Guru Kashi University

Diploma in Pharmacy

Session: 2022-23

Department of Pharmacy

PROGRAMME LEARNING OUTCOMES

1. **Review Prescriptions:** The student should receive and handle prescriptions in a professional manner and be able to check for their completeness and correctness. Also, the prescribers should be contacted for any clarifications and corrections in the prescriptions with suggestions if any.
2. **Dispense Prescription / Non-Prescription Medicines:** The student should be able to dispense the various scheduled drugs / medicines as per the implications of the Drug & Cosmetics Act and Rules there under. Also, the non-prescription medicines (over-the-counter drugs) should be dispensed judicially to the patients as required.
3. **Provide Patient Counselling / Education:** The student should be able to effectively counsel / educate the patients / caretakers about the prescription / non- prescription medicines and other health related issues. Effective communication includes using both oral and written communication skills and various communication techniques.
4. **Hospital and Community Pharmacy Management:** The student should be able to manage the drug distribution system as per the policies and guidelines of the hospital pharmacy, good community pharmacy practice and the recommendations of regulatory agencies. Also, be able to manage the procurement, inventory, and distribution of medicines in hospital / community pharmacy settings.
5. **Expertise on Medications:** The student should be able to provide an expert opinion on medications to health care professionals on safe and effective medication-use, relevant policies and procedures based on available evidences.
6. **Proficiency on Pharmaceutical Formulations:** The student should be able to describe the chemistry, characteristics, types, merits and demerits of both drugs and excipients used in pharmaceutical formulations based on her/his knowledge and scientific resources.
7. **Entrepreneurship and Leadership:** The student should be able to acquire the entrepreneurial skills in the dynamic professional

environments. Also, be able to achieve leadership skills through teamwork and sound decision- making skills.

8. **Deliver Primary and Preventive Healthcare:** The student should be able to contribute to various healthcare programs of the nation including disease prevention initiatives to improve public health. Also contribute to the promotion of national healthpolicies.

9. **Professional, Ethical and Legal Practice:** The student should be able to deliver professional services in accordance with legal, ethical, and professional guidelines with integrity.

10. **Continuing Professional Development:** The student should be able to recognize the gaps in the knowledge and skills in the effective delivery of professional services from time to time and be self-motivated to bridge such gaps by attending continuing professional development programs.

Programme Structure

Year: I						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**No. of Credits**
ER20-11T	Pharmaceutics – Theory	Core Course	3	1	0	04
ER20-11P	Pharmaceutics –Practical	Technical Enhancement	0	0	4	02
ER20-12T	Pharmaceutical Chemistry – Theory	Core Course	3	1	0	04
ER20-12P	Pharmaceutical Chemistry Practical	Technical Enhancement	0	0	4	02
ER20-13T	Pharmacognosy –Theory	Core Course	3	1	0	04
ER20-13P	Pharmacognosy –Practical	Technical Enhancement	0	0	4	02
ER20-14T	Human Anatomy & Physiology —Theory	Core Course	3	1	0	04
ER20-14P	Human Anatomy &Physiology –Practical	Technical Enhancement	0	0	4	02
ER20-15T	Social Pharmacy –Theory	Core Course	3	1	0	04
ER20-15P	Social Pharmacy –Practical	Technical Enhancement	0	0	4	02
TOTAL			**15**	**5**	**15**	**30**

Year: II						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**No. of Credits**
ER20-21T	Pharmacology – Theory	Core Course	3	1	0	04
ER20-21P	Pharmacology – Practical	Technical Enhancement	0	0	2	01
ER20-22T	Community Pharmacy & Management — Theory	Core Course	3	1	0	04
ER20-22P	Community Pharmacy & Management — Practical	Technical Enhancement	0	0	4	02
ER20-23T	Biochemistry & Clinical Pathology – Theory	Core Course	3	1	0	04
ER20-23P	Biochemistry & Clinical Pathology – Practical	Technical Enhancement	0	0	2	01
ER20-24T	Pharmacotherapeutics – Theory	Core Course	3	1	0	04
ER20-24P	Pharmacotherapeutics – Practical	Technical Enhancement	0	0	2	01
ER20-25T	Hospital & Clinical Pharmacy – Theory	Core Course	3	1	0	04
ER20-25P	Hospital & Clinical Pharmacy – Practical	Technical Enhancement	0	0	2	01
ER20-26T	Pharmacy Law & Ethics	Core Course	3	1	0	04
TOTAL			**18**	**6**	**9**	**30**

Evaluation Criteria for Theory Courses

A. Mid Semester Test-1&2 : [20 Marks]
B. End-Term Exam: [80 Marks]

Evaluation Criteria for Practical Courses

A. INTERNAL : [20Marks]

B. Actual performance in the Mst1 and Mst2-: [10 Marks]

C. Assignment marks: 5 Marks

D. Field Visit Report marks: [5 Marks]

F. End-Term Exam: [80 Marks]

ACADEMIC INSTURCTIONS

Attendance Requirements

A student shall have to attend 75% of the scheduled periods in each course in a semester; otherwise, he / she shall not be allowed to appear in that course in the University examination and shall be detained in the course(s). The University may condone attendance shortage in special circumstances (as specified by the Guru Kashi University authorities). A student detained in the course(s) would be allowed to appear in the subsequent university examination(s) only on having completed the attendance in the program, when the program is offered in a regular semester(s) or otherwise as per the rules.

YEAR-I

Course Title: Pharmaceutics

Course Code: ER20-11T

L	T	P	Credits
3	1	0	4

Learning Outcomes: **Total : 75 Hours**

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

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

COURSE CONTENT

UNIT-I **7 hours**

- 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

UNIT-II **5 hours**

Packaging materials: Types, selection criteria, advantages and disadvantages of glass, plastic, metal, rubber as packaging materials

UNIT-III **3 hours**

Pharmaceutical aids: Organoleptic (Colouring, flavouring, and sweetening) agents

Preservatives: Definition, types with examples and uses

UNIT-IV **9 hours**

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 Siverson 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.

UNIT-V **41 hours**

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.

