drug metabolism, drug excretion, Methods prolonging the duration of action of a drug, **Pharmacodynamics**: Mechanism of drug action, site of drug action, drug receptors, dose response relationship, combined effects of drugs, structure activity relationship, Adverse drug Reactions, Drug interactions, **New Drug Development**: Acute, sub-acute and chronic animal Toxicity study, clinical trials
- 2. Pharmacology of Peripheral Nervous system** **09**
Neurohumoral transmission (autonomic and somatic), Parasympathomimetics, Parasympatholytics, Sympathomimetics, adrenergic receptor and neuron blocking agents, Ganglionic stimulants and blocking agents Neuromuscular blocking agents, Local anesthetics
- 3. Autacoids** **05**
a. Histamine, 5-HT and their antagonists. b. Prostaglandins, thromboxane and leukotrienes. c. Pentagastrin, cholecystokinin, Angiotensin, Bradykinin and substance P

Practical (3 hrs/week; 45 Hours)

Credit: 1.5

1. Introduction to experimental pharmacology: preparation of different solutions for experiments. Drug dilutions, use of molar and W/V solutions in experimental pharmacology, common laboratory animals, Legal regulations for the use of experimental animals, anesthetics and instruments commonly used in experimental pharmacology. Some common and standard techniques for drug administration (intravenous injection, intra gastric administration) and collection of blood samples. Euthanasia of laboratory animals.
2. Experiments on urinary excretion of drugs/their metabolites
3. To study the effects of various agonists (pD₂) and antagonist (pA₂) using isolated preparations, To record the concentration response curve (CRC) of acetylcholine using rat ileum/chicken preparation, To study the effect of atropine on concentration response curve (CRC) of acetylcholine using rat/chicken ileum preparation, To record the concentration response curve (CRC) of Histamine on guinea pig/chicken ileum, To study the effect of mepyramine on concentration response curve (CRC) of Histamine using guinea pig /chicken ileum preparation
4. To study the effects of acetylcholine, Histamine, BaCl₂, physostigmine, atropine, mepyramine and papaverine using rat/guinea pig/chicken ileum preparation
5. Demonstration Experiments on study the effects of autonomic drugs on rabbits eye, study the effect of hepatic microsomal enzyme inhibitors and inducers on pentobarbitone sleeping time, study the effects of various drugs on rat fundus preparation, study the effects of various drugs on rat anococcygeus muscle preparations and to study the effects of various drugs on rat.

Reference Books:

1. Pharmacology and pharmacotherapeutics. 21st ed., Popular Prakashan, Mumbai, 2010.
2. Rang, H.P. & Dale, M.M., Pharmacology. 6th ed., Churchill Living stone, London, 2007
3. Goodman & Gilman's, The Pharmacological basis of therapeutics. Mcgrawhil, New Delhi, 2005
4. Basic and clinical pharmacology by Katzung, B.G., 11th ed., Mc graw Hill, New Delhi, 2009.
5. Fundamentals of exp pharmacology by Ghosh, M.N., 4th ed., Hilton & Company, Kolkatta, 2008.
6. Practicals in Pharmacology by R. K. Goyal, 9th ed., B.S. Shah Prakashan, Ahmedabad, 2010.

GANPAT UNIVERSITY
B. Pharm. Semester- IV
4A06PCG Pharmacognosy-III

Theory: (2 Hours / Week; 30 Hrs)

Credit:2

1. Study of the biological sources, cultivation, collection, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following groups of drugs containing glycosides: 22
Saponins: Liquorice, ginseng, dioscorea, Senega, Sarsaparila, Quillaia
Cardioactive sterols: Digitalis, squill, strophanthus, Thevetia
Anthraquinone cathartics: Aloe, senna, rhubarb, cascara, Cassia
Bitter glycosides: Gentian, picrorrhiza, chirata, kalmegh, Quassia
Coumarins: Psoralea, Ammi majus, Ammi visnaga
Cyanogenetic glycosides: Almond, Linseed
Isothiocyanate glycosides: Mustard, Black mustard
Flavonoids: Rutagraveolens
2. Enzymes: Biological sources, preparation, identification test and uses of following Diastase, Papain, Pepsin, Trypsin, Pancreatin 08

Practicals (3 Hours/week; 45 Hours)

Credit:1.5

1. Identification of crude drugs listed in theory.
2. Microscopic study of underlined important glycoside containing crude drugs.

