



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

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SCHOOL OF PHARMACY

1.2.1 Courses having focus on Employability / Entrepreneurship / Skill Development

B. Pharmacy

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BP108P. PHARMACEUTICAL ANALYSIS (Practical)

4 Hours / Week

I Limit Test of the following:

- (1) Chloride.
- (2) Sulphate.
- (3) Iron.
- (4) Arsenic.

II Preparation and standardization of

- (1) Sodium hydroxide.
- (2) Sulphuric acid.
- (3) Sodium thiosulfate.
- (4) Potassium permanganate.
- (5) Ceric ammonium sulphate.

III Assay of the following compounds along with Standardization of Titrant:

- (1) Ammonium chloride by acid base titration.
- (2) Ferrous sulphate by Cerimetry.
- (3) Copper sulphate by Iodometry.
- (4) Calcium gluconate by Complexometry.
- (5) Hydrogen peroxide by Permanganatometry.
- (6) Sodium benzoate by non-aqueous titration.
- (7) Sodium Chloride by precipitation titration.

IV Determination of Normality by electro-analytical methods:

- (1) Conductometric titration of strong acid against strong base.
- (2) Conductometric titration of strong acid and weak acid against strong base.
- (3) Potentiometric titration of strong acid against strong base.

Recommended Books: (Latest Editions)

- Vogel's Textbook of Quantitative Chemical Analysis by Mendham J., Denny R.C., Barnes J.D., Thomas M, Jeffery G.H., Pearson Education Asia.
- A Textbook of Pharmaceutical by Connors K.A., Wiley Inter-science.
- Practical Pharmaceutical Chemistry by Beckett A.H., and Stenlake J.B., Vol. I & II. Athlone Press, University of London.
- British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
- Quantitative Analysis by Alexeyev V., CBS Publishers & Distributors, New Delhi.
- The Pharmacopoeia of India, the Controller of Publications, Delhi.
- Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press, New Delhi.

Employability

BP103T. PHARMACEUTICS- I (Theory)

45 Hours

Course Content:

Unit-I

10 Hours

Historical background and development of profession of pharmacy: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.

Dosage forms: Introduction to dosage forms, classification and definitions.

Prescription: Definition, Parts of prescription, handling of Prescription and Errors in prescription.

Posology: Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

Unit-II

10 Hours

Pharmaceutical calculations: Weights and measures– Imperial & Metric system, Calculations involving percentage solutions, allegation, proof spirit and isotonic solutions based on freezing point and molecular weight.

Powders: Definition, classification, advantages and disadvantages. Simple & compound powders– official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

Liquid dosage forms: Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques.

Unit-III

10 Hours

Monophasic liquids: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.

Biphasic liquids:

Suspensions: Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.

Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

Unit-IV

08 Hours

Suppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.

Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

Unit-V

07 Hours

Semisolid dosage forms: Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi-solid dosage forms. Evaluation of semi-solid dosages forms.

Employability

BP109P. PHARMACEUTICS I (Practical)

3 Hours/week

1. Syrups:

- a) Syrup IP'66
- b) Compound syrup of Ferrous Phosphate BPC'68

2. Elixirs:

- a) Piperazine citrate elixir
- b) Paracetamol pediatric elixir.

3. Linctus:

- a) Terpin Hydrate Linctus IP'66
- b) Iodine Throat Paint (Mandles Paint)

4. Solutions:

- a) Strong solution of ammonium acetate
- b) Cresol with soap solution c) Lugol's solution

5. Suspensions:

- a) Calamine lotion
- b) Magnesium Hydroxide mixture
- c) Aluminium Hydroxide gel

6. Emulsions:

- a) Turpentine Liniment
- b) Liquid paraffin emulsion

7. Powders and Granules:

- a) ORS powder (WHO)
- b) Effervescent granules
- c) Dusting powder
- d) Divided powders

8. Suppositories:

- a) Glycero gelatin suppository
- b) Cocoa butter suppository
- c) Zinc Oxide suppository

9. Semisolids:

- a) Sulphur ointment
- b) Non staining-iodine ointment with methyl salicylate
- c) Carbopal gel

10. Gargles and Mouthwashes:

- a) Iodine gargle
- b) Chlorhexidine mouthwash

Employability

BP209P. BIOCHEMISTRY (Practical)

4 Hours / Week

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch).
2. Identification tests for Proteins (Albumin and Casein).
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method).
4. Qualitative analysis of urine for abnormal constituents.
5. Determination of blood creatinine.
6. Determination of blood sugar.
7. Determination of serum total cholesterol.
8. Preparation of buffer solution and measurement of pH.
9. Study of enzymatic hydrolysis of starch.
10. Determination of Salivary amylase activity.
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

 **Employability**

BP304T. PHARMACEUTICAL ENGINEERING (Theory)

45 Hours

Course content

Unit-I

10

Hours

Flow of Fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturi meter, Pitot tube and Rotameter.

Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

Unit-II

10

Hours

Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

Evaporation: Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporator.

Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation.

Unit-III

10

Hours

Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer,

vacuum dryer, freeze dryer.

Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier.

Unit-IV

08

Hours

Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seitz filter.

Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

Unit-V

07

Hours

Materials of pharmaceutical plant construction, corrosion and its prevention:

Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and their prevention. Ferrous and non-ferrous metals, inorganic and organic non-metals, basic of material handling systems.

Employability

BP307P. PHARMACEUTICAL MICROBIOLOGY (Practical)

4 Hrs/week

1. Introduction and study of different equipment and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid-fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

Employability

BP308P. PHARMACEUTICAL ENGINEERING (Practical)

4
Hours/week

1. Determination of radiation constant of brass, iron, unpainted and painted glass.
2. **Steam distillation** – To calculate the efficiency of steam distillation.
3. To determine the overall heat transfer coefficient by heat exchanger.
4. Construction of drying curves (for calcium carbonate and starch).
5. **Determination of moisture content and loss on drying.**
6. **Determination of humidity of air** – From wet and dry bulb temperatures- use of Dew point method.
7. **Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, dehumidifier.**
8. **Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.**
9. **Size reduction:** To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond coefficients, power requirement and critical speed of Ball Mill.
10. **Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.**
11. Factors affecting rate of filtration and evaporation (Surface area, Concentration and Thickness/viscosity).
12. To study the effect of time on the rate of crystallization.
13. To calculate the uniformity Index for given sample by using Double Cone Blender.

Employability

BP407P. PHYSICAL PHARMACEUTICS- II (Practical)

3 Hrs/week

1. Determination of particle size, particle size distribution using sieving method.
2. Determination of particle size, particle size distribution using Microscopic method.
3. Determination of bulk density, true density and porosity.
4. Determine the angle of repose and influence of lubricant on angle of repose.
5. Determination of viscosity of liquid using Ostwald's viscometer.
6. Determination sedimentation volume with effect of different suspending agent.
7. Determination sedimentation volume with effect of different concentration of single suspending agent.
8. Determination of viscosity of semisolid by using Brookfield viscometer.
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order.
11. Accelerated stability studies.

Employability

BP506P. INDUSTRIAL PHARMACY I (Practical)

4 Hours/week

1. Preformulation studies of Paracetamol/Aspirin/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 tablets/granules.
5. Preparation and evaluation of Tetracycline capsules.
6. Preparation of Calcium Gluconate injection.
7. Preparation of Ascorbic Acid injection.
8. Quality 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).

Employability

BP508P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical)

4 Hours/Week

1. Morphology, histology and powder characteristics & extraction & detection of:
Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander.
2. Exercise involving isolation & detection of active principles:
 - a) Caffeine - from tea dust.
 - b) Diosgenin from Dioscorea.
 - c) Atropine from Belladonna.
 - d) Sennosides from Senna.
3. Separation of sugars by Paper chromatography.
4. TLC of herbal extract.
5. Distillation of volatile oils and detection of phytoconstituents by TLC.
6. Analysis of crude drugs by chemical tests:
 - (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh.

Employability

BP605T. PHARMACEUTICAL BIOTECHNOLOGY (Theory)

45 Hours

Course content:

Unit-I 10

Hours

Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. **Enzyme Biotechnology- Methods of enzyme immobilization and applications. Biosensors- Working and applications of biosensors** in Pharmaceutical Industries. Brief introduction to Protein Engineering.

Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase. Basic principles of genetic engineering.

Unit-II 10

Hours

Study of cloning vectors, restriction endonucleases and DNA ligase. Recombinant DNA technology. Application of genetic engineering in medicine. **Application of r DNA technology and genetic engineering** in the production of:

- I. Interferon
- II. Vaccines- hepatitis- B
- III. Hormones Insulin.
- IV. Brief introduction to PCR.

Unit-III 10

Hours

Types of immunity- humoral immunity, cellular immunity. Structure of Immunoglobulins.

Structure and Function of MHC. **Hypersensitivity reactions, Immune stimulation and Immune suppressions.** General method of the preparation of bacterial infections, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity. Storage conditions and stability of official vaccines. Hybridoma technology- Production, Purification and Applications, Blood products and Plasma Substitutes.

Unit-IV 08

Hours

Immuno-blotting techniques- **ELISA, Western blotting, Southern blotting. Genetic organization of Eukaryotes and Prokaryotes.**

Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. Introduction to Microbial biotransformation and applications. Mutation: Types of mutation/mutants

Unit-V**07****Hours**

Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. Large scale production fermenter design and its various controls. Study of the production of - Penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin. Blood Products: Collection, Processing and Storage of whole human blood, dried humanplasma, plasma Substitutes.

**Employability**

BP606T. PHARMACEUTICAL QUALITY ASSURANCE (Theory)

45 Hours

Course content:

Unit-I

10 Hours

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP. Total Quality Management (TQM): Definition, elements, philosophies. ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, **ICH stability testing guidelines. Quality by design (QbD):** Definition, overview, elements of QbD program, tools. ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration. NABL accreditation: Principles and procedures.

Unit-II

10 Hours

Organization and personnel: Personnel responsibilities, training, hygiene and personal records. Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

Unit-III

10 Hours

Quality Control: Quality control test for containers, rubber closures and secondary packing materials. **Good Laboratory Practices:** General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, **Protocol for Conduct of a Nonclinical Laboratory Study**, Records and Reports, Disqualification of Testing Facilities.

Unit-IV

08 Hours

Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal. **Document maintenance in pharmaceutical industry:** Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

Unit-V

07 Hours

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, **General principles of Analytical method Validation.** Warehousing: Good warehousing practice, materials management.

Employability

BP705P. INSTRUMENTAL METHODS OF ANALYSIS / NDDS

(Practical)

4 Hours/Week

1. Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds.
2. Estimation of sulphanilamide by colorimetry.
3. Simultaneous estimation of ibuprofen and Paracetamol by UV spectroscopy.
4. Estimation of quinine sulphate by fluorimetry.
5. Study of quenching of fluorescence.
6. Determination of sodium by flame photometry.
7. Determination of potassium by flame photometry.
8. Determination of chlorides and sulphates by nephelo-turbidimetry.
9. Separation of sugars by thin layer chromatography.
10. Separation of plant pigments by column chromatography.
11. Demonstration experiment on HPLC.
12. Demonstration experiment on Gas Chromatography.
13. To perform in-vitro dissolution profile of CR/SR marketed formulation.
14. To prepare sustained release matrix tablets and evaluate by UV spectroscopy.
15. Formulation of nanoparticles and evaluate by HPLC.
16. Formulation and evaluation of liposomes.
17. To prepare buccal dosage form and evaluate by UV spectroscopy.
18. To prepare Paracetamol transdermal patch and evaluate by UV spectroscopy.