UNIT-VI **5 hours**

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

UNIT-VII **5 hours**

Novel drug delivery systems: Introduction, Classification with examples, advantages, and challenges

SUGGESTED READINGS: -

1. Luther I.S. and Passi I.B.S. (2007).*Algebra*, Vol.I& II, Narosa Publishing House, New Delhi.
2. Gallian J.A. (1999). *Contemporary Abstract Algebra*, Narosa Publishing House, New Delhi.

Course Title: Pharmaceutics

Course Code: ER20-11P

L	T	P	Credits
0	0	3	2

Total: 75 Hours

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

1. Calculate the working formula from the given master formula
2. Formulate the dosage form and dispense in an appropriate container
3. Design the label with the necessary product and patient information
4. 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 anddispensing 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 Gelatin Capsule:** Tetracycline capsules
   - **Tablet:** Paracetamol tablets
3. Formulation of at least five commonly used cosmetic preparations — e.g. coldcream, shampoo, lotion, toothpaste etc.
4. Demonstration on various stages of tablet manufacturing processes
5. Appropriate methods of usage and storage of all dosage forms including

specialdosage such as different types of inhalers, spacers, insulin pens

6. Demonstration of quality control tests and evaluation of common dosage formsviz. tablets, capsules, emulsion, and sterile injections as per the monographs.

Course Title: Pharmaceutical Chemistry

Course Code: ER20-12T

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes: Upon successful completion of this course, the students will beable to

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

UNIT-I **8 hours**

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.

UNIT-II **8 hours**

Volumetric analysis: Fundamentals of volumetric analysis, Acid-base titration, non-aqueous titration, precipitation titration, complexometric titration, redox titration

Gravimetric analysis: Principle and method.

UNIT-III **7 hours**

Inorganic Pharmaceuticals: Pharmaceuticalformulations, market preparations, storage conditions anduses 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

UNIT-IV **2 hours**

Introduction to nomenclature of organic chemical systems with particular reference to heterocyclic compounds containing up to three rings

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

UNIT-V **2 hours**

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

UNIT-VI **9 hours**

Drugs Acting on Autonomic Nervous System

- **Sympathomimetic Agents:** ***Direct Acting:*** Nor-Epinephrine*,Epinephrine, Phenylephrine, 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*

UNIT-VII **5 hours**

Drugs Acting on Cardiovascular System

- **Anti-Arrhythmic Drugs**: Quinidine Sulphate,Procainamide Hydrochloride, Verapamil, Phenytoin Sodium*, Lidocaine Hydrochloride, Lorcainide Hydrochloride, Amiodarone and Sotalol
- **Anti-Hypertensive Agents**: Propranolol*, Captopril*,Ramipril, Methyldopate Hydrochloride, Clonidine Hydrochloride, Hydralazine Hydrochloride, Nifedipine,
- **Antianginal Agents**: Isosorbide Dinitrate

UNIT-VIII **2 hours**

Diuretics: Acetazolamide, Frusemide*, Bumetanide, Chlorthalidone, Benzthiazide, Metolazone, Xipamide, Spironolactone

UNIT-IX **3 hours**

Hypoglycemic Agents: Insulin and Its Preparations,Metformin*, Glibenclamide*,Glimepiride,Pioglitazone, Repaglinide, Gliflozins, Gliptins

UNIT-X **3 hours**

Analgesic And Anti-Inflammatory Agents: Morphine Analogues, Narcotic Antagonists; ***Nonsteroidal Anti- Inflammatory Agents (NSAIDs)*** - Aspirin*, Diclofenac, Ibuprofen*, Piroxicam, Celecoxib, Mefenamic Acid, Paracetamol*, Aceclofenac

UNIT-XI **8 hours**

Anti-Infective Agents

- **Antifungal Agents:** Amphotericin-B, Griseofulvin, Miconazole, Ketoconazole*, Itraconazole, Fluconazole*, Naftifine Hydrochloride
- **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*

UNIT-XII **8 hours**

- **Antibiotics:** Penicillin G, Amoxicillin*, Cloxacillin, Streptomycin,
- **Tetracyclines*:*** Doxycycline, Minocycline,
- **Macrolides:** Erythromycin, Azithromycin,
- **Miscellaneous*:*** Chloramphenicol*Clindamycin

UNIT-XIII **8 hours**

Anti-Neoplastic Agents: Cyclophosphamide*, Busulfan, Mercaptopurine, Fluorouracil*, Methotrexate, Dactinomycin, Doxorubicin Hydrochloride, Vinblastine Sulphate, Cisplatin*, Dromostanolone Propionate.

Course Title: Pharmaceutical Chemistry

Course Code: ER20-12P

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes:

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

1. Perform the limit tests for various inorganic elements and report
2. Prepare standard solutions using the principles of volumetric analysis
3. Test the purity of the selected inorganic and organic compounds against themonograph standards
4. Synthesize the selected chemical substances as per the standard syntheticscheme
5. Perform qualitative tests to systematically identify the unknown chemicalsubstances

Practicals

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 ofSodiumHydroxide, Potassium Permanganate
4. **Assay of the following compound**

   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
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)

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

Course Title: Pharmacognosy

Course Code: ER20-13T

L	T	P	Credits
3	1	0	4

Total: 75 Hours

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

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

UNIT-I **2 Hours**

Definition, history, present status and scope of Pharmacognosy

UNIT-II **4 Hours**

Classification of drugs:

- Alphabetical
- Taxonomical
- Morphological
- Pharmacological
- Chemical
- Chemo-taxonomical

UNIT-III **6 Hours**

Quality control of crude drugs:

Different methods of adulteration of crude drugs Evaluation of crude drugs

UNIT-IV **6 Hours**

Brief outline of occurrence, distribution, isolation,identification tests, therapeutic activity and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.

UNIT-V **30 Hours**

Biological source, chemical constituents and therapeutic efficacy of the Following categories of crude drugs.

- Laxative - Aloe, Castor oil, Ispaghula, Senna
- Cardiotonic - Digitalis, Arjuna

- Carminatives and G.I. regulators - Coriander, Fennel, Cardamom,

Ginger, Clove, Black Pepper, Asafoetida, 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

UNIT-VI **3 Hours**

Plant fibres used as surgical dressings: Cotton, silk, wooland regenerated fibres

Sutures – Surgical Catgut and Ligatures.

