

Study & Evaluation Scheme of Diploma in Pharmacy

[Applicable for 2022-2024]

Version 2022

Official Gazette (PCI 2020)

For

Diploma in Pharmacy



Approved in BOS	Approved in BOF	Approved in Academic Council
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Quantum University, Roorkee
22 KM Milestone, Dehradun-Roorkee Highway, Roorkee (Uttarakhand)
Website: www.quantumuniversity.edu.in

Quantum University, Roorkee
Study & Evaluation Scheme
Study Summary

Name of the Faculty	Faculty of Health Sciences
Name of the School	Quantum School of Health Sciences
Name of the Department	Department of Pharmacy
Program Name	Diploma in Pharmacy
Duration	2 Years
Medium	English/Hindi

Evaluation Scheme

DIPLOMA IN PHARMACY (PART-I) EXAMINATION						
Subject	Maximum marks for Theory			Maximum marks for Practicals		
	Examination	*Sessional	Total	Examination	*Sessional	Total
Pharmaceutics	80	20	100	80	20	100
Pharmaceutical Chemistry	80	20	100	80	20	100
Pharmacognosy	80	20	100	80	20	100
Human Anatomy & Physiology	80	20	100	80	20	100
Social Pharmacy	80	20	100	80	20	100
			500	+500= 1000		

DIPLOMA IN PHARMACY (PART-II) EXAMINATION					
Subject	Maximum Marks for Theory			Maximum Marks for Practicals	
	Examination	*Sessional	Total	Examination	*Sessional
Pharmacology	80	20	100	80	20
Community Pharmacy & Management	80	20	100	80	20
Biochemistry & Clinical Pathology	80	20	100	80	20
Pharmacotherpeuts	80	20	100	80	20
Hospital and Clinical Pharmacy	80	20	100	80	20
Pharmacy law & Ethics	80	20	100	-	-
			600	+400	+100 =1000

FIRST YEAR

Course Code	Category	Course Title	L	T	P	C	Version	Course Prerequisite
ER20-11T	PC	Pharmaceutics – Theory	3	0	0	6	1.0	--
ER20-11P	PC	Pharmaceutics – Practical	0	0	4	4	1.0	--
ER20-12T	PC	Pharmaceutical Chemistry – Theory	3	0	0	6	1.0	--
ER20-12P	PC	Pharmaceutical Chemistry – Practical	0	0	4	4	1.0	--
ER20-13T	PC	Pharmacognosy – Theory	3	0	0	6	1.0	--
ER20-13P	PC	Pharmacognosy – Practical	0	0	4	4	1.0	--
ER20-14T	PC	Human Anatomy & Physiology – Theory	3	0	0	6	1.0	--
ER20-14P	PC	Human Anatomy & Physiology – Practical	0	0	4	4	1.0	--
ER20-15T	PC	Social Pharmacy – Theory	3	0	0	6	1.0	--
ER20-15P	PC	Social Pharmacy – Practical	0	0	4	4	1.0	--
TOTAL			15	0	20	50		

SECOND YEAR

Course Code	Category	Course Title	L	T	P	C	Version	Course Prerequisite
ER20-21T	PC	Pharmacology – Theory	3	0	0	6	1.0	--
ER20-21P	PC	Pharmacology – Practical	0	0	4	4	1.0	--
ER20-22T	PC	Community Pharmacy & Management – Theory	3	0	0	6	1.0	--
ER20-22P	PC	Community Pharmacy & Management – Practical	0	0	4	4	1.0	--
ER20-23T	PC	Biochemistry & Clinical Pathology – Theory	3	0	0	6	1.0	--
ER20-23P	PC	Biochemistry & Clinical Pathology – Practical	0	0	4	4	1.0	--
ER20-24T	PC	Pharmacotherapeutics – Theory	3	0	0	6	1.0	--
ER20-24P	PC	Pharmacotherapeutics – Practical	0	0	4	4	1.0	--
ER20-25T	PC	Hospital & Clinical Pharmacy – Theory	3	0	0	6	1.0	--
ER20-25P	PC	Hospital & Clinical Pharmacy – Practical	0	0	4	4	1.0	--
ER20-26T	PC	Pharmacy Law & Ethics	3	0	0	6	1.0	--
TOTAL			18	0	20	56		--

PROGRAM OUTCOMES OF D.Pharm.

- PO1.