Employability

BP805ET. PHARMACOVIGILANCE (Theory)

45 hours

Course Content

Unit-I

10

Hours

Introduction to Pharmacovigilance: History and development of Pharmacovigilance □ Importance of safety monitoring of Medicine, WHO international drug monitoring programme □ Pharmacovigilance Program of India (PvPI).

Introduction to adverse drug reactions

Definitions and classification of ADRs, Detection and reporting, Methods in Causality assessment, Severity and seriousness assessment, Predictability and preventability assessment, Management of adverse drug reactions.

Basic terminologies used in pharmacovigilance

Terminologies of adverse medication related events, Regulatory terminologies.

Unit-II

10

hours

Drug and disease classification

Anatomical, therapeutic and chemical classification of drugs, international classification of diseases, Daily defined doses, International Non-proprietary names for drugs.

Drug dictionaries and coding in pharmacovigilance

WHO adverse reaction terminologies, MedDRA and Standardized MedDRA queries, WHO drug dictionary, EudraVigilance medicinal product dictionary.

Information resources in pharmacovigilance

Basic drug information resources, Specialized resources for ADRs.

Establishing pharmacovigilance programme

Establishing in a hospital, Establishment & operation of drug safety department in industry, Contract Research Organizations (CROs), Establishing a national program.

Unit-III

10 Hours

Vaccine safety surveillance

Vaccine Pharmacovigilance □ Vaccination failure, Adverse events following immunization.

Pharmacovigilance methods

Passive surveillance – Spontaneous reports and case series □ Stimulated reporting □ Active surveillance– Sentinel sites, drug event monitoring and registries □ Comparative observational studies– Cross sectional study, case control study and cohort study. Targeted clinical investigations.

Communication in pharmacovigilance

Effective communication in Pharmacovigilance, Communication in Drug Safety Crisis management, Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media.

Unit-IV

8 Hours

Safety data generation: Pre clinical phase, Clinical phase, Post approval phase (PMS).

ICH Guidelines for Pharmacovigilance: Organization and objectives of ICH, Expedited reporting, Individual case safety reports, Periodic safety update reports, Post approval expedited reporting, Pharmacovigilance planning, Good clinical practice in pharmacovigilance studies

Unit-V

7

Hours

Pharmacogenomics of adverse drug reactions: Genetics related ADR with example focusing PK parameters.

Drug safety evaluation in special population: Paediatrics, Pregnancy and lactation, Geriatrics.

CIOMS: CIOMS Working Groups CIOMS Form.

CDSCO (India) and Pharmacovigilance: D & C Act and Schedule Y, Differences in Indian and global pharmacovigilance requirements.



Employability

BP107P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

4 Hours/weeks

- 1. Study of compound microscope.**
2. Microscopic study of epithelial and connective tissue.
3. Microscopic study of muscular and nervous tissue.
4. Identification of axial bones.
5. Identification of appendicular bones.
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count.
8. Enumeration of total red blood corpuscles (RBC) count.
- 9. Determination of bleeding time.**
- 10. Determination of clotting time.**
- 11. Estimation of hemoglobin content.**
- 12. Determination of blood group.**
- 13. Determination of erythrocyte sedimentation rate (ESR).**
- 14. Determination of heart rate and pulse rate.**
15. Recording of blood pressure.



Entrepreneurship

BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY-I (Practical)

4 Hours / week

A. Systematic qualitative analysis of unknown organic compounds like

1. **Preliminary test:** Color, odor, aliphatic/aromatic compounds, saturation and unsaturation, etc.
2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test.

3. Solubility test.

4. Functional group test like Phenols, Amides/Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.

5. Melting point/Boiling point of organic compounds.

6. Identification of the unknown compound from the literature using melting point/boiling point.

7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
8. Minimum 5 unknown organic compounds to be analyzed systematically.

B. Preparation of suitable solid derivatives from organic compounds.

C. Construction of molecular models.



Entrepreneurship

BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools.
4. Creating mailing labels Using Label Wizard, generating label in MS WORD.
5. Create a database in MS Access to store the patient information with the required fields using access.
6. Design a form in MS Access to view, add, delete and modify the patient record in the database.
7. Generating report and printing the report from patient database.
8. Creating invoice table using – MS Access.
9. Drug information storage and retrieval using MS Access.
10. Creating and working with queries in MS Access.
11. Exporting Tables, Queries, Forms and Reports to web pages.
12. Exporting Tables, Queries, Forms and Reports to XML pages.

BP305P. PHARMACEUTICAL ORGANIC CHEMISTRY -II (Practical)

4 Hrs/week

1. Experiments involving laboratory techniques:

- Recrystallization.
- Steam distillation.

2. Determination of following oil values (including standardization of reagents):

- Acid value.
- Saponification value.
- Iodine value.

3. Preparation of compounds

- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/Phenol/Aniline by acylation reaction.
- 2,4,6-tribromo aniline/para bromo acetanilide from Aniline.
- Acetanilide by halogenation (Bromination) reaction.
- 5-nitrosalicylic acid/meta di-nitrobenzene from salicylic acid/ nitro benzene by nitration reaction.
- Benzoic acid from benzyl chloride by oxidation reaction.
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenyl azo-2-naphthol from Aniline by diazotization and coupling reactions.
- Benzil from benzoin by oxidation reaction.
- Dibenzal acetone from benzaldehyde by Claisen-Schmidt reaction.
- Cinnamic acid from benzaldehyde by Perkin reaction.
- *p*-Iodo benzoic acid from *p*-amino benzoic acid.

BP407P. PHYSICAL PHARMACEUTICS- II (Practical)

3 Hrs/week

12. Determination of particle size, particle size distribution using sieving method.
13. Determination of particle size, particle size distribution using Microscopic method.
14. Determination of bulk density, true density and porosity.
15. Determine the angle of repose and influence of lubricant on angle of repose.
16. Determination of viscosity of liquid using Ostwald's viscometer.
17. Determination sedimentation volume with effect of different suspending agent.
18. Determination sedimentation volume with effect of different concentration of single suspending agent.
19. Determination of viscosity of semisolid by using Brookfield viscometer.
20. Determination of reaction rate constant first order.
21. Determination of reaction rate constant second order.
22. Accelerated stability studies.



Entrepreneurship

BP502T. INDUSTRIAL PHARMACY I (Theory)

45 Hours

Course content

Unit-I Hours

07

Pre-formulation Studies: Introduction to pre-formulation, goals and objectives, study of physicochemical characteristics of drug substances.

Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism.

Chemical Properties: Hydrolysis, oxidation, reduction, racemization, polymerization. BCS classification of drugs & its significance.

Application of pre-formulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

Unit-II Hours

10

Tablets: Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipment's and tablet tooling.

Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. **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**

Unit-III Hours

08

Capsules: 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.**

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, palletization process, and equipment for manufacture of pellets.

Unit-IV

10

Hours

Parenteral Products:

Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity.

Production procedure, production facilities and controls, aseptic processing.

Formulation of injections, sterile powders, large volume parenteral and lyophilized products.

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.

Unit-V

10

Hours

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.



Entrepreneurship

BP504T. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)

45Hours

Course Content

Unit-I 7 Hours

Metabolic pathways in higher plants and their determination

Brief study of basic metabolic pathways and formation of different secondary metabolites

through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

Unit-II 14 Hours

General introduction, composition, chemistry & chemical classes, bio-sources, therapeutic uses and commercial applications of following secondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium.

Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta.

Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis.

Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander.

Tannins: Catechu, Pterocarpus.

Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony.

Glycosides: Senna, Aloes, Bitter Almond.

Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, Taxus, carotenoids.

Unit-III 06 Hours

Isolation, Identification and Analysis of Phytoconstituents. Terpenoids: Menthol, Citral, Artemisin.

Glycosides: Glycyrrhetic acid & Rutin. Alkaloids: Atropine, Quinine, Reserpine, Caffeine
Resins: Podophyllotoxin, Curcumin.

Unit-IV 10

Hours

Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine.

Unit-V**8****Hours****Basics of Phytochemistry**

Modern methods of extraction, application of latest techniques like Spectroscopy, Chromatography and electrophoresis in the isolation, purification and identification of crude drugs.



Entrepreneurship

BP505T. PHARMACEUTICAL JURISPRUDENCE (Theory)

45 Hours

Course Content:

Unit-I

10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules.

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties.

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

Unit-II

10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945

Detailed study of Schedule G, H, M, N, P, T, U, V, X, Y, Part XII B, Sch F & DMR (OA) Sale of Drugs – Wholesale, Retail sale and restricted license. Offences and penalties.

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules– Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, licensing authorities, controlling authorities, Drugs Inspectors.

Unit-III

10 Hours

Pharmacy Act-1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties.

Medicinal and Toilet Preparation Act-1955: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.

Narcotic Drugs and Psychotropic substances Act-1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation,

opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties.

Unit-IV

08

Hours

Study of Salient Features of Drugs and Magic Remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties.

Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, CPCSE guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties.

National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO)- 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM).

Unit-V

07 Hours

Pharmaceutical Legislations - A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee.

Code of Pharmaceutical ethics - Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath.

Medical Termination of Pregnancy Act

Right to Information Act

Introduction to Intellectual Property Rights (IPR)



Entrepreneurship

BP603T. HERBAL DRUG TECHNOLOGY (Theory)

45 hours

Course content

Unit-I 10

Hours

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: Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy. Preparation and standardization of Ayurvedic formulations viz. Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.

Unit-II 8

Hours

Nutraceuticals

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfa-alfa, 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.

Unit-III 10

Hours

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.

Unit-IV

10

Hours

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs. Stability testing of herbal drugs.

Patenting and Regulatory requirements of natural products: Definition of the terms:Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy.

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.

Unit-V

07

Hours

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.



Entrepreneurship

BP609P. HERBAL DRUG TECHNOLOGY (Practical)

4 Hours/ week

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.



Entrepreneurship

BP704T. NOVEL DRUG DELIVERY SYSTEMS (NDDS) (Theory)

45 Hours

Course content

Unit-I

10 Hours

Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design-controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations.

Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

Unit-II

10 Hours

Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications.

Mucosal Drug Delivery system: Introduction, Principles of bioadhesion/mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems.

Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump.

Unit-III

10 Hours

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of **TDDS, formulation approaches.**

Gastro-retentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS– Floating, high density systems, inflatable and gastro-adhesive systems and their applications.

Naso-pulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers.

Unit-IV

08 Hours

Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications.

Unit-V

07 Hours

Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome—Preliminary study, ocular formulations and ocuserts.

Intrauterine Drug Delivery Systems: Introduction, advantages and Disadvantages, development of intra uterine devices (IUDs) and applications.



Entrepreneurship

BP105T. COMMUNICATION SKILLS (Theory)

30 Hours

Course content:

Unit-I 07 Hours

Communication Skills: Introduction, Definition, The Importance of Communication, the communication process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context.

Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers.

Perspectives in communication: Introduction, Visual perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.

Unit-II 07 Hours

Elements of communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication.

Communication styles: Introduction, The Communication Styles Matrix with example for each Direct communication style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style.

Unit-III 07 Hours

Basic listening skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in difficult situations.

Effective written communication: Introduction, When and When Not to Use Written Communication- Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication.

Writing effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message.

Unit-IV 05 Hours

Interview skills: Purpose of an interview, Do's and Don'ts of an interview.

Giving presentations: Dealing with Fears, planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery.

Unit-V 04 Hours

Group discussion: Introduction, Communication skills in group discussion, Do's and Don'ts of group discussion.

Skill Development

BP111P. COMMUNICATION SKILLS (Practical)

2 Hours / Week

Course content:

The following learning modules are to be conducted using words worth[®] English language lab software.

Basic communication covering the following topics

- Meeting People.
- Asking Questions.
- Making Friends.
- What did you do?
- Do's and Don'ts.