UNIT-VII **8 Hours**

- **Basic principles involved in the traditional systems ofmedicine like:** Ayurveda, Siddha, Unani and Homeopathy
- **Method of preparation of Ayurvedic formulations like:**

  Arista, Asava, Gutika, Taila, Churna, Lehya and Bhasma

UNIT-VIII **2 Hours**

Role of medicinal and aromatic plants in national economy and their export potential

UNIT-IX **4 Hours**

Herbs as health food:

Brief introduction and therapeutic applications of: Nutraceuticals, Antioxidants, Pro-biotics, Pre-biotics, Dietaryfibres, Omega-3-fatty acids, Spirulina, Carotenoids, Soya and Garlic

UNIT-X **4 Hours**

Introduction to herbal formulations

UNIT-XI **4 Hours**

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

UNIT-XII **2 Hours**

Phytochemical investigation of drugs

Course Title: Pharmacognosy

Course Code: ER20-13P

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

1. Identify the given crude drugs based on the morphological characteristics
2. Take a transverse section of the given crude drugs
3. Describe the anatomical characteristics of the given crude drug under microscopical conditions
4. Carry out the physical and chemical tests to evaluate the given crude drugs.

Practicals

1. Morphological Identification of the following drugs:

Ispaghula, Senna, Coriander, Fennel, Cardamom, Ginger, Nutmeg, Black Pepper, Cinnamon, Clove, Ephedra, Rauwolfia, Gokhru, Punarnava, Cinchona, Agar.

2. Gross anatomical studies (Transverse Section) of the following drugs:

Ajwain, Datura, Cinnamon, Cinchona, Coriander, Ashwagandha, Liquorice, Clove, Curcuma, Nux vomica, Vasaka

3. Physical and chemical tests for evaluation of any FIVE of the following drugs:

Asafoetida, Benzoin, Pale catechu, Black catechu, Castor oil, Acacia, Tragacanth, Agar, Guar gum, Gelatine.

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)

1. Market preparations of various dosage forms of Ayurvedic, Unani, Siddha, Homeopathic (Classical and Proprietary), indications, and their labelling requirements
2. Market preparations of various herbal formulations and herbal cosmetics, indications, and their labelling requirements
3. Herb-Drug interactions documented in the literature and their clinical

significances

Field Visit

The students shall be taken in groups to a medicinal garden to witness and understand the nature of various medicinal plants discussed in theory and practical courses. Additionally, they shall be taken in groups to the pharmacies of traditional systems of medicines to understand the availability of various dosage forms and their labelling requirements. Individual reports from each student on their learning experience from the field visit shall be submitted

Course Title: Human Anatomy and Physiology

Course Code: ERP20-14T

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

1. Describe the various organ systems of the human body
2. Discuss the anatomical features of the important human organs and tissues
3. Explain the homeostatic mechanisms regulating the normal physiology in thehuman system
4. Discuss the significance of various vital physiological parameters of thehuman body

UNIT- I **2 Hours**

Scope of Anatomy and Physiology Definition of various terminologies

UNIT- II **2 Hours**

Structure of Cell: Components and its functions

UNIT-III **4 Hours**

Tissues ofthe human body: Epithelial, Connective, Muscula and Nervous tissues their sub-types and characteristics.

UNIT-IV **Osseous system** **6 Hours**

Structure and functions of bones of axial and appendicular skeleton

Classification, types and movements of joints, disorders of joints

UNIT- V **Haemopoietic system** **8 Hours**

- Composition and functions of blood
- Process of Hemopoiesis
- Characteristics and functions of RBCs, WBCs, and platelets
- Mechanism of Blood Clotting
- Importance of Blood groups

UNIT- VI **Lymphatic system** **3 Hours**

- Lymph and lymphatic system, composition, function andits formation.
- Structure and functions of spleen and lymph node.

UNIT- VII **Cardiovascular system** **8 Hours**

- Anatomy and Physiology of heart
- Blood vessels and circulation (Pulmonary, coronary andsystemic circulation)
- Cardiac cycle and Heart sounds, Basics of ECG
- Blood pressure and its regulation

UNIT- VIII **Respiratory system** **4 Hours**

- Anatomy of respiratory organs and their functions.
- Regulation, and Mechanism of respiration.
- Respiratory volumes and capacities – definitions

UNIT- IX **Digestive system** **8 Hours**

- Anatomy and Physiology of the GIT
- Anatomy and functions of accessory glands
- Physiology of digestion and absorption

UNIT-X **Skeletal muscles** **2 Hours**

- Histology
- Physiology of muscle contraction
- Disorder of skeletal muscles

UNIT XI **Nervous system** **8 Hours**

- Classification of nervous system
- Anatomy and physiology of cerebrum, cerebellum, midbrain
- Function of hypothalamus, medulla oblongata and basalganglia
- Spinal cord-structure and reflexes
- Names and functions of cranial nerves.
- Anatomy and physiology of sympathetic andparasympathetic nervous system (ANS)

UNIT-XII **Sense organs - Anatomy and physiology of** **6 Hours**

- Eye
- Ear
- Skin
- Tongue
- Nose

Course Title: Human Anatomy and Physiology

Course Code: ER20-14P

L	T	P	Credits
0	0	3	2

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

1. Perform the hematological tests in human subjects and interpret the results
2. Record, monitor and document the vital physiological parameters of humansubjects and interpret the results
3. Describe the anatomical features of the important human tissues under themicroscopical conditions
4. Discuss the significance of various anatomical and physiological characteristics of the human body

Practicals

1. Study of compound microscope
2. General techniques for the collection of blood
3. Microscopic examination of epithelial tissue, Cardiac muscle, Smooth muscle, Skeletal muscle, Connective tissue, and Nervous tissue of ready / pre-prepared slides.
4. Study of Human Skeleton-Axial skeleton and appendicular skeleton
5. Determination of
    a. Blood group
    b. ESR
    c. Haemoglobin content of blood
    d. Bleeding time and Clotting time
6. Determination of WBC count of blood
7. Determination of RBC count of blood
8. Determination of Differential count of blood
9. Recording of Blood Pressure in various postures, different arms, before and after exertion and interpreting the results
10. 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