Pharmaceutical Knowledge: Students gain a deep knowledge regarding human body, its related diseases, analytical skills, drug molecules (Active Pharmaceutical Ingredients) along with excipients, natural drug resources, chemistry involved in API including synthesis of commonly used drugs, effect of drug on human body, toxicity and impurity profile, ADME studies of drugs (behaviour of drug in human body), dosage form studies including novel approaches, designing and development of formulation stability studies, analysis etc.

- PO2 **Research Analysis:** Students could apply the knowledge in research field to make new discoveries.
- PO3. **Design & Development of dosage forms:** Various dosage forms could be prepared by a pharmacy student in the pharmaceutical companies for the ease of patients.
- PO4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern methods with an understanding of the limitations and its usage. The student also learns to handle many instruments related to their studies which would help them work in a Pharmaceutical Industry, pharmacovigilance, regulatory requirements, legal processes etc.
- PO6. **Pharmacy and society:** Pharmacist provides complete health care data and practices to the people of the society and guides them to be healthy. The student also learns drug distribution system, patient counselling, industrial laws etc. Student gains expertise in storage and distribution of drugs with all precautions and in-depth knowledge of dose, adverse effect and other health related issues to deal with indoor and outdoor patients admitted in hospitals and also in public.
- PO7. **Environment and sustainability:** Understand the impact of the professional pharmacist in society and environment, and make an impact of it on the people of the society.
- PO8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the pharmacy practice. Student is also trained in ethical behavior with physician, nurses and other paramedical staff for protecting patient's health.
- PO9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams acts as a multidisciplinary person in every context.
- PO10. **Communication:** Communicate effectively on pharmaceutical activities with the community and with society.
- PO11. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
- PO12. **Social Interaction:** Being a public welfare job, a pharmacist would be able to interact with the people in a better way to cure them and make them feel healthy.

D. Pharm.**Program Specific Outcomes:**

- PSO1:** Detail understanding of theoretical and practical knowledge of all core and allied subjects of pharmaceutical sciences, which consist of dosage form design, routes of administration of various drugs, their mechanism of action, chemical moiety involved, doses of drugs, patient treatment, patient counseling, drug dispensing, hospital administration, drug manufacturing and QA/QC regulation etc.
- PSO2:** Highlight the concepts and operative components of pharmacovigilance, clinical pharmacy, hospital pharmacy, community pharmacy, pharmaceutical care, pharmacovigilance, pharmacoeconomics, clinical research, clinical pharmacokinetics and other related areas for the benefit of academicians, hospital/community pharmacists and industry, emphasizing the consequences of the use of medications.
- PSO3:** Rigorous core course-work in biopharmaceutics, drug transport, pharmacokinetics & pharmacodynamics, drug delivery systems, cell and molecular biology, synthetic and macromolecular chemistry, chemical and biomedical engineering, materials science, physiology and pharmacology.
- PSO4:** Emphasis on Drug Discovery and Design, Drug Delivery, Drug Action, Clinical trials, Drug Analysis, Cost Effectiveness of Medicines (Pharmacoeconomics) and Drug Regulatory Affairs etc.

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.

Chapter	Topics	Hours
1	<ul style="list-style-type: none"> • 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:	9
	Size reduction : hammer mill and ball mill	
	Size separation: Classification powder 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	
5	Tablets –coated and uncoated, various modified tablets (sustained release, extended-release, fast dissolving, double layered)	8
	Capsules - hard and soft gelatin capsules	4
	Liquid oral preparations - solution, syrup, elixir, emulsion, Suspension, dry powder for reconstitution	6
	Topical preparations -Ointments, creams, pastes, gels, Liniments and lotions, suppositories and pessaries	8
	Nasal preparations, Ear preparations	2

	Powders and granules -Insufflations ,dusting powders, Effervescent powders and effervescent granules	3
	Sterile formulations –Injectables, eye drops and eye Ointments	6
	Immunological products: Sera,vaccines, toxoids and Their manufacturing methods.	4
6	Basicstructure,layout,sectionsandactivitiesofpharmaceuticalmanuf acturing plants Qualitycontrolandqualityassurance: Definitionandconceptsofquality control&qualityassurance,currentgoodmanufacturingpractice(cGMP),In troductionto concept of calibration and validation	5
7	Novel drug delivery systems: Introduction, Classification With examples ,advantages and challenges	5