Pronunciations covering the following topics

- Pronunciation (Consonant Sounds).Pronunciation and Nouns.
- Pronunciation (Vowel Sounds).

Advanced Learning

- Listening Comprehension / Direct and Indirect Speech.Figures of Speech.
- Effective Communication.Writing Skills.
- Effective Writing. InterviewHandling Skills.
- E-Mail etiquette. Presentation Skills.

Skill Development

BP205T. COMPUTER APPLICATIONS IN PHARMACY
(Theory)

30 Hours
(2 Hours/Week)

Course content

Unit-I hours	06
Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division.	
Concept of Information Systems and Software: Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project.	
Unit-II hours	06
Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products.	
Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database.	
Unit-III hours	06
Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring.	
Diagnostic system. Lab-diagnostic System, Patient Monitoring System, Pharma Information System.	
Unit-IV hours	06
Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery.	
Unit-V hours	06
Computers as data analysis in Preclinical development:	
Chromatographic data analysis (CDS), Laboratory Information management System(LIMS) and Text Information Management System (TIMS).	

 **Skill Development**

BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools.
4. Creating mailing labels Using Label Wizard, generating label in MS WORD.
5. Create a database in MS Access to store the patient information with the required fields using access.
6. Design a form in MS Access to view, add, delete and modify the patient record in the database.
7. Generating report and printing the report from patient database.
8. Creating invoice table using – MS Access.
9. Drug information storage and retrieval using MS Access.
10. Creating and working with queries in MS Access.
11. Exporting Tables, Queries, Forms and Reports to web pages.
12. Exporting Tables, Queries, Forms and Reports to XML pages.

BP506P. INDUSTRIAL PHARMACY I (Practical)

4 Hours/week

12. Preformulation studies of Paracetamol/Aspirin/or any other drug.
13. Preparation and evaluation of Paracetamol tablets.
14. Preparation and evaluation of Aspirin tablets.
15. Coating of tablets- film coating of tables/granules.
16. Preparation and evaluation of Tetracycline capsules.
17. Preparation of Calcium Gluconate injection.
18. Preparation of Ascorbic Acid injection.
19. Quality control test of (as per IP) marketed tablets and capsules.
20. Preparation of Eye drops/ and Eye ointments.
21. Preparation of Creams (cold / vanishing cream).
22. Evaluation of glass containers (as per IP).

 **Skill Development**

BP705P. INSTRUMENTAL METHODS OF ANALYSIS / NDDS (Practical)

4 Hours/Week

1. Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds.
2. Estimation of sulphanilamide by colorimetry.
3. Simultaneous estimation of ibuprofen and Paracetamol by UV spectroscopy.
4. Estimation of quinine sulphate by fluorimetry.
5. Study of quenching of fluorescence.
6. Determination of sodium by flame photometry.
7. Determination of potassium by flame photometry.
8. Determination of chlorides and sulphates by nephelometry-turbidimetry.
9. Separation of sugars by thin layer chromatography.
10. Separation of plant pigments by column chromatography.
11. Demonstration experiment on HPLC.
12. Demonstration experiment on Gas Chromatography.
13. To perform in-vitro dissolution profile of CR/SR marketed formulation.
14. To prepare sustained release matrix tablets and evaluate by UV spectroscopy.
15. Formulation of nanoparticles and evaluate by HPLC.
16. Formulation and evaluation of liposomes.
17. To prepare buccal dosage form and evaluate by UV spectroscopy.
18. To prepare Paracetamol transdermal patch and evaluate by UV spectroscopy.

Skill Development

BP801T. BIOSTATISTICS AND RESEARCH METHODOLOGY (Theory)

45 Hours

Course content:

Unit-I

10

Hours

Introduction: Statistics, Biostatistics, Frequency distribution.

Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples.

Measures of dispersion: Dispersion, Range, standard deviation, pharmaceutical problems.

Correlation: Definition, Karl Pearson's coefficient of correlation, multiple correlation-Pharmaceuticals examples.

Unit-II

10

Hours

Regression: Curve fitting by the method of least squares, fitting the lines $y = a + bx$ and $x = a + by$, Multiple regression, standard error of regression– Pharmaceutical examples. **Probability:** Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties– problems.

Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples.

Parametric test: t-test (Sample, Pooled or Unpaired and Paired), ANOVA, (One way and Two way), Least Significance difference.

Unit-III

10

Hours

Non-Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test.

Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, Plagiarism.

Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph **Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

Unit-IV

8

Hours

Blocking and confounding system for Two-level factorials.

Regression modeling: Hypothesis testing in Simple and Multiple regression models **Introduction to Practical components of Industrial and Clinical Trials Problems:** Statistical Analysis Using

Excel, SPSS, MINITAB[®], Design of experiment, R- Online Statistical Software's to Industrial and Clinical trial approach.

Unit-V

7

Hours

Design and Analysis of experiments:

Factorial Design: Definition, 2^2 , 2^3 design. Advantages of factorial design.

Response Surface methodology: Central composite design, Historical design, Optimization Techniques.





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School of Pharmacy

1.1.3 Courses having focus on Employability / Entrepreneurship / Skill Development

D. Pharmacy

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PHARMACEUTICS – THEORY

Course Code: ER20-11T

75 Hours (3 Hours/week)

Scope: This course is designed to impart basic knowledge and skills on the art and science of formulating and dispensing different pharmaceutical dosage forms.

Course Objectives:

This course will discuss the following aspects of pharmaceutical dosage forms

- Basic concepts, types and need
- Advantages and disadvantages, methods of preparation / formulation
- Packaging and labelling requirements
- Basic quality control tests, concepts of quality assurance and good manufacturing practices

Course Outcomes: Upon successful completion of this course, the students will be able to

- Describe about the different dosage forms and their formulation aspects
- Explain the advantages, disadvantages, and quality control tests of different dosage forms
- Discuss the importance of quality assurance and good manufacturing practices

CHAPTER	TOPICS	HOURS
1	• History of the profession of Pharmacy in India in relation to Pharmacy education, industry, pharmacy practice, and various professional associations. • Pharmacy as a career • Pharmacopoeia: Introduction to IP, BP, USP, NF and • Extra Pharmacopoeia. Salient features of Indian Pharmacopoeia	7
2	Packaging materials: Types, selection criteria, advantages and disadvantages of glass, plastic, metal, rubber as packaging materials	5
3	Pharmaceutical aids: Organoleptic (Colouring, flavouring, and sweetening) agents Preservatives: Definition, types with examples and uses	3
4	Unit operations: Definition, objectives/applications, principles, construction, and workings of: Size reduction: hammer mill and ball mill Size separation: Classification of powders according to IP, Cyclone separator, Sieves and standards of sieves Mixing: Double cone blender, Turbine mixer, Triple roller mill and Silverson mixer homogenizer Filtration: Theory of filtration, membrane filter and sintered glass filter Drying: working of fluidized bed dryer and process of freeze drying Extraction: Definition, Classification, method, and applications	9

Employability

5	Tablets – coated and uncoated, various modified tablets (sustained release, extended-release, fast dissolving, multi-layered, etc.) Capsules - hard and soft gelatin capsules Liquid oral preparations - solution, syrup, elixir, emulsion, suspension, dry powder for reconstitution Topical preparations - ointments, creams, pastes, gels, liniments and lotions, suppositories, and pessaries Nasal preparations, Ear preparations Powders and granules - Insufflations, dusting powders, effervescent powders, and effervescent granules Sterile formulations – Injectables, eye drops and eye Ointments Immunological products: Sera, vaccines, toxoids, and their manufacturing methods.	8
6	Basic structure, layout, sections, and activities of pharmaceutical manufacturing plants Quality control and quality assurance: Definition and concepts of quality control and quality assurance, current good manufacturing practice (cGMP), Introduction to the concept of calibration and validation	5
7	Novel drug delivery systems: Introduction, Classification with examples, advantages, and challenges	5

Employability

PHARMACOGNOSY – THEORY

Course Code: ER20-13T

75 Hours (3 Hours/week)

Scope: This course is designed to impart knowledge on the medicinal uses of various drugs of natural origin. Also, the course emphasizes the fundamental concepts in the evaluation of crude drugs, alternative systems of medicine, nutraceuticals, and herbal cosmetics.

Course Objectives: This course will discuss the following aspects of drug substances derived from natural resources.

- Occurrence, distribution, isolation, identification tests of common phytoconstituents
- Therapeutic activity and pharmaceutical applications of various natural drug substances and phytoconstituents
- Biological source, chemical constituents of selected crude drugs and their therapeutic efficacy in common diseases and ailments
- Basic concepts in quality control of crude drugs and various system of medicines
- Applications of herbs in health foods and cosmetics

Course Outcomes:

- Upon successful completion of this course, the students will be able to
- Identify the important/common crude drugs of natural origin
- Describe the uses of herbs in nutraceuticals and cosmeceuticals
- Discuss the principles of alternative system of medicines
- Describe the importance of quality control of drugs of natural origin

CHAPTER	TOPIC	HOURS
1	Definition, history, present status and scope of Pharmacognosy	2
2	Classification of drugs: • Alphabetical • Taxonomical • Morphological • Pharmacological • Chemical • Chemo-taxonomical	4
3	Quality control of crude drugs: • Different methods of adulteration of crude drugs • Evaluation of crude drugs	6
4	Brief outline of occurrence, distribution, isolation, identification tests, therapeutic activity and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.	6

Employability

5	Biological source, chemical constituents and therapeutic efficacy of the following categories of crude drugs.		30
	Laxatives	Aloe, Castor oil, Ispaghula, Senna	
	Cardiotonic	Digitalis, Arjuna	
	Carminatives and G.I. regulators	Coriander, Fennel, Cardamom, Ginger, Clove, Black Pepper, Asafetida, Nutmeg, Cinnamon	
	Astringents	Myrobalan, Black Catechu, Pale Catechu	
	Drugs acting on nervous system	Hyoscyamus, Belladonna, Ephedra, Opium, Tea leaves, Coffee seeds, Coca	
	Anti-hypertensive	Rauwolfia	
	Anti-tussive	Vasaka, Tolu Balsam	
	Anti-rheumatics	Colchicum seed	
	Anti-tumour	Vinca, Podophyllum	
	Antidiabetics	Pterocarpus, Gymnema	
	Diuretics	Gokhru, Punarnava	
	Anti-dysenteric	Ipecacuanha	
	Antiseptics and disinfectants	Benzoin, Myrrh, Neem, Turmeric	
	Antimalarials	Cinchona, Artemisia	
	Oxytocic	Ergot	
	Vitamins	Cod liver oil, Shark liver oil	
	Enzymes	Papaya, Diastase, Pancreatin, Yeast	
	Pharmaceutical Aids	Kaolin, Lanolin, Beeswax, Acacia, Tragacanth, Sodium alginate, Agar, Guar gum, Gelatine	
	Miscellaneous	Squill, Galls, Ashwagandha, Tulsi, Guggul	
6	Plant fibres used as surgical dressings: Cotton, silk, wool and regenerated fibres Sutures – Surgical Catgut and Ligatures		3

Employability

7	• Basic principles involved in the traditional systems of medicine like: Ayurveda, Siddha, Unani and Homeopathy • Method of preparation of Ayurvedic formulations like: Arista, Asava, Gutika, Taila, Churna, Lehya and Bhasma	8
8	Role of medicinal and aromatic plants in national economy and their export potential	2
9	Herbs as health food: Brief introduction and therapeutic applications of: Nutraceuticals, Antioxidants, Pro-biotics, Pre-biotics, Dietary fibres, Omega-3-fatty acids, Spirulina, Carotenoids, Soya and Garlic	4
10	Introduction to herbal formulations	4
11	Herbal cosmetics: Sources, chemical constituents, commercial preparations, therapeutic and cosmetic uses of: Aloe vera gel, Almond oil, Lavender oil, Olive oil, Rosemary oil, Sandal Wood oil	4
12	Phytochemical investigation of drugs	2



Employability

SOCIAL PHARMACY – THEORY

Course Code: ER20-15T

75 Hours (3 Hours/week)

Scope: This course is designed to impart basic knowledge on public health, epidemiology, preventive care, and other social health related concepts. Also, to emphasize the roles of pharmacists in the public health programs.