11. Recording Pulse Oxygen (before and after exertion)
12. Recording force of air expelled using Peak Flow Meter
13. Measurement of height, weight, and BMI
14. Study of various systems and organs with the help of chart, models, and specimens

    a) Cardiovascular system
    b) Respiratory system
    c) Digestive system
    d) Urinary system
    e) Endocrine system
    f) Reproductive system
    g) Nervous system
    h) Eye
    i) Ear
    j) Skin

Course Title: Social Pharmacy

Course Code: ERP20-15T

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable 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

UNIT-I **9 Hours**

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, NationalHealth Mission (2)
- Introduction to Millennium Development Goals, Sustainable Development Goals, FIP DevelopmentGoals (1)

UNIT-II **18 Hours**

Preventive healthcare – Role of Pharmacists in thefollowing

- Demography and Family Planning (3)
- Mother and child health, importance of breastfeeding, illeffects 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, and tobacco products. Social Impact of these habits on social health and Productivity and suicidal behaviors (2)

UNIT-III **10 Hours**

Nutrition and Health

- Basics of nutrition – Macronutrients and Micronutrients (3)
- Importance of water and fibers 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, geneticallymodified foods (1)
- Dietary supplements, nutraceuticals, food supplements Indications, benefits, Drug-Food Interactions (2)

UNIT-IV **28 Hours**

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) 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)

UNIT-V **8 Hours**

Introduction to health systems and all ongoing NationalHealth programs in India, their objectives, functioning, outcome, and the role of pharmacists.

UNIT-VI **2 Hours**

Pharmacoeconomics – Introduction, basic terminologies, importance of pharmacoeconomics

Course Title: Social Pharmacy

Course Code: ERP2O-15P

L	T	P	Credits
0	0	3	2

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

1. Describe the roles and responsibilities of pharmacists in various Nationalhealth programs
2. Design promotional materials for public health awareness
3. Describe various health hazards including microbial sources
4. Advice on preventive measures for various diseases
5. Provide first aid for various emergency conditions

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, NationalHealth Mission (2)
- Introduction to Millennium Development Goals, Sustainable Development Goals, FIP DevelopmentGoals (1)

Practical

1. National immunization schedule for children, adult vaccine schedule, Vaccineswhich are not included in the National Immunization Program.
2. RCH – reproductive and child health – nutritional aspects, relevant nationalhealth programmes.
3. Family planning devices
4. Microscopical observation of different microbes (readymade slides)
5. Oral Health and Hygiene
6. Personal hygiene and etiquettes — hand washing techniques, Cough andsneeze etiquettes.

7. Various types of masks, PPE gear, wearing/using them, and disposal.
8. Menstrual hygiene, products used
9. 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).
10. Emergency treatment for all medical emergency cases viz. snake bite, dog bite, insecticide poisoning, fractures, burns, epilepsy etc.
11. Role of Pharmacist in Disaster Management.
12. Marketed preparations of disinfectants, antiseptics, fumigating agents, antilarval agents, mosquito repellents, etc.
13. 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.
14. Water purification techniques, use of water testing kit, calculation of Content/percentage of KMnO4, bleaching powder to be used for wells/tanks
15. Counselling children on junk foods, balanced diets — using Information, Education and Communication (IEC), counselling, etc. (Simulation Experiments).
16. 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.
17. 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)

1. An overview of Women's Health Issues

2. Study the labels of various packed foods to understand their nutritionalcontents
3. Breastfeeding counselling, guidance – using Information, Education andCommunication (IEC)
4. Information about the organizations working on de-addiction services in theregion (city / district, etc.)
5. Role of a pharmacist in disaster management – A case study
6. Overview on the National Tuberculosis Elimination Programme (NTEP)
7. Drug disposal systems in the country, at industry level and citizen level
8. Various Prebiotics or Probiotics (dietary and market products)
9. Emergency preparedness: Study of local Government structure with respect to Fire, Police departments, health department
10. 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.
11. List of home medicines, their storage, safe handling, and disposal of unused medicines.
12. Responsible Use of Medicines: From Purchase to Disposal
13. 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.
14. Read a minimum of one article relevant to any theory topic, from Pharma/Science/ or other Periodicals and prepare summary of it for submission.
15. 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 centers/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.

1. Garbage Treatment Plant
2. Sewage Treatment Plant

3. Bio-medical Waste Treatment Plant
4. Effluent Treatment Plant
5. Water purification plant
6. Orphanage / Elderly-Care-Home / School and or Hostel/Home for persons withdisabilities
7. Primary health care center

YEAR- II

Course Title: Pharmacology

Course Code: ER20-21T

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes: Upon successful completion of this course, the students will beable to

1. Describe the basic concepts of pharmacokinetics and pharmacodynamics
2. Enlist the various classes and drugs of choices for any given disease condition
3. Advice the dosage regimen, route of administration and contraindications for agiven drug
4. Describe the common adverse drug reactions

UNIT-I General Pharmacology 10 Hours

- Introduction and scope of Pharmacology
- Various routes of drug administration - advantages anddisadvantages
- Drug absorption - definition, types, factors affecting drug absorption
- Bioavailability and the factors affecting bioavailability
- Drug distribution - definition, factors affecting drug distribution
- Biotransformation of drugs - Definition, types of biotransformation reactions, factors influencing drug metabolisms
- Excretion of drugs - Definition, routes of drug excretion General mechanisms of drug action and factors modifying drug action

UNIT-II Drugs Acting on the Peripheral Nervous System 11 Hours

- Steps involved in neurohumoral transmission
- Definition, classification, pharmacological actions, dose,indications, and contraindications of
    a) Cholinergic drugs
    b) Anti-Cholinergic drugs

c) Adrenergic drugs
d) Anti-adrenergic drugs
e) Neuromuscular blocking agents
f) Drugs used in Myasthenia gravis
g) Local anesthetic agents
h) Non-Steroidal Anti-Inflammatory drugs(NSAIDs)

UNIT-III Drugs Acting on the Eye 2 Hours

Definition, classification, pharmacological actions, dose,indications and contraindications of

