**III Year I-Semester**

**PHR16311-** **PHARMACOGNOSY – II (50 Hrs)**

**Definition, general tests and detailed Pharmacognostic study of the following drugs**.

**UNIT I 10**

**Glycoside containing drugs:**

* 1. Saponin Glycosides **:** Glycyrrhiza, Ginseng, Dioscorea, Sarasaparilla &

 Senega.

* 1. Cardio active Glycosides **:** Digitalis, Squill, Strophanthus & Thevetia.
	2. Anthraquinone Glycosides **:** Aloe, Senna, Rhubarb & Cascara.
	3. Bitter Glycosides **:** Psoralea, Gentian & Chirata.

*LO:* To understand that Glycosides are isolated from plant sources and have varied action based on aglycone part.

**UNIT II 10**

**Alkaloid containing drugs:**

a.Pyridine – Piperidine derivatives: Tobacco & Lobelia.

b. Tropane: Belladona, Hyoscyamus, Datura, Coca &

 Aswagandha.

c. Quinoline & Isoquinoline: Cinchona, Ipecac, Opium.

d.Indole **:** Ergot, Rauwolfia, Vinca, Nux-vomica

e**.** Imidazole : Pilocarpus

f. Steroid : Kurchi

* 1. Alkaloidal amine : Ephedra & Colchicum.
	2. Glycoalkaloid : Solanum
	3. Purine : Coffee, Tea.

*LO:* To understand that Alkaloids of different structures are synthesized by different plants and possess varied activities based on structure.

**UNIT - III 07**

**Systematic Pharmacognostic study of the following Volatile oil containing drugs**: Mentha, Coriander, Cinnamon, Lemon Oil, Nutmeg, Eucalyptus, Ginger, Cardamom, Tulsi, Lemon Grass, Caraway, Cumin, Dill, Clove, Fennel and Black Pepper.

*LO:* To maintain quality in volatile oils.

**UNIT- IV** **06**

**Biological source, preparations, identification tests and uses of the following enzymes:** Diastase, Papain, Pepsin, Trypsin, Pancreatin.

*LO:* To understand that different enzymes of useful nature are produced by plants

**UNIT-V 10**

**Biogenesis of Phytopharmaceuticals:**

General techniques of biosynthetic studies and basic metabolic pathways.

Brief introduction to biogenesis of secondary metabolites of Pharmaceutical importance.

Biosynthesis of Atropine, Morphine, Isoprenoid compounds and Cardiac glycosides.

*LO:* To understand that compounds of varied chemical nature are produced by Plants (chemo diversity).

**UNIT – VI 07**

Study of plant Fibers like Cotton, Cotton Wood Pulp, Jute, Silk, Hemp and Flax used in surgical dressing and related products.

The applications of natural dyes like Turmeric, Henna, Saffron, Cochineal and Marigold in Pharmacy.

*LO:* Plants exhibit a lot of diversity in producing Fibers useful for fabrics as well as Dyes to colour them.

### TEXT BOOKS

1. Trease and Evans, Pharmacognosy.
2. Tyler, Brady & Robert, Pharmacognosy.
3. Wallis, Text book of Pharmacognosy.
4. Quadry, Pharmacognosy.
5. Kokate C.K , Purohit AP & Gokhale, Pharmacognosy
6. S.L.Deore, et.al., Pharmacognosy and Phytochemistry, A comprehensive approach

**REFERENCES**

1. Atal C.K & Kapur B.M, Cultivation & Utilization of Medicinal Plants.

2. Ayurvedic Pharmacopoeia of India, Pub by Govt. Of India

3. Khare C.P, Indian Medicinal plants – An Illustrated dictionary

4. Arya Vaidya Sala, Indian Medicinal Plants, University Press

**III Year I Semester**

**PHR16312 - MEDICINAL CHEMISTRY-II (50Hrs)**

**UNIT – I 06**

1. **Introduction to principles of chemotherapy,** chemotherapeutic index, drug resistance.
2. **Sulphonamides:** Sulfisoxazole, Sulphamethazole and Sulphathiazole.
3. **Antitubercular agents:** PASA, isoniazid, Ethambutol
4. **Antileprotic agents:** Dapsone