Course Objectives: This course will discuss about basic concepts of

1. Public health and national health programs
2. Preventive healthcare
3. Food and nutrition related health issues
4. Health education and health promotion
5. General roles and responsibilities of pharmacists in public health

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Discuss about roles of pharmacists in the various national health programs
2. Describe various sources of health hazards and disease preventive measures
3. Discuss the healthcare issues associated with food and nutritional substances
4. Describe the general roles and responsibilities of pharmacists in public health

CHAPTER	TOPIC	HOURS
1	Introduction to Social Pharmacy • Definition and Scope. Social Pharmacy as a discipline and its scope in improving the public health. Role of Pharmacists in Public Health. (2) • Concept of Health -WHO Definition, various dimensions, determinants, and health indicators. (3) • National Health Policy – Indian perspective (1) • Public and Private Health System in India, National Health Mission (2) • Introduction to Millennium Development Goals, Sustainable Development Goals, FIP Development Goals (1)	9

Employability

2	Preventive healthcare – Role of Pharmacists in the following • Demography and Family Planning (3) • Mother and child health, importance of breastfeeding, ill effects of infant milk substitutes and bottle feeding (2) • Overview of Vaccines, types of immunity and immunization (4) • Effect of Environment on Health – Water pollution, importance of safe drinking water, waterborne diseases, air pollution, noise pollution, sewage and solid waste disposal, occupational illnesses, Environmental pollution due to pharmaceuticals (7) • Psychosocial Pharmacy: Drugs of misuse and abuse – psychotropics, narcotics, alcohol, tobacco products. Social Impact of these habits on social health and productivity and suicidal behaviours (2)	18
3	Nutrition and Health • Basics of nutrition – Macronutrients and Micronutrients (3) • Importance of water and fibres in diet (1) • Balanced diet, Malnutrition, nutrition deficiency diseases, ill effects of junk foods, calorific and nutritive values of various foods, fortification of food (3) • Introduction to food safety, adulteration of foods, effects of artificial ripening, use of pesticides, genetically modified foods (1) • Dietary supplements, nutraceuticals, food supplements – indications, benefits, Drug-Food Interactions (2)	10
4	Introduction to Microbiology and common microorganisms (3) Epidemiology: Introduction to epidemiology, and its applications. Understanding of terms such as epidemic, pandemic, endemic, mode of transmission, outbreak, quarantine, isolation, incubation period, contact tracing, morbidity, mortality, . (2) Causative agents, epidemiology and clinical presentations and Role of Pharmacists in educating the public in prevention of the following communicable diseases: • Respiratory infections – chickenpox, measles, rubella, mumps, influenza (including Avian-Flu, H1N1, SARS, MERS, COVID-19), diphtheria, whooping cough, meningococcal meningitis, acute respiratory infections, tuberculosis, Ebola (7)	28

Employability

	• Intestinal infections – poliomyelitis, viral hepatitis, cholera, acute diarrheal diseases, typhoid, amebiasis, worm infestations, food poisoning (7) • Arthropod-borne infections - dengue, malaria, filariasis and, chikungunya (4) • Surface infections – trachoma, tetanus, leprosy (2) • STDs, HIV/AIDS (3)	
5	Introduction to health systems and all ongoing National Health programs in India , their objectives, functioning, outcome, and the role of pharmacists.	8
6	Pharmacoeconomics – Introduction, basic terminologies, importance of pharmacoeconomics	2



Employability

PHARMACEUTICS – PRACTICAL

Course Code: ER20-11P

s 75 Hours (3 Hours/week)

Scope: This course is designed to train the students in formulating and dispensing common pharmaceutical dosage forms.

Course Objectives: This course will discuss and train the following aspects of preparing and dispensing various pharmaceutical dosage forms

- Calculation of working formula from the official master formula
- Formulation of dosage forms based on working formula
- Appropriate Packaging and labelling requirements
- Methods of basic quality control tests

Course Outcomes:

Upon successful completion of this course, the students will be able to

- Calculate the working formula from the given master formula
- Formulate the dosage form and dispense in an appropriate container
- Design the label with the necessary product and patient information
- Perform the basic quality control tests for the common dosage forms

Practicals

1. Handling and referring the official references: Pharmacopoeias, Formularies, etc. for retrieving formulas, procedures, etc.
2. Formulation of the following dosage forms as per monograph standards and dispensing with appropriate packaging and labelling
 - **Liquid Oral:** Simple syrup, Piperazine citrate elixir, Aqueous Iodine solution
 - **Emulsion:** Castor oil emulsion, Cod liver oil emulsion
 - **Suspension:** Calamine lotion, Magnesium hydroxide mixture
 - **Ointment:** Simple ointment base, Sulphur ointment
 - **Cream:** Cetrimide cream
 - **Gel:** Sodium alginate gel
 - **Liniment:** Turpentine liniment, White liniment BPC
 - **Dry powder:** Effervescent powder granules, Dusting powder
 - **Sterile Injection:** Normal Saline, Calcium gluconate Injection
 - **Hard Gelatine Capsule:** Tetracycline capsules
 - **Tablet:** Paracetamol tablets
 - Formulation of at least five commonly used cosmetic preparations – e.g. cold cream, shampoo, lotion, toothpaste etc
 - Demonstration on various stages of tablet manufacturing processes
 - Appropriate methods of usage and storage of all dosage forms including special dosage such as different types of inhalers, spacers, insulin pens
- Demonstration of quality control tests and evaluation of common dosage forms viz. tablets, capsules, emulsion, sterile injections as per the monographs

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1. Various systems of measures commonly used in prescribing, compounding and dispensing practices
2. Market preparations (including Fixed Dose Combinations) of each type of dosage forms, their generic name, minimum three brand names and label contents of the dosage forms mentioned in theory/practical
3. Overview of various machines / equipments/ instruments involved in the formulation and quality control of various dosage forms / pharmaceutical formulations.
4. Overview of extemporaneous preparations at community / hospital pharmacy vs. manufacturing of dosage forms at industrial level
5. Basic pharmaceutical calculations: ratios, conversion to percentage fraction, alligation, proof spirit, isotonicity

Field Visit

The students shall be taken for an industrial visit to pharmaceutical industries to witness and understand the various processes of manufacturing of any of the common dosage forms viz. tablets, capsules, liquid orals, injectables, etc. Individual reports from each student on their learning experience from the field visit shall be submitted.



Employability

HOSPITAL AND CLINICAL PHARMACY – THEORY

Course Code: ER20-25T

75 Hours (3 Hours/week)

Scope: This course is designed to impart fundamental knowledge and professional skills required for facilitating various hospital and clinical pharmacy services.

Course Objectives: This course will discuss and train the students in the following

- Hospital and Hospital Pharmacy organization and set-ups
- Basics of hospital pharmacy services including the procurement, supply chain, storage of medicines and medical supplies
- Basics of clinical pharmacy including introduction to comprehensive pharmaceutical care services
- Basic interpretation of common laboratory results used in clinical diagnosis towards optimizing the drug therapy

Course Outcomes: Upon successful completion of this course, the students will be able to

- Explain about the basic concepts of hospital pharmacy administration
- Manage the supply chain and distribution of medicines within the hospital settings
- Assist the other healthcare providers in monitoring drug therapy and address drug related problems
- Interpret common lab investigation reports for optimizing drug therapy

S. NO.	TOPIC	HOURS
1	Hospital Pharmacy • Definition, scope, national and international scenario • Organisational structure • Professional responsibilities, Qualification and experience requirements, job specifications, work load requirements and inter professional relationships • Good Pharmacy Practice (GPP) in hospital • Hospital Pharmacy Standards (FIP Basel Statements, AHSP) • Introduction to NAQS guidelines and NABH Accreditation and Role of Pharmacists	6

Employability

2	Different Committees in the Hospital - Pharmacy and Therapeutics Committee - Objectives, Composition, and functions - Hospital Formulary - Definition, procedure for development and use of hospital formulary - Infection Control Committee – Role of Pharmacist in preventing Antimicrobial Resistance	4
4	Supply Chain and Inventory Control - Preparation of Drug lists - High Risk drugs, Emergency drugs, Schedule H1 drugs, NDPS drugs, reserved antibiotics - Procedures of Drug Purchases – Drug selection, short term, long term, and tender/e-tender process, quotations, etc. - Inventory control techniques: Economic Order Quantity, Reorder Quantity Level, Inventory Turnover etc. - Inventory Management of Central Drug Store – Storage conditions, Methods of storage, Distribution, Maintaining ColdChain, Devices used for cold storage (Refrigerator, ILR, Walk-in- Cold rooms) - FEFO, FIFO methods - Expiry drug removal and handling, and disposal. Disposal of Narcotics, cytotoxic drugs - Documentation - purchase and inventory	14
5	Drug distribution - Drug distribution (in- patients and out - patients) – Definition, advantages and disadvantages of individual prescription order method, Floor Stock Method, Unit Dose Drug Distribution Method, Drug Basket Method. - Distribution of drugs to ICCU/ICU/NICU/Emergency wards. - Automated drug dispensing systems and devices - Distribution of Narcotic and Psychotropic substances and their storage	7
6	Compounding in Hospitals. Bulk compounding, IV admixture services and incompatibilities, Total parenteral nutrition	4
7	Radio Pharmaceuticals - Storage, dispensing and disposal of radiopharmaceuticals	2

Employability

8	Application of computers in Hospital Pharmacy Practice, Electronic health records, Softwares used in hospital pharmacy	2
9	Clinical Pharmacy: Definition, scope, and development - in India and other countries Technical definitions, common terminologies used in clinical settings and their significance such as Paediatrics, Geriatric, Anti-natal Care, Post- natal Care, etc. Daily activities of clinical pharmacists: Definition, goal, and procedure of • Ward round participation • Treatment Chart Review • Adverse drug reaction monitoring • Drug information and poisons information • Medication history • Patient counselling • Interprofessional collaboration Pharmaceutical care: Definition, classification of drug related problems. Principles and procedure to provide pharmaceutical care Medication Therapy Management, Home Medication Review	12
10	Clinical laboratory tests used in the evaluation of disease states - significance and interpretation of test results • Haematological, Liver function, Renal function, thyroid function tests • Tests associated with cardiac disorders • Fluid and electrolyte balance • Pulmonary Function Tests	10
11	Poisoning: Types of poisoning: Clinical manifestations and Antidotes Drugs and Poison Information Centre and their services – Definition, Requirements, Information resources with examples, and their advantages and disadvantages	6

Employability

12	Pharmacovigilance • Definition, aim and scope • Overview of Pharmacovigilance	2
13	Medication errors: Definition, types, consequences, and strategies to minimize medication errors, LASA drugs and Tallman lettering as per ISMP Drug Interactions: Definition, types, clinical significance of drug interactions	6



Employability

PHARMACY LAW AND ETHICS – THEORY

Course Code: ER20-26T

75 Hours (3 Hours/week)

Scope: This course is designed to impart basic knowledge on several important legislations related to the profession of pharmacy in India

Course Objectives: This course will discuss the following

- General perspectives, history, evolution of pharmacy law in India
- Act and Rules regulating the profession and practice of pharmacy in India
- Important code of ethical guidelines pertaining to various practice standards
- Brief introduction to the patent laws and their applications in pharmacy