- Miotics
- Mydriatics
- Drugs used in Glaucoma

UNIT-IV Drugs Acting on the Central Nervous System 8 Hours

Definition, classification, pharmacological actions, dose,indications, and contraindications of

- General anaesthetics
- Hypnotics and sedatives
- Anti-Convulsant drugs
- Anti-anxiety drugs
- Anti-depressant drugs
- Anti-psychotics
- Nootropic agents
- Centrally acting muscle relaxants
- Opioid analgesics

UNIT-V Drugs Acting on the Cardiovascular System 6 Hours

Definition, classification pharmacological actions, dose,indications,and contraindications of

- Anti-hypertensive drugs
- Anti-anginal drugs

- Anti-arrhythmic drugs
- Drugs used in atherosclerosis and
- Congestive heart failure
- Drug therapy for shock

UNIT-VI Drugs Acting on Blood and Blood Forming Organs 4 Hours

Definition, classification, pharmacological actions, dose,indications, and contraindications of

- Hematinic agents
- Anti-coagulants
- Anti-platelet agents
- Thrombolytic drugs

UNIT-VII Drugs Acting on Respiratory system 2 Hours

Definition, classification, pharmacological actions, dose,indications, and contraindications of

- Bronchodilators
- Expectorants
- Anti-tussive agents
- Mucolytic agents

UNIT-VIII Drugs Acting on the Gastro Intestinal Tract 5 Hours

Definition, classification, pharmacological actions, dose,indications, and contraindications of

- Anti-ulcer drugs
- Anti-emetics
- Laxatives and purgatives
- Anti-diarrheal drugs

UNIT-IX Drugs Acting on the Kidney 2 Hours

Definition, classification, pharmacological actions, dose,indications, and

contraindications of

- Diuretics
- Anti-Diuretics

UNIT-X Hormones and Hormone Antagonists 8 Hours

Physiological and pathological role and clinical uses of

- Thyroid hormones
- Anti-thyroid drugs
- Parathormone
- Calcitonin
- Vitamin D
- Insulin
- Oral hypoglycemic agents
- Estrogen
- Progesterone
- Oxytocin
- Corticosteroids

UNIT-XI Autocoids 3 Hours

- Physiological role of Histamine, 5 HT and Prostaglandins
- Classification, clinical uses, and adverse effects of Antihistamines and 5 HT antagonists

UNIT-XII Chemotherapeutic Agents 12 Hours

Introduction, basic principles of chemotherapy of infections, infestations and neoplastic diseases, Classification, dose, indication and contraindications of drugs belonging to following classes:

- Penicillin
- Cephalosporin
- Aminoglycosides
- Fluoroquinolones
- Macrolides
- Tetracycline
- Sulphonamides

- Anti-tubercular drugs
- Anti-fungal drugs
- Anti-viral drugs
- Anti-amoebic agents
- Anthelmintic
- Anti-malarial agents
- Anti-neoplastic agents

UNIT-XIII Biologicals 2 Hours

Definition, types, and indications of biological agents withexamples

Course Title: Pharmacology

Course Code: ER20-21P

L	T	P	Credits
3	1	0	4

Total: 50 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

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

Practicals

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

1. Introduction to experimental pharmacology
2. Study of laboratory animals Mice; Rats; Guinea pigs; Rabbits
3. Commonly used instruments in experimental pharmacology
4. Different routes of administration of drugs in animals
5. Types of pre-clinical experiments: In-Vivo, In-Vitro, Ex-Vivo, etc.
6. Techniques of blood collection from animals 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

1. Study of local anaesthetics on rabbit eye
2. Study of Mydriatic effect on rabbit eye
3. Study of Miotic effect on rabbit eye
4. Effect of analgesics using Analgesiometer

5. Study of analgesic activity by writhing test
6. Screening of anti-Convulsant using Electro Convulsiometer
7. Screening of Muscle relaxants using Rota-Rod apparatus
8. Screening of CNS stimulants and depressants using Actophotometer
9. Study of anxiolytic activity using elevated plus maze method
10. Study of effect of drugs (any 2) on isolated heart
11. Effect of drugs on ciliary motility on frog's buccal cavity
12. 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)

1. Introduction to Allergy Testing
2. Introduction to Toxicity Studies
3. Drug Facts Labels of US FDA
4. Pre-clinical studies in new drug development
5. Medicines and meals: Before or After food
6. Pre-clinical studies in new drug development
7. Drugs available as paediatric formulations
8. Drug information apps

Course Title: Community Pharmacy and Management

Course Code: ER20-22T

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

1. Describe the establishment, legal requirements, and effective administrationof a community pharmacy
2. Professionally handle prescriptions and dispense medications
3. Counsel patients about the disease, prescription and or non-prescriptionmedicines
4. Perform basic health screening on patients and interpret the reports in thecommunity pharmacy settings

UNIT-I **2 Hours**

Community Pharmacy Practice — Definition, history anddevelopment of community pharmacy - International and Indian scenarios

UNIT-II **3 Hours**

Professional responsibilities of community pharmacists Introduction to the concept of Good Pharmacy Practice andSOPs.

UNIT-III **7 Hours**

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

UNIT-IV **6 Hours**

Communication skills

- Definition, types of communication skills
- Interactions with professionals and patients
- Verbal communication skills (one-to-one, over thetelephone)
- Written communication skills
- Body language
- Patient interview techniques

UNIT-V **10 Hours**

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 chronicdiseases/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

UNIT-VI **2 Hours**

Medication Adherence

Definition, factors influencing non- adherence, strategies toovercome non-adherence

UNIT-VII **5 Hours**

Health Screening Services in Community Pharmacy Introduction, scope, and importance of various health screeningservices - for routine monitoring of patients, early detection, and referral of undiagnosed cases

UNIT-VIII **15 Hours**

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)

UNIT-IX **25 Hours**

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 inventorymanagement
- Financial planning and management
- Accountancy in community pharmacy – Day book, Cashbook
- Introduction to pharmacy operation software – usefulnessand availability
- Customer Relation Management (CRM)
- Audits in Pharmacies
- SOP of Pharmacy Management Introduction to Digital Health, mHealth and Online pharmacies

Course Title: Community Pharmacy and Management

Course Code: ER20-22P

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

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

Practicals

Note: The following practicals shall be carried out in the model community pharmacywith 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.