Course Outcomes for ER21-11 T

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/Skill(S)/ Entrepreneurship (En)/ None (Use, for more thanone)
CO1	Describe about the different dosage forms and their formulation aspects	2	Em,S
CO2	Explaintheadvantages,disadvantagesandqualitycontroltestsofdif ferentdosage forms	2	Em,S
CO3	Discuss the importance quality assurance &good manufacturing practices	1	Em,S

CO-PO Mapping for ER20-11T

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO1	2	2	2	1	1	2	1	2	1	3	1	2	2	1
CO2	2	3	2	2	2	2	2	2	2	3	2	1	1	2
CO3	2	2	2	2	2	2	2	2	2	3	2	2	2	1
Avg	2	2.3	2	1.6	1.6	2	1.6	2	1.6	3	1.6	1.6	1.6	1.6

PHARMACEUTICS–PRACTICAL

Course Code: ER 20-11P
75 Hours (3 Hours/week)

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

Practical

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 & labeling
 - **Liquid Oral:** Simple syrup, Piperazine citrate elixir, Aqueous Iodine solution, Strong Iodine solution
 - **Emulsion:** Castor oil emulsion, Cod liver oil emulsion, olive 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 granule, Dusting powder
 - **Sterile Injection:** Normal Saline, Calcium gluconate Injection
 - **Hard Gelatin Capsule:** Indomethacin capsules, Tetracycline capsules
 - **Tablet:** Paracetamol tablet granules ready for compression
3. Demonstration on various stages of tablet manufacturing processes (including coating tablets, if possible)
4. Appropriate methods of usage, and storage of special dosage forms including different types of inhalers, spacers, insulin pens
5. Demonstration of quality control tests and evaluation of common dosage forms viz. tablets, capsules, emulsion, sterile injections as per the monographs

Course Outcomes for ER21-11 P

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Calculate the working formula from the given master formula	2	Em, S
CO2	Formulate the dosage form and dispense in appropriate container	2	Em, S
CO3	Design the label with necessary product and patient information	1	Em, S

CO-PO Mapping for ER20-11P

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO1	2	2	2	1	1	2	1	2	1	3	1	2	2	1
CO2	2	3	2	2	2	2	2	2	2	3	2	1	1	2
CO3	2	2	2	2	2	2	2	2	2	3	2	2	2	1
Avg	2	2.3	2	1.6	1.6	2	1.6	2	1.6	3	1.6	1.6	1.6	1.6

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.

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
3	Inorganic Pharmaceuticals: Pharmaceutical	7
	formulations, market preparations, storage conditions and uses of <ul style="list-style-type: none"> ● Haematinics: Ferrous sulphate, Ferrous fumarate, Ferric ammonium citrate, Ferrous ascorbate, Carbonyliron ● Antacids: Aluminum hydroxide gel, Magnesium hydroxide, Magaldrate, Sodium bicarbonate, Calcium Carbonate ● Anti-microbial 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, Mouthwashes ● Medicinal gases: Carbon dioxide, nitrous oxide, Oxygen 	
4	Introduction to nomenclature of organic chemical systems with particular reference to heterocyclic compounds Containing up to The 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 <ul style="list-style-type: none"> ● Anesthetics: 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 <ul style="list-style-type: none"> ● Sympathomimetic Agents: <i>Direct Acting:</i> Nor-Epinephrine*, Epinephrine, Phenylephrine, Dopamine*, Terbutaline, Salbutamol (Albuterol), Naphazoline*, Tetrahydrozoline. <i>Indirect Acting</i> 	9
	<i>Agents:</i> Hydroxy Amphetamine, Pseudoephedrine. <i>Agents With Mixed Mechanism:</i> Ephedrine, Metaraminol <ul style="list-style-type: none"> ● 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, Echthiopate Iodide ● Cholinergic Blocking Agents: Atropine Sulphate*, Ipratropium Bromide <i>Synthetic Cholinergic Blocking Agents:</i> Tropicamide, Cyclopentolate Hydrochloride, Clidinium Bromide, Dicyclomine Hydrochloride*	