Course Outcomes: Upon successful completion of this course, the students will be able to

- Describe the history and evolution of pharmacy law in India
- Interpret the act and rules regulating the profession and practice of pharmacy in India
- Discuss the various codes of ethics related to practice standards in pharmacy
- Interpret the fundamentals of patent laws from the perspectives of pharmacy

CHAPTER	TOPICS	HOURS
1	General Principles of Law, History and various Acts related to Drugs and Pharmacy profession	2
2	Pharmacy Act-1948 and Rules: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils, Registration of Pharmacists, Offences and Penalties. Pharmacy Practice Regulations 2015	5
3	Drugs and Cosmetics Act 1940 and Rules 1945 and New Amendments Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and	23

Employability

	analysis, manufacture of new drug, loan license and repacking license. Study of schedule C and C1, G, H, H1, K, P, M, N, and X. Sale of Drugs – Wholesale, Retail sale and Restricted license, Records to be kept in a pharmacy Drugs Prohibited for manufacture and sale in India Administration of the Act and Rules – Drugs Technical Advisory Board, Central Drugs Laboratory, Drugs Consultative Committee, Government analysts, licensing authorities, controlling authorities, Drug Inspectors.	
4	Narcotic Drugs and Psychotropic Substances Act 1985 and Rules Objectives, Definitions, Authorities and Officers, Prohibition, Control and Regulation, Offences and Penalties.	2
5	Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties.	2
6	Prevention of Cruelty to Animals Act-1960: Objectives, Definitions, CPCSEA - brief overview, Institutional Animal Ethics Committee, Breeding and Stocking of Animals, Performance of Experiments, Transfer and Acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties.	2
7	Poisons Act-1919: Introduction, objective, definition, possession, possession for sales and sale of any poison, import of poisons	2
8	FSSAI (Food Safety and Standards Authority of India) Act and Rules: brief overview and aspects related to manufacture, storage, sale, and labelling of Food Supplements	2

Employability

9	National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO) - 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, Pharmaceutical Policy 2002, National List of Essential Medicines (NLEM)	5
10	Code of Pharmaceutical Ethics: Definition, ethical principles, ethical problem solving, registration, code of ethics for Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath.	5
11	Medical Termination of Pregnancy Act and Rules – basic understanding, salient features, and Amendments	2
12	Role of all the government pharma regulator bodies – Central Drugs Standards Control Organization (CDSCO), Indian Pharmacopoeia Commission (IPC)	1
13	Good Regulatory practices (documentation, licenses, renewals, e-governance) in Community Pharmacy, Hospital pharmacy, Pharma Manufacturing, Wholesale business, inspections, import, export of drugs and medical devices	3
14	Introduction to BCS system of classification, Basic concepts of Clinical Trials, ANDA, NDA, New Drug development, New Drugs and Clinical Trials Rules, 2019. Brand v/s Generic, Trade name concept, Introduction to Patent Law and Intellectual Property Rights, Emergency Use Authorization	7
15	Blood bank – basic requirements and functions	2
16	Clinical Establishment Act and Rules – Aspects related to Pharmacy	2
17	Biomedical Waste Management Rules 2016 – Basic aspects, and aspects related to pharma manufacture to disposal of pharma / medical waste at homes, pharmacies, and hospitals	2

Employability

18	Bioethics - Basic concepts, history and principles. Brief overview of ICMR's National Ethical Guidelines for Biomedical and Health Research involving human participants	2
19	Introduction to the Consumer Protection Act	1
20	Introduction to the Disaster Management Act	1
21	Medical Devices – Categorization, basic aspects related to manufacture and sale	2

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student) Requirements for Ayurvedic, Homeopathic manufacturing, sale, and licensing requirements

- Layout and contents of official websites of various agencies regulating the profession of pharmacy in India: e.g., CDSCO, SUGAM portal, PCI, etc.
- Licenses required, application processes (online/offline), drug regulatory office website of the respective state
- Case studies – actions taken on violation of any act / rule related to pharmacy
- Schedule H1 drugs and its implementation in India
- Counterfeit / Spurious medicines
- Drug Testing Labs in India
- Overview of Pharma marketing practices
- Generic Medicines

Employability

BIOCHEMISTRY & CLINICAL PATHOLOGY – PRACTICAL

Course Code: ER20-23P

50 Hours (2 Hours/week)

Scope: This course is designed to train the students in the qualitative testing of various biomolecules and testing of biological samples for determination of normal and abnormal constituents

Course Objectives: This course will train and provide hands-on experiences on the following

- Qualitative determination of biomolecules / metabolites in simulated biological samples
- Determination of normal and abnormal constituents of simulated blood and urine samples

Course Outcomes: Upon successful completion of this course, the students will be able to

- Qualitatively determine the biomolecules / metabolites in the given biological samples
- Determine the normal and abnormal constituents in blood and urine samples and interpret the results of such testing

Practical's

- Qualitative analysis of carbohydrates (4 experiments)
- Qualitative analysis of Proteins and amino acids (4 experiments)
- Qualitative analysis of lipids (2 experiments)
- Qualitative analysis of urine for normal and abnormal constituents (4 experiments)
- Determination of constituents of urine (glucose, creatinine, chlorides) (2 experiments)
- Determination of constituents of blood/serum (simulated) (Creatine, glucose, cholesterol, Calcium, Urea, SGOT/SGPT) (5 experiments)
- Study the hydrolysis of starch from acid and salivary amylase enzyme (1 experiment)

Assignments

The students shall be asked to submit written assignments on Various Pathology Lab Reports (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

Employability

COMMUNITY PHARMACY AND MANAGEMENT – THEORY

Course Code: ER20-22T

75 Hours (3 Hours/week)

Scope: The course is designed to impart basic knowledge and skills to provide various pharmaceutical care services to patients and general practitioners in the community setup.

Course Objectives: This course will discuss the following:

- Establishing and running a community pharmacy and its legal requirements
- Professional aspects of handling and filling prescriptions
- Patient counselling on diseases, prescription and or non-prescription medicines
- Scope for performing basic health screening in community pharmacy settings

Course Outcomes: Upon successful completion of this course, the students will be able to

- Describe the establishment, legal requirements, and effective administration of a community pharmacy
- Professionally handle prescriptions and dispense medications
- Counsel patients about the disease, prescription and or non-prescription medicines
- Perform basic health screening on patients and interpret the reports in the community pharmacy settings

Chapter	Topic	Hours
1	Community Pharmacy Practice – Definition, history and development of community pharmacy - International and Indian scenarios	2
2	Professional responsibilities of community pharmacists Introduction to the concept of Good Pharmacy Practice and SOPs.	3
3	Prescription and prescription handling Definition, parts of prescriptions, legality of prescriptions, prescription handling, labelling of dispensed medications (Main label, ancillary label, pictograms), brief instructions on medication usage Dispensing process, Good Dispensing Practices, dispensing errors and strategies to minimize them	7

Entrepreneurship

4	Communication skills Definition, types of communication skills Interactions with professionals and patients Verbal communication skills (one-to-one, over the telephone) Written communication skills Body language Patient interview techniques	6
5	Patient counselling Definition and benefits of patient counselling Stages of patient counselling - Introduction, counselling content, counselling process, and closing the counselling session Barriers to effective counseling - Types and strategies to overcome the barriers Patient counselling points for chronic diseases/disorders - Hypertension, Diabetes, Asthma, Tuberculosis, Chronic obstructive pulmonary disease, and AIDS Patient Package Inserts - Definition, importance and benefits, Scenarios of PPI use in India and other countries Patient Information leaflets - Definition and uses	10
6	Medication Adherence Definition, factors influencing non-adherence, strategies to overcome non-adherence	2
	Health Screening Services in Community Pharmacy Introduction, scope, and importance of various health screening services - for routine monitoring of patients, early detection, and referral of undiagnosed cases	5

Entrepreneurship

9	Over The Counter (OTC) Medications Definition, need and role of Pharmacists in OTC medication dispensing OTC medications in India, counseling for OTC products Self-medication and role of pharmacists in promoting the safe practices during self-medication Responding to symptoms, minor ailments, and advice for self-care in conditions such as - Pain management, Cough, Cold, Diarrhea, Constipation, Vomiting, Fever, Sore throat, Skin disorders, Oral health (mouth ulcers, dental pain, gum swelling)	15
10	Community Pharmacy Management Legal requirements to set up a community pharmacy Site selection requirements Pharmacy designs and interiors Vendor selection and ordering Procurement, inventory control methods, and inventory management Financial planning and management Accountancy in community pharmacy – Day book, Cashbook Introduction to pharmacy operation softwares – usefulness and availability Customer Relation Management (CRM) Audits in Pharmacies SOP of Pharmacy Management Introduction to Digital Health, mHealth and Online pharmacies	25

COMMUNITY PHARMACY AND MANAGEMENT – PRACTICAL

Course Code: ER20-22P

75 Hours (3 Hours/week)

Scope: The course is designed to train the students and improve professional skills to provide various pharmaceutical care services in community pharmacy.

Course Objectives: This course will train the students in the following

- Professional handling and filling prescriptions
- Patient counselling on diseases and minor ailments
- Patient counselling on prescription and / or non-prescription medicines
- Preparation of counselling materials such as patient information leaflets
- Performing basic health screening tests

Course Outcomes: Upon successful completion of this course, the students will be able to

- Handle and fill prescriptions in a professional manner
- Counsel patients on various diseases and minor ailments
- Counsel patients on prescription and or non-prescription medicines
- Design and prepare patient information leaflets
- Perform basic health screening tests

Practicals

Note: The following practicals shall be carried out in the model community pharmacy with appropriate simulated scenarios and materials. Students shall be trained through role plays wherever necessary. The activities of the students shall be assessed / evaluated using a structured objective assessment form.

- Handling of prescriptions with professional standards, reviewing prescriptions, checking for legal compliance and completeness (minimum 5)
- Identification of drug-drug interactions in the prescription and follow-up actions (minimum 2)
- Preparation of dispensing labels and auxiliary labels for the prescribed medications (minimum 5)
- Providing the following health screening services for monitoring patients / detecting new patients (one experiment for each activity)

Blood Pressure Recording, Capillary Blood Glucose Monitoring, Lung function assessment using Peak Flow Meter and incentive spirometer, recording capillary oxygen level using Pulse Oximeter, BMI measurement

- Providing counselling to simulated patients for the following chronic diseases / disorders including education on the use of devices such as insulin pen, inhalers, spacers, nebulizers, etc. where appropriate (one experiment for each disease)
- Type 2 Diabetes Mellitus, Primary Hypertension, Asthma, Hyperlipidaemia, Rheumatoid Arthritis
- Providing counselling to simulated patients for the following minor ailments (any three)
- Headache, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhoea, constipation), Worm infestations, Pyrexia, Upper Respiratory Tract infections, Skin infections, Oral and dental disorders.
- Appropriate handling of dummy dosage forms with correct administration techniques - oral liquids with measuring cup/cap/dropper, Eye Drops, Inhalers, Nasal drops, Insulin pen, nebulizers, different types of tablets, patches, enemas, suppositories
- Use of Community Pharmacy Software and digital health tools

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

- SOPs for various activities in Community Pharmacy (as discussed in Theory and Practical)
- List out the various abbreviations, short forms used in prescriptions and their interpretation
- Patient Information Leaflet for a given chronic disease / disorder
- Patient Information Leaflet for prescription / non-prescription medicines
- Preparation of window / shelf display materials for the model community pharmacy
- Overview of Software available for retail pharmacy management including billing, inventory, etc.
- Dosage / Medication Reminder Aids
- Overview on the operations and marketing strategies of various online pharmacies
- Overview on the common fixed dose combinations
- Overview on the medications requiring special storage conditions
- Role of Community Pharmacists in preventing Antimicrobial Resistance
- Jan Aushadhi and other Generic Medicine initiatives in India
- Global Overview of Online Pharmacies
- Community Pharmacy Practice Standards: Global Vs. Indian Scenario
- Overview of pharmacy associations in India

BIOCHEMISTRY & CLINICAL PATHOLOGY – PRACTICAL

Course Code: ER20-23P

50 Hours (2 Hours/week) Scope: This

course is designed to train the students in the qualitative testing of various biomolecules and testing of biological samples for determination of normal and abnormal constituents

Course Objectives: This course will train and provide hands-on experiences on the following

- Qualitative determination of biomolecules / metabolites in simulated biological samples
- Determination of normal and abnormal constituents of simulated blood and urine samples

Course Outcomes: Upon successful completion of this course, the students will be able to

- Qualitatively determine the biomolecules / metabolites in the given biological samples
- Determine the normal and abnormal constituents in blood and urine samples and interpret the results of such testing

Practical's

- Qualitative analysis of carbohydrates (4 experiments)
- Qualitative analysis of Proteins and amino acids (4 experiments)
- Qualitative analysis of lipids (2 experiments)
- Qualitative analysis of urine for normal and abnormal constituents (4 experiments)
- Determination of constituents of urine (glucose, creatinine, chlorides) (2 experiments)
- Determination of constituents of blood/serum (simulated) (Creatine, glucose, cholesterol, Calcium, Urea, SGOT/SGPT) (5 experiments)
- Study the hydrolysis of starch from acid and salivary amylase enzyme (1 experiment)

Assignments

The students shall be asked to submit written assignments on Various Pathology Lab Reports (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student).