1. Handling of prescriptions with professional standards, reviewing prescriptions,checking for legal compliance and completeness (minimum 5)
2. Identification of drug-drug interactions in the prescription and follow-up actions(minimum 2)
3. Preparation of dispensing labels and auxiliary labels for the prescribedmedications (minimum 5)
4. 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
5. 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,Hyperlipidemia, Rheumatoid Arthritis

6. Providing counselling to simulated patients for the following minor ailments (any three) Headache, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea, constipation), Worm infestations, Pyrexia, Upper Respiratory Tract infections, Skin infections, Oral and dental disorders.
7. 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
8. 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)

1. SOPs for various activities in Community Pharmacy (as discussed in Theory and Practical)
2. List out the various abbreviations, short forms used in prescriptions and theirinterpretation
3. Patient Information Leaflet for a given chronic disease / disorder
4. Patient Information Leaflet for prescription / non-prescription medicines
5. Preparation of window / shelf display materials for the model communitypharmacy
6. Overview of Software available for retail pharmacy management includingbilling, inventory, etc.
7. Dosage / Medication Reminder Aids
8. Overview on the operations and marketing strategies of various online pharmacies
9. Overview on the common fixed dose combinations
10. Overview on the medications requiring special storage conditions
11. Role of Community Pharmacists in preventing Antimicrobial Resistance
12. Jan Aushadhi and other Generic Medicine initiatives in India

13. Global Overview of Online Pharmacies
14. Community Pharmacy Practice Standards: Global Vs. Indian Scenario

Overview of pharmacy associations in India

Field Visit

The students shall be taken in groups to visit community pharmacies and medicine distributors to understand and witness the professional activities of the community pharmacists, and supply chain logistics. Individual reports from each student on their learning experience from the field visit shall be submitted.

Course Title: Biochemistry and Clinical Pathology

Course Code: ER20-23T

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

1. Describe the functions of biomolecules
2. Discuss the various functions of enzymes in the human system
3. Explain the metabolic pathways of biomolecules in both physiological andpathological conditions
4. Describe the principles of organ function tests and their clinical significances
5. Determine the biomolecules / metabolites in the given biological samples,both qualitatively and quantitatively
6. Describe the clinical pathology of blood and urine

UNIT-I Introduction to Biochemistry 2 Hours

Scope of biochemistry in Pharmacy; Cell and its biochemical organization.

UNIT-II Carbohydrates 5 Hours

- Definition, classification with examples, chemicalproperties
- Monosaccharides - Structure of glucose, fructose, andgalactose
- Disaccharides - structure of maltose, lactose, andsucrose
- Polysaccharides - chemical nature of starch andglycogen Qualitative tests and biological role of carbohydrates

UNIT-III Proteins 5 Hours

- Definition, classification of proteins based on composition and solubility with examples
- Definition, classification of amino acids based on chemical nature and nutritional requirements withexamples
- Structure of proteins (four levels of organization of protein structure)
- Qualitative tests and biological role of proteins and amino acids

UNIT-IV Lipids 5 Hours

- Definition, classification with examples.
- Structure and properties of triglycerides (oils and fats).

- Fatty acid classification – Based on chemical and nutritional requirements with examples Structure and functions of cholesterol in the body
- Lipoproteins - types, composition and functions in thebody Qualitative tests and functions of lipids Diseases related to malnutrition of proteins.

UNIT-V Nucleic acids 4 Hours

Definition, purine and pyrimidine bases

- Components of nucleosides and nucleotides withexamples
- Structure of DNA (Watson and Crick model), RNA and their functions

UNIT-VI Enzymes 5 Hours

- Definition, properties and IUB and MB classification.
- Factors affecting enzyme activity.
- Mechanism of action of enzymes, Enzyme inhibitors Therapeutic and pharmaceutical importance of enzymes.

UNIT-VII Vitamins 6 Hours

- Definition and classification with examples Sources, chemical nature, functions, coenzyme form, recommended dietary requirements, deficiency diseases of fat-and water-soluble vitamins.

UNIT-VIII Metabolism 20 Hours

(Study of cycle/pathways without chemicalstructures)

- Metabolism of Carbohydrates: Glycolysis, TCA cycle and glycogen metabolism, regulation of blood glucose level. Diseases related to abnormal metabolism of Carbohydrates
- Metabolism of lipids: Lipolysis, β-oxidation of Fatty acid (Palmitic acid) ketogenesis and ketolysis. Diseases related to abnormal metabolism of lipids such as Ketoacidosis, Fatty liver, Hypercholesterolemia
- Metabolism of Amino acids (Proteins): General reactions of amino acids and its significance– Transamination, deamination, Urea cycle and decarboxylation. Diseases related to abnormal metabolism of amino acids, Disorders of ammonia metabolism, phenylketonuria, alkaptonuria and Jaundice.
- Biological oxidation: Electron transport chain and Oxidative phosphorylation

UNIT-IX Minerals **5 Hours**

Types, Functions, Deficiency diseases, recommended dietary requirements

UNIT-X Water and Electrolytes **5 Hours**

Distribution, functions of water in the body

- Water turnover and balance
- Electrolyte composition of the body fluids, Dietaryintake of electrolyte and Electrolyte balance
- Dehydration, causes of dehydration and oral rehydration therapy

UNIT-XI Introduction to Biotechnology **10 Hours**

UNIT-XII Organ function tests **6 Hours**

- Functions of kidney and routinely performed tests to assess the functions of kidney and their clinical significances
- Functions of liver and routinely performed tests to assess the functions of liver and their clinical significances Lipid profile tests and its clinical significances

UNIT-XIII Introduction to Pathology of Blood and Urine **6 Hours**

- Lymphocytes and Platelets, their role in health anddisease
- Erythrocytes - Abnormal cells and their significance Normal and Abnormal constituents of Urine and theirsignificance

Course Title: Biochemistry and Clinical Pathology

Course Code: ER20-23P

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

1. Qualitatively determine the biomolecules / metabolites in the given biologicalsamples
2. Determine the normal and abnormal constituents in blood and urine samplesand interpret the results of such testing