**LO:** Definition, current status, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class.

**UNIT – II 08**

1. **Antimalarials:** chloroquine, primaquine and pyrimethamine
2. **Anthelmintics:** diethyl carbamazine citrate, mebendazole, tinidazole,
3. **Antiamoebic agents:** metronidazole and diloxanide furoate.
4. **Antifungal agents:** clotrimazole, fluconazole and tolnaftate.

**LO:** Definition, current status, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class.

**UNIT – III 10**

1. **Antiviral agents:** acyclovir, zidovudine, idoxuridine and amantadine.
2. **Cytostatic agents:** chlorambucil, cyclophospamide, carmustine, 5-flouro uracil and

mercaptopurine

**LO:** Definition, current status, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class.

**UNIT – IV 12**

**Antibiotics:**

1. **Penicillins:** Ampicillin, Amoxycillin
2. **Cephalosporins:** structures of important cephalosporins (not synthesis)
3. **Tetracyclins:** oxytetracycline, doxycycline
4. **Aminoglycosides:** streptomycin and neomycin (structures).
5. **Miscellaneous:** Chloramphenicol, rifampicin (only structure)

**LO:** Chemistry, structures of currently used drugs, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses and synthesis of compounds as given above under each class.

**UNIT – V 07**

**Water soluble vitamins:** structures of B1, B2, B6, B12, Nicotinic acid, Nicotinamide, Folic acid and Ascorbic acid.

**LO:** Chemistry, structural features, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses, biological role.

**UNIT – VI 07**

**Fat soluble vitamins:** structures of vitamin A, Retinoic acid, Vitamin D, Ergosterol

**LO:** Chemistry including reactions, structural features, interconversions, classification, mode of action, Structure-Activity Relationship (SAR) wherever applicable, therapeutic uses, biological role.

### TEXT BOOKS

1. William O. Foye, Textbook of Medicinal Chemistry, Lea & Febiger, Philadelphia.
2. JH Block & JM Beale, Wilson & Giswold’s Text book of organic Medicinal Chemistry and

 pharmaceutical chemistry by (Eds), 11th Ed, Lipincott, Raven, Philadelphia, 2004.

1. S. N. Pandeya, Textbook of medicinal chemistry, SG Publ. Varanasi, 2003.
2. Sri Ram, Medicinal Chemistry.
3. Rama Rao Nadendla, Medicinal Chemistry.

**REFERENCES**

1. D. Abraham (Ed), Burger Medicinal chemistry and Drug discovery, Vol. 1 & 2. John Wiley

 & Sons, New York 2003.

1. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences .
2. L. M. Atherden, Bentley and Driver’s Textbook of Pharmaceutical Chemistry. Oxford University Press, Delhi.
3. B.N. Lads, M.G.Mandel and F.I.Way, Fundamentals of drug metabolism & disposition,

 William & welking co, Baltimore USA.

1. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, oxford 1991.
2. Daniel lednicer, Strategies For Organic Drug Synthesis And Design, John Wiley, N. Y. 1998.
3. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.
4. Kadam, Textbook of Medicinal Chemistry Vol. 1 & 2.
5. O.P.Agarwal, Text book of natural products. Vol. 1 & 2

**III Year I Semester**

**PHR16313 - PHARMACEUTICAL TECHNOLOGY – I**

**UNIT – I 10**

**Preformulation**: Physicochemical properties like physical form, particle size, shape, density, wetting, dielectric constant, solubility, dissolution, organoleptic additives, hydrolysis, oxidation reduction, recemization, polymerization, e.t.c. and their effect on formulation, stability and bioavailability. Study of Prodrugs. Stability testing of finished products as per ICH guidelines.