Entrepreneurship

PHARMACEUTICS – THEORY

Course Code: ER20-11T

75 Hours (3 Hours/week)

Scope: This course is designed to impart basic knowledge and skills on the art and science of formulating and dispensing different pharmaceutical dosage forms.

Course Objectives: This course will discuss the following aspects of pharmaceutical dosage forms

- Basic concepts, types and need
- Advantages and disadvantages, methods of preparation / formulation
- Packaging and labelling requirements
- Basic quality control tests, concepts of quality assurance and good
- manufacturing practices

Course Outcomes: Upon successful completion of this course, the students will be

- able to
- Describe about the different dosage forms and their formulation aspects
- Explain the advantages, disadvantages, and quality control tests of different
- dosage forms
- Discuss the importance of quality assurance and good manufacturing practices

CHAPTER	TOPICS	HOURS
1	• History of the profession of Pharmacy in India in relation to Pharmacy education, industry, pharmacy practice, and various professional associations. • Pharmacy as a career • Pharmacopoeia: Introduction to IP, BP, USP, NF and • Extra Pharmacopoeia. Salient features of Indian • Pharmacopoeia	7
2	Packaging materials: Types, selection criteria, advantages and disadvantages of glass, plastic, metal, rubber as packaging materials	5
3	Pharmaceutical aids: Organoleptic (Colouring, flavouring, and sweetening) agents Preservatives: Definition, types with examples and uses	3

 Skill Development

4	Unit operations: Definition, objectives/applications, principles, construction, and workings of: Size reduction: hammer mill and ball mill Size separation: Classification of powders according to IP, Cyclone separator, Sieves and standards of sieves Mixing: Double cone blender, Turbine mixer, Triple roller mill and Silverson mixer homogenizer Filtration: Theory of filtration, membrane filter and sintered glass filter Drying: working of fluidized bed dryer and process of freeze drying Extraction: Definition, Classification, method, and applications	9
5	Tablets – coated and uncoated, various modified tablets (sustained release, extended-release, fast dissolving, multi-layered, etc.) Capsules - hard and soft gelatine capsules Liquid oral preparations - solution, syrup, elixir, emulsion, suspension, dry powder for reconstitution Topical preparations - ointments, creams, pastes, gels, liniments and lotions, suppositories, and pessaries Nasal preparations, Ear preparations Powders and granules - Insufflations, dusting powders, effervescent powders, and effervescent granules Sterile formulations – Injectables, eye drops and eye Ointments Immunological products: Sera, vaccines, toxoids, and their manufacturing methods.	8
6	Basic structure, layout, sections, and activities of pharmaceutical manufacturing plants Quality control and quality assurance: Definition and concepts of quality control and quality assurance, current good manufacturing practice (cGMP), Introduction to the concept of calibration and validation	5
7	Novel drug delivery systems: Introduction, Classification with examples, advantages, and challenges	5

Skill Development

PHARMACEUTICAL CHEMISTRY – THEORY

Course Code: ER20-12T

75 Hours (3 Hours/week)

Scope: This course is designed to impart basic knowledge on the chemical structure, storage conditions and medicinal uses of organic and inorganic chemical substances used as drugs and pharmaceuticals. Also, this course discusses the impurities, quality control aspects of chemical substances used in pharmaceuticals.

Course Objectives: This course will discuss the following aspects of the chemical substances used as drugs and pharmaceuticals for various disease conditions

- Chemical classification, chemical name, chemical structure
- Pharmacological uses, doses, stability and storage conditions
- Different types of formulations / dosage form available and their brand names
- Impurity testing and basic quality control tests

Course Outcomes: Upon successful completion of this course, the students will be able to

- Describe the chemical class, structure and chemical name of the commonly used drugs and pharmaceuticals of both organic and inorganic nature
- Discuss the pharmacological uses, dosage regimen, stability issues and storage conditions of all such chemical substances commonly used as drugs
- Describe the quantitative and qualitative analysis, impurity testing of the chemical substances given in the official monographs. Identify the dosage form & the brand names of the drugs and pharmaceuticals popular in the marketplace

CHAPTER	TOPIC	HOURS
1	Introduction to Pharmaceutical chemistry: Scope and objectives Sources and types of errors: Accuracy, precision, significant figures Impurities in Pharmaceuticals: Source and effect of impurities in Pharmacopoeial substances, importance of limit test, Principle and procedures of Limit tests for chlorides, sulphates, iron, heavy metals and arsenic.	8
2	Volumetric analysis: Fundamentals of volumetric analysis, Acid-base titration, non-aqueous titration, precipitation titration, complexometric titration, redox titration Gravimetric analysis: Principle and method.	8

Skill Development

3	Inorganic Pharmaceuticals: Pharmaceutical formulations, market preparations, storage conditions and uses of • Haematinics: Ferrous sulphate, Ferrous fumarate, Ferric ammonium citrate, Ferrous ascorbate, Carbonyl iron • Gastro-intestinal Agents: Antacids :Aluminium hydroxide gel, Magnesium hydroxide, Magaldrate, Sodium bicarbonate, Calcium Carbonate, Acidifying agents, Adsorbents, Protectives, Cathartics • Topical agents: Silver Nitrate, Ionic Silver, Chlorhexidine Gluconate, Hydrogen peroxide, Boric acid, Bleaching powder, Potassium permanganate • Dental products: Calcium carbonate, Sodium fluoride, Denture cleaners, Denture adhesives, Mouth washes • Medicinal gases: Carbon dioxide, nitrous oxide, oxygen	7
4	Introduction to nomenclature of organic chemical systems with particular reference to heterocyclic compounds containing up to Three rings	2
Study of the following category of medicinal compounds with respect to classification, chemical name, chemical structure (compounds marked with*) uses, stability and storage conditions, different types of formulations and their popular brand names		
5	Drugs Acting on Central Nervous System • Anaesthetics: Thiopental Sodium*, Ketamine Hydrochloride*, Propofol • Sedatives and Hypnotics: Diazepam*, Alprazolam*, Nitrazepam, Phenobarbital* • Antipsychotics: Chlorpromazine Hydrochloride*, Haloperidol*, Risperidone*, Sulpiride*, Olanzapine, Quetiapine, Lurasidone • Anticonvulsants: Phenytoin*, Carbamazepine*, Clonazepam, Valproic Acid*, Gabapentin*, Topiramate, Vigabatrin, Lamotrigine • Anti-Depressants: Amitriptyline Hydrochloride*, Imipramine Hydrochloride*, Fluoxetine*, Venlafaxine, Duloxetine, Sertraline, Citalopram, Escitalopram, Fluvoxamine, Paroxetine	9
6	Drugs Acting on Autonomic Nervous System • Sympathomimetic Agents: Direct Acting: Nor- Epinephrine*, Epinephrine, Phenylephrine,	9

	Dopamine*, Terbutaline, Salbutamol (Albuterol), Naphazoline*, Tetrahydrozoline. Indirect Acting Agents: Hydroxy Amphetamine, Pseudoephedrine. Agents With Mixed Mechanism: Ephedrine, Metaraminol • Adrenergic Antagonists: Alpha Adrenergic Blockers: Tolazoline, Phentolamine • Phenoxybenzamine, Prazosin. Beta Adrenergic Blockers: Propranolol*, Atenolol*, Carvedilol • Cholinergic Drugs and Related Agents: Direct Acting Agents: Acetylcholine*, Carbachol, And Pilocarpine. Cholinesterase Inhibitors: Neostigmine*, Edrophonium Chloride, Tacrine Hydrochloride, Pralidoxime Chloride, Echothiopate Iodide • Cholinergic Blocking Agents: Atropine Sulphate*, Ipratropium Bromide Synthetic Cholinergic Blocking Agents: Tropicamide, Cyclopentolate Hydrochloride, Clidinium Bromide, Dicyclomine Hydrochloride*	
7	Drugs Acting on Cardiovascular System • Anti-Arrhythmic Drugs: Quinidine Sulphate, Procainamide Hydrochloride, Verapamil, Phenytoin Sodium*, Lidocaine Hydrochloride, Lorcaïnide Hydrochloride, Amiodarone and Sotalol • Anti-Hypertensive Agents: Propranolol*, Captopril*, Ramipril, Methyldopate Hydrochloride, Clonidine Hydrochloride, Hydralazine Hydrochloride, Nifedipine, • Antianginal Agents: Isosorbide Dinitrate	5
8	Diuretics: Acetazolamide, Frusemide*, Bumetanide, Chlorthalidone, Benzthiazide, Metolazone, Xipamide, Spironolactone	2
9	Hypoglycemic Agents: Insulin and Its Preparations, Metformin*, Glibenclamide*, Glimepiride, Pioglitazone, Repaglinide, Gliflozins, Gliptins	3
10	Analgesic And Anti-Inflammatory Agents: Morphine Analogues, Narcotic Antagonists; Nonsteroidal Anti- Inflammatory Agents (NSAIDs) - Aspirin*, Diclofenac, Ibuprofen*, Piroxicam, Celecoxib, Mefenamic Acid, Paracetamol*, Aceclofenac	3
11	Anti-Infective Agents • Antifungal Agents: Amphotericin-B, Griseofulvin, Miconazole, Ketoconazole*, Itraconazole, Fluconazole*, Naftifine Hydrochloride	8

	• Urinary Tract Anti-Infective Agents: Norfloxacin, Ciprofloxacin, Ofloxacin*, Moxifloxacin, • Anti-Tubercular Agents: INH*, Ethambutol, Para Amino Salicylic Acid, Pyrazinamide, Rifampicin, Bedaquiline, Delamanid, Pretomanid* • Antiviral Agents: Amantadine Hydrochloride, Idoxuridine, Acyclovir*, Foscarnet, Zidovudine, Ribavirin, Remdesivir, Favipiravir • Antimalarials: Quinine Sulphate, Chloroquine Phosphate*, Primaquine Phosphate, Mefloquine*, Cycloguanil, Pyrimethamine, Artemisinin • Sulfonamides: Sulfanilamide, Sulfadiazine, Sulfamethoxazole, Sulfacetamide*, Mafenide Acetate, Cotrimoxazole, Dapsone*	
12	Antibiotics: Penicillin G, Amoxicillin*, Cloxacillin, Streptomycin, Tetracyclines: Doxycycline, Minocycline, Macrolides: Erythromycin, Azithromycin, Miscellaneous: Chloramphenicol* Clindamycin	8
13	Anti-Neoplastic Agents: Cyclophosphamide*, Busulfan, Mercaptopurine, Fluorouracil*, Methotrexate, Dactinomycin, Doxorubicin Hydrochloride, Vinblastine Sulphate, Cisplatin*, Dromostanolone Propionate	3

Skill Development

PHARMACEUTICAL CHEMISTRY – PRACTICAL

Course Code: ER20-12P

75Hours(3 Hours/week)

Scope: This course is designed to impart basic training and hands-on experiences to synthesis chemical substances used as drugs and pharmaceuticals. Also, to perform the quality control tests, impurity testing, test for purity and systematic qualitative analysis of chemical substances used as drugs and pharmaceuticals.