Practicals

1. Qualitative analysis of carbohydrates (4 experiments)
2. Qualitative analysis of Proteins and amino acids (4 experiments)
3. Qualitative analysis of lipids (2 experiments)
4. Qualitative analysis of urine for normal and abnormal constituents(4 experiments)
5. Determination of constituents of urine (glucose, creatinine, chlorides)(2 experiments)
6. Determination of constituents of blood/serum (simulated) (Creatine, glucose,cholesterol, Calcium, Urea, SGOT/SGPT) (5 experiments)
7. Study the hydrolysis of starch from acid and salivary amylase enzyme(1 experiment)
8. Qualitative analysis of carbohydrates (4 experiments)
9. Qualitative analysis of Proteins and amino acids (4 experiments)
10. Qualitative analysis of lipids (2 experiments)
11. Qualitative analysis of urine for normal and abnormal constituents(4 experiments)
12. Determination of constituents of urine (glucose, creatinine, chlorides)(2 experiments)
13. Determination of constituents of blood/serum (simulated) (Creatine, glucose,cholesterol, Calcium, Urea, SGOT/SGPT) (5 experiments)
14. Study the hydrolysis of starch from acid and salivary amylase enzyme (1 experiment)

Course Title: Pharmacotherapeutics

Course Code: ER20-24T

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

1. Help assessing the subjective and objective parameters of patients incommon disease conditions
2. Assist other healthcare providers to analyse drug related problems andprovide therapeutic interventions
3. Participate in planning the rational medicine therapy for common diseases
4. Design and deliver discharge counselling for patients

UNIT-I **10 Hours**

Pharmacotherapeutics – Introduction, scope, and objectives. Rational use of Medicines, Evidence Based Medicine, Essential Medicines List, Standard Treatment Guidelines (STGs)

UNIT-II **65 Hours**

Definition, etiopathogenesis, clinical manifestations, non-pharmacological and pharmacological management of thediseases associated with

Cardiovascular System

- Hypertension
- Angina and Myocardial infarction
- Hyperlipidemia
- Congestive Heart Failure

Respiratory System

- Asthma
- COPD

Endocrine System

Thyroid disorders - Hypo and Hyperthyroidism

Central Nervous System

Parkinson's disease

- Alzheimer's disease
- Stroke
- Migraine

Gastro Intestinal Disorders

Gastro esophageal reflux disease

- Peptic Ulcer Disease
- Alcoholic liver disease
- Inflammatory Bowel Diseases (Crohn's Disease and Ulcerative Colitis)

Haematological disorders

- Iron deficiency anemia
- Megaloblastic anemia

Infectious diseases

- Tuberculosis
- Pneumonia
- Urinary tract infections
- Hepatitis
- Gonorrhea and Syphilis
- Malaria
- HIV and Opportunistic infections
- Viral Infections (SARS, CoV2)

Musculoskeletal disorders

- Rheumatoid arthritis
- Osteoarthritis

Dermatology

- Psoriasis
- Scabies
- Eczema

Psychiatric Disorders

- Depression
- Anxiety
- Psychosis

Ophthalmology

- Conjunctivitis (bacterial and viral)
- Glaucoma

Anti-microbial Resistance

Women's Health

- Polycystic Ovary Syndrome
- Dysmenorrhea
- Premenstrual Syndrome

Course Title: Pharmacotherapeutics

Course Code: ER20-24P

L	T	P	Credits
3	1	0	4

Total: 25 Hours

Learning Outcomes:

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

1. Write SOAP (Subjective, Objective, Assessment and Plan) notes for the given clinical cases of selected common diseases
2. Counsel the patients about the disease conditions, uses of drugs, methods of handling and administration of drugs, life-style modifications, and monitoring parameters.

Practicals

I. Preparation and discussion of SOAP (Subjective, Objective, Assessment and Plan) notes for at least SIX clinical cases (real / hypothetical) of the following disease conditions.

1. Hypertension
2. Angina Pectoris
3. Myocardial Infarction
4. Hyperlipidaemia
5. Rheumatoid arthritis
6. Asthma
7. COPD
8. Diabetes
9. Epilepsy
10. Stroke
11. Depression
12. Tuberculosis
13. Anaemia (any one type as covered in theory)
14. Viral infection (any one type as covered in theory)
15. Dermatological conditions (any one condition as covered in theory)

II. Patient counselling exercises using role plays based on the real /

hypothetical clinical case scenarios. The students are expected to provide counselling on disease condition, medications, life-style modifications, monitoring parameters, etc. and the same shall be documented. (Minimum 5 cases)

III. Simulated cases to enable dose calculation of selected drugs in paediatrics, and geriatrics under various pathological conditions. (Minimum 4 cases)

IV. Patient counselling exercises using role plays based on the real / hypothetical clinical case scenarios. The students are expected to provide counselling on disease condition, medications, life-style modifications, monitoring parameters, etc. and the same shall be documented. (Minimum 5 cases)

V. Simulated cases to enable dose calculation of selected drugs in paediatrics, and geriatrics under various pathological conditions. (Minimum 4 cases)

Course Title: Hospital and Clinical Pharmacy

Course Code: ER20-25T

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes:

Upon successful completion of this course, the students will beable to

1. Explain about the basic concepts of hospital pharmacy administration
2. Manage the supply chain and distribution of medicines within the hospitalsettings
3. Assist the other healthcare providers in monitoring drug therapy and addressdrug related problems
4. Interpret common lab investigation reports for optimizing drug therapy

UNIT-I **6 Hours**

Hospital Pharmacy

- Definition, scope, national and international scenario
- Organizational structure
- Professional responsibilities, Qualification and experiencerequirements, 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.