**L.O:** To understand performulation parameters and their significance, methods, stability testing protocols, ICH guidelines.

**UNIT – II 12**

**Liquid dosage forms:** Introduction, types of additives used in formulations, vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubulizers, colors, flavours and other manufacturing, packaging and evaluation of clear liquids, suspensions and emulsions official in pharmacopoeia.

**L.O:** To understand liquid dosage formulations, additives, manufacturing, evaluation, packaging procedures, official preparations.

**UNIT – III 10**

**Semisolid dosage forms:** Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semi solids, clear gels manufacturing procedure, evaluation and packaging.

**Suppositories:** Ideal requirements of bases, Different types of bases, manufacturing procedure packing and evaluation.

**L.O: T**o understand semisolid and suppositories preparations, their formulations, methods of preparations, evaluations and packaging.

**UNIT – IV 06**

**Pharmaceutical aerosols:** Definition, propellants general formulation, manufacturing and packaging methods, pharmaceutical applications.

**Opthalmic Preparations:** Requirements, formulation, methods of preparation, containers, evaluation.

**L.O:** To understand aerosols, ophthalmic preparations, their formulation, types, preparations, packaging and evaluation methods.

**UNIT – V 06**

**Cosmeticology and Cosmetic Preparations - I:** Fundamentals of cosmetic science, structures and functions of skin and hair. Formulation, preparation and packaging of cosmetics for skin like powders and compacts, skin creams (Cold cream and Vanishing cream), sun screen preparations & cosmetics for Hair like Shampoos, hair colorants, hair removers.

**L.O:** To understand cosmetics science, functions of skin and hair, cosmetic properties and their formulations, preparations and evaluation methods.

**UNIT – VI 06**

**Cosmeticology and Cosmetic Preparations – II:** Formulation, preparation & packaging of dentrifices like tooth powders, pastes, gels etc., and manicure preparations like nail polish, lipsticks, eye lashes, baby care products etc.

**L.O:** To understand formulation, preparations and packaging of various cosmetics preparations.

**TEXT BOOKS**

1. L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of Industrial Pharmacy, Lea & Febieger, Philadelphia Latest Edn.
2. CVS. Subramanyam, Pharmaceutical production and management, Vallabh Prakashan,

New Delhi 2005.

1. BM Mithal and RN Saha, A handbook of Cosmetics, Vallabh Prakashan, New Delhi.
2. M.Vimala Devi, Textbook of Cosmetics, CBS Publishers.
3. Balsam S.M and Sagarin Edward, Cosmetics: Science and Technology, 2nd Ed. 3 Vol set.

**REFERENCES**

1. Shobha Rani, Text of Industrial Pharmacy, Hiremath Orient Longman.
2. Sagarian & MS Balsam, Cosmetics Sciences &Technology Vol.1, 2 & 3
3. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
4. E.A.Rawlkins, Bentley’s Text Book of Pharmaceutics, Elbs publications.
5. HC Ansel Introduction to Pharmaceutical Dosage forms
6. S.H. Willing, M.M Tucherman and W.S. Hitchings IV, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, Marcel Dekker, Inc., New York 1998.
7. Gilbert S. Banker and Christopher T Rhodes, Modern Pharmaceutics, IV Ed, Marcel Dekker, USA, 2005.
8. Poucher’s, Perfumes, cosmetics and soaps, 10th Edition by Hilda Butler.