Course Objectives: This course will provide the hands-on experience on the following aspects of chemical substances used as drugs and pharmaceuticals

- Limit tests and assays of selected chemical substances as per the monograph
- Volumetric analysis of the chemical substances
- Basics of preparatory chemistry and their analysis
- Systematic qualitative analysis for the identification of the chemical drugs

Course Outcomes: Upon successful completion of this course, the students will be able to

- Perform the limit tests for various inorganic elements and report
- Prepare standard solutions using the principles of volumetric analysis
- Test the purity of the selected inorganic and organic compounds against the monograph standards
- Synthesize the selected chemical substances as per the standard synthetic scheme
- Perform qualitative tests to systematically identify the unknown chemical substances

Practicals

S. NO.	EXPERIMENT
1	Limit test for • Chlorides; sulphate; Iron; heavy metals
2	Identification tests for Anions and Cations as per Indian Pharmacopoeia
3	Fundamentals of Volumetric analysis Preparation of standard solution and standardization of Sodium Hydroxide, Potassium Permanganate
4	Assay of the following compounds • Ferrous sulphate- by redox titration • Calcium gluconate-by complexometric • Sodium chloride-by Modified Volhard's method • Ascorbic acid by iodometry • Ibuprofen by alkalimetry
5	Fundamentals of preparative organic chemistry Determination of Melting point and boiling point of organic compounds
6	Preparation of organic compounds • Benzoic acid from Benzamide • Picric acid from Phenol

Skill Development

7	Identification and test for purity of pharmaceuticals Aspirin, Caffeine, Paracetamol, Sulfanilamide
8	Systematic Qualitative analysis experiments (4 substances)

Assignments

The students shall be asked to submit the written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

- Different monographs and formularies available and their major contents
- Significance of quality control and quality assurance in pharmaceutical industries
- Overview on Green Chemistry
- Various software programs available for computer aided drug discovery
- Various instrumentations used for characterization and quantification of drug

Skill Development

HUMAN ANATOMY AND PHYSIOLOGY – PRACTICAL

Course Code: ER20-14P

75 Hours (3 Hours/week)

Scope: This course is designed to train the students and instil the skills for carrying out basic physiological monitoring of various systems and functions.

Course Objectives: This course will provide hands-on experience in the following:

- General blood collection techniques and carrying out various haematological assessments and interpreting the results
- Recording and monitoring the vital physiological parameters in human subjects and the basic interpretations of the results
- Microscopic examinations of the various tissues permanently mounted in glass slides
- Discuss the anatomical and physiological characteristics of various organ systems of the body using models, charts, and other teaching aids

Course Outcomes:

Upon successful completion of this course, the students will be able to

- Perform the haematological tests in human subjects and interpret the results
- Record, monitor and document the vital physiological parameters of human subjects and interpret the results
- Describe the anatomical features of the important human tissues under the microscopical conditions
- Discuss the significance of various anatomical and physiological characteristics of the human body

Practicals

- Study of compound microscope
- General techniques for the collection of blood
- Microscopic examination of Epithelial tissue, Cardiac muscle, Smooth muscle, Skeletal muscle, Connective tissue, and Nervous tissue of ready / pre-prepared slides.
- Study of Human Skeleton-Axial skeleton and appendicular skeleton
- Determination of
- Blood group
- ESR
- Haemoglobin content of blood
- Bleeding time and Clotting time
- Determination of WBC count of blood
- Determination of RBC count of blood
- Determination of Differential count of blood
- Recording of Blood Pressure in various postures, different arms, before and after exertion and interpreting the results
- Recording of Body temperature (using mercury, digital and IR thermometers at various locations), Pulse rate/ Heart rate (at various locations in the body, before and after exertion), Respiratory Rate
- Recording Pulse Oxygen (before and after exertion)

- Recording force of air expelled using Peak Flow Meter
- Measurement of height, weight, and BMI
- Study of various systems and organs with the help of chart, models, and specimens
- Cardiovascular system
- Respiratory system
- Digestive system
- Urinary system
- Endocrine system
- Reproductive system
- Nervous system
- Eye
- Ear
- Skin



Skill Development

SOCIAL PHARMACY – PRACTICAL

Course Code: ER20-15P

75 Hours (3 Hours/week)

Scope: This course is designed to provide simulated experience in various public health and social pharmacy activities.

Course Objectives: This course will train the students on various roles of pharmacists in public health and social pharmacy activities in the following areas:

- National immunization programs
- Reproductive and child health programs
- Food and nutrition related health programs
- Health education and promotion
- General roles and responsibilities of the pharmacists in public health
- First Aid for various emergency conditions including basic life support and cardiopulmonary resuscitation

Course Outcomes: Upon successful completion of this course, the students will be able to

- Describe the roles and responsibilities of pharmacists in various National health programs
- Design promotional materials for public health awareness
- Describe various health hazards including microbial sources
- Advice on preventive measures for various diseases
- Provide first aid for various emergency conditions

Note: Demonstration / Hands-on experience / preparation of charts / models / promotional materials / role plays / enacting / e-brochures / e-flyers / podcasts / video podcasts / any other innovative activities to understand the concept of various elements of social pharmacy listed here. (At least one activity to be carried out for each one of the following):

Practicals

- National immunization schedule for children, adult vaccine schedule, Vaccines which are not included in the National Immunization Program.
- RCH – reproductive and child health – nutritional aspects, relevant national health programmes.
- Family planning devices
- Microscopical observation of different microbes (readymade slides)
- Oral Health and Hygiene
- Personal hygiene and etiquettes – hand washing techniques, Cough and sneeze etiquettes.
- Various types of masks, PPE gear, wearing/using them, and disposal.
- Menstrual hygiene, products used
- First Aid – Theory, basics, demonstration, hands on training, audio-visuals, and practice, BSL (Basic Life Support) Systems [SCA - Sudden Cardiac Arrest, FBAO - Foreign Body Airway Obstruction, CPR, Defibrillation (using AED) (Includes CPR techniques, First Responder)].
- Emergency treatment for all medical emergency cases viz. snake bite, dog bite, insecticide poisoning, fractures, burns, epilepsy etc.
- Role of Pharmacist in Disaster Management.
- Marketed preparations of disinfectants, antiseptics, fumigating agents, antilarval agents, mosquito repellents, etc.

- Health Communication: Audio / Video podcasts, Images, Power Point Slides, Short Films, etc. in regional language(s) for mass communication / education / Awareness on 5 different communicable diseases, their signs and symptoms, and prevention.
- Water purification techniques, use of water testing kit, calculation of Content/percentage of KMnO₄, bleaching powder to be used for wells/tanks
- Counselling children on junk foods, balanced diets – using Information, Education and Communication (IEC), counselling, etc. (Simulation Experiments).
- Preparation of various charts on nutrition, sources of various nutrients from Locally available foods, calculation of caloric needs of different groups (e.g. child, mother, sedentary lifestyle, etc.). Chart of glycemic index of foods.
- Tobacco cessation, counselling, identifying various tobacco containing products through charts/pictures

Assignment

The students shall be asked to submit the written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

- An overview of Women's Health Issues
- Study the labels of various packed foods to understand their nutritional contents
- Breastfeeding counselling, guidance – using Information, Education and Communication (IEC)
- Information about the organizations working on de-addiction services in the region (city / district, etc.)
- Role of a pharmacist in disaster management – A case study
- Overview on the National Tuberculosis Elimination Programme (NTEP)
- Drug disposal systems in the country, at industry level and citizen level
- Various Prebiotics or Probiotics (dietary and market products)
- Prepare poster/presentation for general public on any one of the Health Days. e.g. Day, AIDS Day, Handwashing Day, ORS day, World Diabetes Day, World Heart Day, etc.
- List of home medicines, their storage, safe handling, and disposal of unused medicines
- Responsible Use of Medicines: From Purchase to Disposal
- Collection of newspaper clips (minimum 5) relevant to any one topic and its submission in an organized form with collective summary based on the news items
- Read a minimum of one article relevant to any theory topic, from Pharma
- /Science/ or other Periodicals and prepare summary of it for submission
- Potential roles of pharmacists in rural India

Field Visits

The students shall be taken in groups to visit any THREE of the following facilities to witness and understand the activities of such centres/facilities from the perspectives of the topics discussed in theory and/or practical courses. Individual reports from each student on their learning experience from the field visits shall be submitted.

- Garbage Treatment Plant
- Sewage Treatment Plant
- Bio-medical Waste Treatment Plant
- Effluent Treatment Plant
- Water purification plant
- Orphanage / Elderly-Care-Home / School and or Hostel/Home for persons with disabilities
- Primary health care centre

COMMUNITY PHARMACY AND MANAGEMENT – THEORY

Course Code: ER20-22T

75 Hours (3 Hours/week)

Scope: The course is designed to impart basic knowledge and skills to provide various pharmaceutical care services to patients and general practitioners in the community setup.

Course Objectives: This course will discuss the following:

- Establishing and running a community pharmacy and its legal requirements
- Professional aspects of handling and filling prescriptions
- Patient counselling on diseases, prescription and or non-prescription medicines
- Scope for performing basic health screening in community pharmacy settings

Course Outcomes: Upon successful completion of this course, the students will be able to

- Describe the establishment, legal requirements, and effective administration of a community pharmacy
- Professionally handle prescriptions and dispense medications
- Counsel patients about the disease, prescription and or non-prescription medicines
- Perform basic health screening on patients and interpret the reports in the community pharmacy settings

CHAPTER	TOPIC	HOURS
1	Community Pharmacy Practice – Definition, history and development of community pharmacy - International and Indian scenarios	2
2	Professional responsibilities of community pharmacists Introduction to the concept of Good Pharmacy Practice and SOPs.	3
3	Prescription and prescription handling • Definition, parts of prescriptions, legality of prescriptions, prescription handling, labelling of dispensed medications (Main label, ancillary label, pictograms), brief instructions on medication usage • Dispensing process, Good Dispensing Practices, dispensing errors and strategies to minimize them	7
4	Communication skills • Definition, types of communication skills • Interactions with professionals and patients • Verbal communication skills (one-to-one, over the telephone) • Written communication skills • Body language • Patient interview techniques	6