UNIT-II **4 Hours**

Different Committees in the Hospital

- Pharmacy and Therapeutics Committee - Objectives,Composition, and functions Hospital Formulary
- Infection Control Committee — Role of Pharmacist inpreventing Antimicrobial Resistance

UNIT-III **14 Hours**

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 Cold Chain, 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

UNIT-IV **7 Hours**

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

UNIT-V **7 Hours**

Compounding in Hospitals. Bulk compounding, IV add mixture services and incompatibilities, Total parenteral nutrition

UNIT-VI **7 Hours**

Radio Pharmaceuticals - Storage, dispensing and disposal of radiopharmaceuticals

UNIT-VII **7 Hours**

Application of computers in Hospital Pharmacy Practice, Electronic health records, Soft wares used in hospital pharmacy

UNIT-VIII **12 Hours**

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

UNIT-IX **10 Hours**

Clinical laboratory tests used in the evaluation of diseasestates - significance and interpretation of test results

- Haematological, Liver function, Renal function, thyroidfunction tests
- Tests associated with cardiac disorders
- Fluid and electrolyte balance
- Pulmonary Function Tests

UNIT- X **6 Hours**

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

UNIT- XI **2 Hours**

Pharmacovigilance

- Definition, aim and scope
- Overview of Pharmacovigilance

UNIT- XII **6 Hours**

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

Course Title: Hospital and Clinical Pharmacy

Course Code: ER20-25P

L	T	P	Credits
3	1	0	4

-

Total: 25 Hours

Learning Outcomes: Upon completion of the course, the students will be able to

1. Professionally handle and answer the drug information queries
2. Interpret the common laboratory reports
3. Report suspected adverse drug reactions using standard procedures
4. Understand the uses and methods of handling various medical/surgical aidsand devices
5. Interpret and report the drug-drug interactions in common diseases foroptimizing the drug therapy

Note: Few of the experiments of Hospital and Clinical Pharmacy practical course listed here require adequate numbers of desktop computers with internet connectivity, adequate drug information resources including reference books, different types of surgical dressings and other medical devices and accessories. Various charts, models, exhibits pertaining to the experiments shall also be displayed in the laboratory.

Practicals

1. Systematic approach to drug information queries using primary / secondary /tertiary resources of information (2 cases)
2. Interpretation of laboratory reports to optimize the drug therapy in a given clinicalcase (2 cases)
3. Filling up IPC's ADR Reporting Form and perform causality assessments usingvarious scales (2 cases)
4. Demonstration / simulated / hands-on experience on the identification, types, use /application /administration of Orthopedic and Surgical Aids such as knee cap, LS belts, abdominal belt,walker, walking sticks, etc.
    - Different types of bandages such as sterile gauze, cotton, crepe bandages,etc.
    - Needles, syringes, catheters, IV set, urine bag, RYLE's tube, urine pots,colostomy bags, oxygen masks, etc.
5. Case studies on drug-drug interactions (any 2 cases)
6. Wound dressing (simulated cases and role play –minimum 2 cases)
7. Vaccination and injection techniques (IV, IM, SC) using mannequins (5 activities)
8. Use of Hospital Pharmacy Software and various 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)

1. Typical profile of a drug to be included in the hospital formulary
2. Brief layout and various services of the Central Sterile Supplies Department(CSSD)
3. Various types of sterilizers and sterilization techniques used in hospitals
4. Fumigation and pesticide control in hospitals
5. Role of Pharmacists in Transition of Care: Discharge cards, post hospitalizationcare, medicine reconciliation activities in developed countries
6. Total parenteral nutrition and IV admixtures and their compatibility issues
7. Concept of electronic health records
8. Invasive and Non-invasive diagnostic tests - HRCT, MRI, Sonography, 2DECHO, X-rays, Mammography, ECG, EMG, EEG
9. Home Diagnostic Kits - Pregnancy Test, COVID testing etc.
10. Measures to be taken in hospitals to minimize Antimicrobial Resistance
11. Role and responsibilities of a pharmacist in public hospital in rural parts of thecountry
12. Safe waste disposal of hospital waste

Field Visit

The students shall be taken in groups to visit a Government / private healthcare facility to understand and witness the various hospital and clinical pharmacy experience from the field visit shall be submitted

Course Title: Pharmacy Law and Ethics
Course Code: ER20-26T

L	T	P	Credits
3	1	0	4

Total: 75 Hours

Learning Outcomes: Upon successful completion of this course, the students will beable to

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

UNIT- I **2 Hours**

General Principles of Law, History and various Acts related to Drugs and Pharmacy profession

UNIT- II **5 Hours**

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

UNIT- III **23 Hours**

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 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 TechnicalAdvisory Board, Central Drugs Laboratory, Drugs Consultative Committee, Government analysts, licensing Authorities, controlling authorities, Drug Inspectors.

UNIT- IV **2 Hours**

Narcotic Drugs and Psychotropic Substances Act 1985 and Rules Objectives, Definitions, Authorities and Officers, Prohibition, Control and Regulation, Offences and Penalties.

UNIT- V **2 Hours**

Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties.

UNIT- VI **2 Hours**

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.

UNIT- VII **2 Hours**

Poisons Act-1919: Introduction, objective, definition, possession, possession for sales and sale of any poison,import of poisons

UNIT- VIII **2 Hours**

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

UNIT- IX **5 Hours**

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)

UNIT- X **5 Hours**

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.

UNIT- XI **2 Hours**

Medical Termination of Pregnancy Act and Rules – basicunderstanding, salient features, and Amendments

UNIT- XII **1 Hours**

Role of all the government pharma regulator bodies –Central Drugs Standards Control Organization (CDSCO), Indian Pharmacopoeia Commission

UNIT- XIII **3 Hours**

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

UNIT- XIV **7 Hours**

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

UNIT- XV **2 Hours**

Blood bank – basic requirements and functions

UNIT- XVI **2 Hours**

Clinical Establishment Act and Rules – Aspects related to Pharmacy

UNIT- XVII **2 Hours**

Biomedical Waste Management Rules 2016 – Basic aspects, and aspects related to pharma manufacture to disposal of pharma / medical waste at homes, pharmacies, and hospitals

UNIT- XVIII **2 Hours**

Biomedical Waste Management Rules 2016 – Basic aspects, and aspects related to pharma manufacture to disposal of pharma / medical waste at homes, pharmacies, and hospital

UNIT- XIX **2 Hours**

Introduction to the Consumer Protection Act

UNIT- XX **2 Hours**

Introduction to the Disaster Management Act

UNIT- XXI **2 Hours**

Medical Devices – Categorization, basic aspects related to Manufacture and sale