**III Year I Semester**

**PHR16314 - ENVIRONMENTAL SCIENCES (50Hrs)**

**UNIT – I 10**

**Multidisciplinary Nature of Environmental Studies:** Definition, Scope and Importance– Need for Public Awareness.

**Natural Resources :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.

*LO*: To know environment, Natural resource, Conservation of national resources

**UNIT – II 10**

**Ecosystems :**Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

*LO*: To understand various Ecosystems Characteristic features, structural functions of each

**UNIT-III 10**

**Biodiversity and its conservation :**Introduction - Definition: genetic, species andecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

*LO*: To understand biodiversity-basic principles-Conservation of Biodiversity

**UNIT –IV 10**

**Environmental Pollution :** Definition, Cause, effects and control measures of :

a. Air pollution

b. Water pollution

c. Soil pollution

d. Marine pollution

e. Noise pollution

f. Thermal pollution

g. Nuclear hazards

**Solid waste Management:** Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

*LO*: To know about environmental pollution, types of pollution-Causes-Measures to prevent and solid waste management-techniques/Methods.

**UNIT – V 05**

**Social Issues and the Environment:** Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Waste land reclamation, Consumerism and waste products. Environment Protection Act -Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

**Human population & environment:** Population growth, variation among nations, population explosion – family welfare programs. Environment and human health. Human rights. Value education. Women and child welfare. Role of technology in environment and human health.

*LO*: To know about social issues in environment, ethics, Acts related to environmental protection and conservation. Human population and environment, Human health issues.

**UNIT –VI 05**

**Human Population and the Environment:** Population growth, variation among nations. Population explosion – Family Welfare Programme. -Environment and human health. -Human Rights. -Value Education. HIV/AIDS. -Women and Child Welfare. -Role of information Technology in Environment and human health.

*LO*: Different aspects of human population and environment and their importance.

**Text Books :**

1. An Introduction to Environmental Studies by B. Sudhakara Reddy, T. SivajiRao, U. Tataji

& K. Purushottam Reddy, Maruti Publications.

**Reference:**

1. Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada
3. Text Book of Environmental Sciences and Technology by M. Anji Reddy, BS Publications.

**III Year I Semester**

**PHR16315 - PHARMACEUTICAL MANAGEMENT (50Hrs)**

**UNIT – I 08**

**Features of Business Organisations & New Economic Environment:**

Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-Liberalisation scenario.

**L.O:** To understand business organization – types – functions.

**UNIT – II 10**

**Manufacturing Management:** Goals of Production Management and Organisation – Production, Planning and Control – Plant location - Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), New Product Development.

**L.O:** To understand production management and organization – Planning and control – Layout – Product development.

**UNIT – III 10**

**Work Study** - Basic procedure involved in Method Study and Work Measurement-Statistical Quality Control: chart, R chart, *c* chart, *p* chart, (simple Problems), Acceptance Sampling, Deming’s contribution to quality.

**L.O:** To understand principles of work study – Methods – Control charts – Principles – Contribution – Quality concepts.

**UNIT – IV 08**

**Organisation of Distribution and Marketing**: Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle., Channels of distribution – Factors influencing channels of distribution, sales organization and sales promotion.

**L.O:** To understand concepts in organization – Distribution – Marketing – Functions – Strategies –Factors – Sales – Sales promotions.

**UNIT - V 08**

**Pharma Industry:** Growth of Pharma Industry in India – current status and its role in building national economy and national health – Structure of Pharma Industry in India – PSUs in Pharma Industry –Progress in the manufacture of basic drugs, synthetic and drugs of vegetable origin. Export and import of drugs and pharmaceuticals – Export and import trade.

**L.O:** To understand Pharma industry – Structure – Manufacturing of drugs and Pharmaceuticals – Exports and imports.

**UNIT – VI 06**

**Insurance and Pharma:** Various types of insurance including marine and health insurance.

Pharmaceutical associations and societies, statutory councils governing the profession. General Principles of medical detailing.

**L.O:**  To understand insurance – types – health insurance – association and society governing pharmacy profession.

**TEXT BOOK**

1. Aryasri and Subbarao, Pharmaceutical Administration, TMH.
2. Manohar A. Potdar, Pharmaceutical Plant Administration.
3. G.Vidya Sagar, Pharmaceutical Industrial Management.
4. C.V.S. Subramanyam, Pharmaceutical production and management

**REFERENCES**

1. Subbarao Chaganti, Pharmaceutical Marketing in India – Concepts and Strategy Cases, BS Publications.
2. O.P.Khanna, Industrial Management, Dhanpatrai, New Delhi.
3. Raja B Smarta, Strategic Pharmaceutical Marketing.