Skill Development

5	Patient counselling • Definition and benefits of patient counselling • Stages of patient counselling - Introduction, counselling content, counselling process, and closing the counselling session • Barriers to effective counseling - Types and strategies to overcome the barriers • Patient counselling points for chronic diseases/disorders - Hypertension, Diabetes, Asthma, Tuberculosis, Chronic obstructive pulmonary disease, and AIDS • Patient Package Inserts - Definition, importance and benefits, Scenarios of PPI use in India and other countries • Patient Information leaflets - Definition and uses	10
6	Medication Adherence Definition, factors influencing non- adherence, strategies to overcome non-adherence	2
7	Health Screening Services in Community Pharmacy Introduction, scope, and importance of various health screening services - for routine monitoring of patients, early detection, and referral of undiagnosed cases	5
9	Over The Counter (OTC) Medications • Definition, need and role of Pharmacists in OTC medication dispensing • OTC medications in India, counseling for OTC products • Self-medication and role of pharmacists in promoting the safe practices during self-medication • Responding to symptoms, minor ailments, and advice for self-care in conditions such as - Pain management, Cough, Cold, Diarrhea, Constipation, Vomiting, Fever, Sore throat, Skin disorders, Oral health (mouth ulcers, dental pain, gum swelling)	15

10	Community Pharmacy Management • Legal requirements to set up a community pharmacy • Site selection requirements • Pharmacy designs and interiors • Vendor selection and ordering • Procurement, inventory control methods, and inventory management • Financial planning and management • Accountancy in community pharmacy – Day book, Cash book • Introduction to pharmacy operation softwares – usefulness and availability • Customer Relation Management (CRM) • Audits in Pharmacies • SOP of Pharmacy Management • Introduction to Digital Health, mHealth and Online pharmacies	25
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Skill Development

PHARMACY LAW AND ETHICS – THEORY

Course Code: ER20-26T

75 Hours (3 Hours/week)

Scope: This course is designed to impart basic knowledge on several important legislations related to the profession of pharmacy in India

Course Objectives: This course will discuss the following

- General perspectives, history, evolution of pharmacy law in India
- Act and Rules regulating the profession and practice of pharmacy in India
- Important code of ethical guidelines pertaining to various practice standards
- Brief introduction to the patent laws and their applications in pharmacy

Course Outcomes: Upon successful completion of this course, the students will be able to

- Describe the history and evolution of pharmacy law in India
- Interpret the act and rules regulating the profession and practice of pharmacy in India
- Discuss the various codes of ethics related to practice standards in pharmacy
- Interpret the fundamentals of patent laws from the perspectives of pharmacy

CHAPTER	TOPICS	HOURS
1	General Principles of Law, History and various Acts related to Drugs and Pharmacy profession	2
2	Pharmacy Act-1948 and Rules: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils, Registration of Pharmacists, Offences and Penalties. Pharmacy Practice Regulations 2015	5
3	Drugs and Cosmetics Act 1940 and Rules 1945 and New Amendments Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit.	23

Skill Development

	Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license. Study of schedule C and C1, G, H, H1, K, P, M, N, and X. Sale of Drugs – Wholesale, Retail sale and Restricted license, Records to be kept in a pharmacy Drugs Prohibited for manufacture and sale in India Administration of the Act and Rules – Drugs Technical Advisory Board, Central Drugs Laboratory, Drugs Consultative Committee, Government analysts, licensing authorities, controlling authorities, Drug Inspectors.	
4	Narcotic Drugs and Psychotropic Substances Act 1985 and Rules Objectives, Definitions, Authorities and Officers, Prohibition, Control and Regulation, Offences and Penalties.	2
5	Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties.	2
6	Prevention of Cruelty to Animals Act-1960: Objectives, Definitions, CPCSEA - brief overview, Institutional Animal Ethics Committee, Breeding and Stocking of Animals, Performance of Experiments, Transfer and Acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties.	2
7	Poisons Act-1919: Introduction, objective, definition, possession, possession for sales and sale of any poison, import of poisons	2
8	FSSAI (Food Safety and Standards Authority of India) Act and Rules: brief overview and aspects related to manufacture, storage, sale, and labelling of Food Supplements	2
9	National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO) - 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, Pharmaceutical Policy 2002, National List of Essential Medicines (NLEM)	5
10	Code of Pharmaceutical Ethics: Definition, ethical principles, ethical problem solving, registration, code of ethics for Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath.	5
11	Medical Termination of Pregnancy Act and Rules – basic understanding, salient features, and Amendments	2

12	Role of all the government pharma regulator bodies – Central Drugs Standards Control Organization (CDSCO), Indian Pharmacopoeia Commission (IPC)	1
13	Good Regulatory practices (documentation, licenses, renewals, e-governance) in Community Pharmacy, Hospital pharmacy, Pharma Manufacturing, Wholesale business, inspections, import, export of drugs and medical devices	3
14	Introduction to BCS system of classification, Basic concepts of Clinical Trials, ANDA, NDA, New Drug development, New Drugs and Clinical Trials Rules, 2019. Brand v/s Generic, Trade name concept, Introduction to Patent Law and Intellectual Property Rights, Emergency Use Authorization	7
15	Blood bank – basic requirements and functions	2
16	Clinical Establishment Act and Rules – Aspects related to Pharmacy	2
17	Biomedical Waste Management Rules 2016 – Basic aspects, and aspects related to pharma manufacture to disposal of pharma / medical waste at homes, pharmacies, and hospitals	2
18	Bioethics - Basic concepts, history and principles. Brief overview of ICMR's National Ethical Guidelines for Biomedical and Health Research involving human participants	2
19	Introduction to the Consumer Protection Act	1
20	Introduction to the Disaster Management Act	1
21	Medical Devices – Categorization, basic aspects related to manufacture and sale	2

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

- Requirements for Ayurvedic, Homeopathic manufacturing, sale, and licensing requirements
- Layout and contents of official websites of various agencies regulating the profession of pharmacy in India: e.g., CDSCO, SUGAM portal, PCI, etc.
- Licenses required, application processes (online/offline), drug regulatory office website of the respective state
- Case studies – actions taken on violation of any act / rule related to pharmacy
- Schedule H1 drugs and its implementation in India
- Counterfeit / Spurious medicines
- Drug Testing Labs in India
- Overview of Pharma marketing practices
- Generic Medicines

Skill Development

PHARMACOLOGY – PRACTICAL

Course Code: ER20-21P

50 Hours (2 Hours/week)

Scope: This course provides the basic understanding about the uses, mechanisms of actions, dose dependent responses of drugs in simulated virtual animal models and experimental conditions.

Course Objectives: This course will demonstrate / provide hands-on experience in the virtual platform using appropriate software on the following

- Study of pharmacological effects of drugs like local anaesthetics, mydriatic and mitotic on rabbit eye
- Screening the effects of various drugs acting in the central nervous system
- Study of drug effects on isolated organs / tissues
- Study of pyrogen testing on rabbit

Course Outcomes: Upon successful completion of this course, the students will be able to

- Study and report the local anaesthetic, mydriatic and mitotic effects of the given drug on the rabbit eye
- Choose appropriate animal experiment model to study the effects of the given drugs acting on the central nervous system and submit the report
- Perform the effects of given tissues (simulated) on isolated organs / tissues and interpret the results
- Interpret the dose dependent responses of drugs in various animal experiment models

Practicals

Introduction to the following topics pertaining to the experimental pharmacology have to be discussed and documented in the practical manuals.

- Introduction to experimental pharmacology
- Study of laboratory animals
- Mice; (b) Rats; (c) Guinea pigs; (d) Rabbits
- Commonly used instruments in experimental pharmacology
- Different routes of administration of drugs in animals
- Types of pre-clinical experiments: In-Vivo, In-Vitro, Ex-Vivo, etc.

Experiments

Note: Animals shall not be used for doing / demonstrating any of the experiments given. The given experiments shall be carried- out / demonstrated as the case may be, ONLY with the use of software program(s) such as 'Ex Pharm' or any other suitable software

- Study of local anaesthetics on rabbit eye
- Study of Mydriatic effect on rabbit eye
- Study of Miotic effect on rabbit eye
- Effect of analgesics using Analgesiometer
- Study of analgesic activity by writhing test
- Screening of anti-convulsant using Electro Convulsiometer
- Screening of Muscle relaxants using Rota-Rod apparatus
- Screening of CNS stimulants and depressants using Actophotometer
- Study of anxiolytic activity using elevated plus maze method
- Study of effect of drugs (any 2) on isolated heart

- Effect of drugs on ciliary motility on frog's buccal cavity
- Pyrogen testing by rabbit method

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

- Introduction to Allergy Testing
- Introduction to Toxicity Studies
- Drug Facts Labels of US FDA
- Pre-clinical studies in new drug development
- Medicines and meals: Before or After food
- Pre-clinical studies in new drug development
- Drugs available as paediatric formulations
- Drug information apps



Skill Development

COMMUNITY PHARMACY AND MANAGEMENT – PRACTICAL

Course Code: ER20-22P

75 Hours (3 Hours/week)

Scope: The course is designed to train the students and improve professional skills to provide various pharmaceutical care services in community pharmacy.

Course Objectives: This course will train the students in the following

- Professional handling and filling prescriptions
- Patient counselling on diseases and minor ailments
- Patient counselling on prescription and / or non-prescription medicines
- Preparation of counselling materials such as patient information leaflets
- Performing basic health screening tests

Course Outcomes: Upon successful completion of this course, the students will be able to

- Handle and fill prescriptions in a professional manner
- Counsel patients on various diseases and minor ailments
- Counsel patients on prescription and or non-prescription medicines
- Design and prepare patient information leaflets
- Perform basic health screening tests

Practicals

Note: The following practicals shall be carried out in the model community pharmacy with appropriate simulated scenarios and materials. Students shall be trained through role plays wherever necessary. The activities of the students shall be assessed / evaluated using a structured objective assessment form.

Handling of prescriptions with professional standards, reviewing prescriptions, checking for legal compliance and completeness (minimum 5)

- Identification of drug-drug interactions in the prescription and follow-up actions (minimum 2)
- Preparation of dispensing labels and auxiliary labels for the prescribed medications (minimum 5)
- Providing the following health screening services for monitoring patients / detecting new patients (one experiment for each activity)

Blood Pressure Recording, Capillary Blood Glucose Monitoring, Lung function assessment using Peak Flow Meter and incentive spirometer, recording capillary oxygen level using Pulse Oximeter, BMI measurement

- Providing counselling to simulated patients for the following chronic diseases / disorders including education on the use of devices such as insulin pen, inhalers, spacers, nebulizers, etc. where appropriate (one experiment for each disease)
- Type 2 Diabetes Mellitus, Primary Hypertension, Asthma, Hyperlipidaemia, Rheumatoid Arthritis
- Providing counselling to simulated patients for the following minor ailments (any three)
- Headache, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhoea, constipation), Worm infestations, Pyrexia, Upper Respiratory Tract infections, Skin infections, Oral and dental disorders.
- Appropriate handling of dummy dosage forms with correct administration techniques - oral liquids with measuring cup/cap/dropper, Eye Drops, Inhalers, Nasal drops, Insulin pen, nebulizers, different types of tablets, patches, enemas, suppositories
- Use of Community Pharmacy Software and digital health tools

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

- SOPs for various activities in Community Pharmacy (as discussed in Theory and Practical)
- List out the various abbreviations, short forms used in prescriptions and their interpretation
- Patient Information Leaflet for a given chronic disease / disorder
- Patient Information Leaflet for prescription / non-prescription medicines
- Preparation of window / shelf display materials for the model community pharmacy
- Overview of Software available for retail pharmacy management including billing, inventory, etc.
- Dosage / Medication Reminder Aids
- Overview on the operations and marketing strategies of various online pharmacies
- Overview on the common fixed dose combinations
- Overview on the medications requiring special storage conditions
- Role of Community Pharmacists in preventing Antimicrobial Resistance
- Jan Aushadhi and other Generic Medicine initiatives in India
- Global Overview of Online Pharmacies
- Community Pharmacy Practice Standards: Global Vs. Indian Scenario
- Overview of pharmacy associations in India