Reference Books:

1. Trease and Evans Pharmacognosy by Evans William Charles, 16th ed., Saunders Elsevier, Newyork, 2009.
2. Pharmacognosy by V. E. Tyler, 9th ed., Lea and Febiger, Philadelphia, 1988.
3. A Text book of Pharmacognosy by Quadry, J. S. 16th ed., CBS Publishers & Distrubuters, New Delhi, 2010.
4. Textbook of Pharmacognosy by T. E. Wallis, 5th ed., CBS Publishers & Distrubuters, New Delhi, 2005.
5. A Textbook of Pharmacognosy. by T. C. Denston, 5th Edition, Pitman Medical Publishing Co. Ltd., London, 1958.
6. Modern Pharmacognosy by Egil Ramstad, Blackiston Division, McGraw-Hill, New York, 1959
7. Text book of Pharmacogonosy by Heber W. Youngken, 6th ed., The Blakiston Company, Toronto, 1948
8. Pharmacognosy: Phytochemistry Medicinal Plants by Jean Bruneton, 2nd ed., TEC & DOC Paris, 1999
9. Laboratory Handbook for the fractionation of Nattutal extracts by Peter Houghton and Amala Raman, Springer, 2011.
10. Cultivation and Utilization of Aromatic Plants, Handa S. S. and Kaul M. K., Jammu-Tawi Regional Research Laboratory, Council of Scientific & Industrial Research, 1997
11. Cultivation and Utilization of Aromatic Plants by Atal C. K., CSIR, Jammu, 1982.

GANPAT UNIVERSITY
B.Pharm Semester – IV
4B07EPC Environment and Pollution Control

Theory: 45 hours (3 hours/week)

Credit:3

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|---|-----------|
| 1. INTRODUCTION | 1 |
| Environment & its components, Environment in India, Public awareness | |
| 2. ECOLOGICAL ASPECTS OF ENVIRONMENT | 6 |
| Ecology, Eco system, Factors affecting Eco system, Elton pyramid, Biogeochemical cycles (Hydrologic cycle, Carbon cycle, Nitrogen cycle, Phosphorus cycle, Sulphur cycle), Biodiversity, Future of human being | |
| 3. NATURAL RESOURCES | 7 |
| Types of natural resources, Quality of life, Population and Environment, Water resources, Population projection methods (Arithmetic progression method, Geometric progression method, Incremental Increase method, Logistic curve method, Declining growth method, Water demand, Forest as resource, Forest and Environment, Deforestation, Afforestation, Forest conservation, its methods, Land, Uses and abuses of waste and wet land, Other resources, Oil and mineral resources, their depletion and effects | |
| 4. GLOBAL ENVIRONMENTAL PROBLEMS | 6 |
| Major Global problems, Acid rain, Green house effect, Depletion of Ozone layer, Human predictiments, Introduction of global warming, Measures against global worming | |
| 5. ENVIRONMENTAL POLLUTION | 12 |
| Water pollution, Characteristics of domestic waste water, Principles of treatment, Water treatment plant, Air pollution, Pollutants, Sources of pollution, Effect of pollutants, Air monitoring system, Air pollution control, Noise pollution, Acoustic treatment for noise pollution, Place of noise pollution, Effect of noise pollution, Radio active pollution, Radiation, Adverse effects of radiation & thermal pollution | |
| 6. CLEAN TECHNOLOGIES | 7 |
| Clean technology, Types of Energy, Conventional Energy Sources, Non-conventional Sources of Energy, Recycling pollution control, Types of Pesticides, Integrated Pest Management. | |
| 7. Water Quality Standards for industrial use (Pharmaceutical Industry) | 2 |
| 8. Pollution Control in Pharmaceutical Industries | 2 |
| 9. Recycling and reuse of liquid and solid industrial waste in Pharmaceutical industries | 2 |

Reference Books:

1. Handbook of industrial pollution and control vol. 1 by S.C. Bhatia CBS Publishers & Distributors, New Delhi, 2002
2. Air Pollution by Rao and Rao, Mcgraw hill, Europe, 1989
3. Environmental Engineering by Panday and Carney TMH New Delhi
4. Introduction to Environmental Engineering and science by Gilber M Masters, 3rd ed., Doeling Kindersley , New delhi,2008
5. Environment and Sismic Engineering By Atul Prakashan Ahmedabad.