**III Year I Semester**

**PHR16316 - PHARMACOGNOSY – II LAB**

* + 1. Study of Microscopy, Macroscopy and Powder characters of any four to five **Glycoside** containing crude drugs.
		2. Study of Microscopy, Macroscopy and powder characters of any four to five **Alkaloid** containing crude drugs.
		3. Study of Microscopy, Macroscopy and powder characters of any four to five **Volatile oils** containing crude drugs.
		4. Identification of powdered crude drug mixtures based on microscopical characters (Two powder mixtures, 2 experiments)
		5. Identification of powdered crude drug mixtures based on microscopical characters (Three powder mixtures, 2 experiments)
		6. Identification tests for the enzymes Papain and Casein.
		7. Identification of the fibers - cotton, wool, silk by morphological characters and chemical tests .

### TEXT BOOKS

1. C.K. Kokate et.al, Practical Pharmacognosy.
2. Kandhelwal, Practical Pharmacognosy.
3. G.Krishna Mohan, K.N.Jayaveera, G.S.Kumar, Practical Pharmacognosy, A laboratory Handbook.

**REFERENCES**

1. T.E. Wallis, Practical Pharmacognosy 4th Edition.

**III Year I Semester**

**PHR16317 - PHARMACEUTICAL TECHNOLOGY – I LAB**

**A total of at least 50 preparations are to be prepared belonging to various categories.**

Preparation, evaluation and packaging of Syrups (6\*), Elixir (4\*), Oral Suspensions (4\*), Suspensions for external use (4\*), Emulsions (6\*), Ointments (4\*), Creams (2\*), Gels (2\*), Eye ointments (2\*).

Formulation of various types of cosmetics - Shampoos (4\*), Cleansing creams (2\*), Tooth powders (2\*), Tooth paste (2\*), Nail Polish (1\*), Manicure preparations (1\*), Lipsticks (1\*), Face powder (1\*), Prickle heat power (1\*) and Baby Powder (1\*).

**\* indicates number of experiments**

**TEXT BOOK**

1. Swarnlata Saraf and shailendra Saraf, Cosmetics: A Practical Manual, 3rd Ed.

**III Year I Semester**

**PHR16318 - MEDICINAL CHEMISTRY LAB**

**I. Synthesis of any 8 medicinal compounds and their analogues listed below.**

1. Barbituric acid from Diethyl Malonate.
2. Phenytoin from Benzoin or Benzyl.
3. Paracetomol from *para*- nitro phenol or *para*- aminophenol.
4. 1,4- di hydro pyridine from ethyl aceto acetate.
5. Quinazolinone from anthranilic acid via benzoxazinone.
6. Sulfanilamide from acetanilide
7. Isoniazid from γ-picoline.
8. Antipyrine from ethyl aceto acetate.
9. Benzocaine from *para*- nitro benzoic acid.
10. Amphetamine from Phenyl acetone.
11. Acetyl Glycine from glycine.
12. 2,3 – Diphenyl quinoxaline from benzil.
13. Chlorobutanol from acetone and chloroform.

 **II. Qualitative estimation of some functional groups.**

1. Halogens (Strepheno’s method).
2. Hydroxyl groups (Acetylation method)
3. Methoxyl groups (Zeissel’s method)
4. Carboxyl groups (Silver salt method).

**REFERENCES**

1. A.I. Vogel, Text Book of Practical Organic Chemistry, 5th Edition.
2. R.K. Bansal, Laboratory Manual of Organic Chemistry.
3. F.G. Mann & B.C. Saunders, Practical Organic Chemistry, 4th Edition.