7	Drugs Acting on Cardiovascular System <ul style="list-style-type: none"> ● Anti-Arrhythmic Drugs: Quinidine Sulphate, Procainamide Hydrochloride, Verapamil, Phenytoin Sodium*, Lidocaine Hydrochloride, Lorcanide 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 <ul style="list-style-type: none"> ● Antifungal Agents: Amphotericin-B, Griseofulvin, Miconazole, Ketoconazole*, Itraconazole, Fluconazole*, Naftifine Hydrochloride ● Urinary Tract Anti-Infective Agents: Norfloxacin, Ciprofloxacin, Ofloxacin*, Moxifloxacin, 	8
	<ul style="list-style-type: none"> ● Anti-Tubercular Agents: INH*, Ethambutol, ParaAmino 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
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Course Outcomes for ER20-12T

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/None (Use, for more than one)
CO1	Describe the chemical class, structure and chemical name of the commonly used drugs and pharmaceuticals of both organic and inorganic nature	3	Em,S
CO2	Discuss the pharmacological uses, dosage regimen, stability issues and storage conditions of all such chemical substances commonly used as drugs	2	Em,S
CO3	Describe the quantitative and qualitative analysis, impurity testing of the chemical substances given in the official monographs	1	Em,S
CO4	Identify the dosage form & the brand names of the drugs and pharmaceuticals popular in the marketplace	2	Em,S

CO-PO Mapping for ER 20-12T

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	P O 1	PO 2	PO3	P O 4	PO5	P O 6	P O7	PO 8	PO 9	PO 10	PO 11	PSO 1	PS O2	PSO3
CO1	2	2	2	1	1	1	1	1	1	3	1	2	2	1
CO2	2	3	1	1	1	1	1	1	1	3	3	1	1	1
CO3	2	2	1	2	1	1	1	1	3	3	3	1	2	1
CO4	1	2	2	1	2	2	2	2	1	1	1	1	1	1
Avg	1.75	2.25	1.5	1.25	1.25	1.25	1.25	1.25	1.5	2.5	2	1.25	1.5	1.00

PHARMACEUTICAL CHEMISTRY–PRACTICAL

Course Code: ER20-12P
75 Hours (3Hours/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

1. Limit tests and assays of selected chemical substances as per the monograph
2. Volumetric analysis of the chemical substances
3. Basics of preparatory chemistry and their analysis
4. Systematic qualitative analysis for the identification of the chemical drugs

Course 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 the monograph standards
4. Synthesize the selected chemical substances as per the standard synthetic scheme
5. Perform qualitative tests to systematically identify the unknown chemical substances

Practicals

S.No.	Experiment
1	Limit test for <ul style="list-style-type: none"> ● 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, Ceric Ammonium Sulfate, Potassium Permanganate
4	Assay of the following compounds <ul style="list-style-type: none"> ● Ferrous sulphate-by redox titration ● Calcium gluconate-by complexometric ● Sodium chloride-by Modified Volhard's method ● Ascorbic acid by cerimetry ● Metronidazole by Non-Aqueous Titration ● Ibuprofen by alkalimetry
5	Fundamentals of preparative organic chemistry Determination of Melting point and boiling point of organic compounds
6	Preparation of organic compounds <ul style="list-style-type: none"> ● Acetanilide from aniline ● Aspirin from salicylic acid
7	Identification and test for purity of pharmaceuticals Aspirin, Caffeine, Paracetamol, Sulfanilamide
8	Systematic Qualitative analysis experiments (4 substances)

Course Outcomes for ER20-12P

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/None (Use, for more than one)
CO1	Students should be able to perform limit test for quality control in pharmaceuticals.	2	Em,S
CO2	Students should be able to perform assay of inorganic compounds	2	Em,S
CO3	Students should be able to perform the limit tests for iron, sulphur, chlorides, arsenic, and heavy metals in pharmaceutical preparations.	2	Em,S

CO-PO Mapping for ER20-12P

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	2	1	2	2	1	2	1	2	2	2	1
CO2	2	2	2	2	2	2	1	2	1	2	2	2	3	1
CO3	2	3	2	2	1	1	3	3	3	2	1	1	1	1
Avg	1.67	2.00	1.67	2.00	1.33	1.67	2.00	2.00	2.00	1.67	1.67	1.67	2.00	1.00

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.

Chapter	Topic	Hours
1	Definition ,history, present status and scope of Pharmacognosy	2
2	Classification of drugs: AlphabeticalTaxonomicalMorphologicalPharmacologicalChemicalChemo-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
5	Biological source, chemical constituents and therapeutic Efficacy of the following categories of crude drugs.	34
	Laxatives	Aloe, Castor oil, Ispaghula, Senna
	Cardio tonic	Digitalis, Arjuna
	Carminatives and G.I. regulators	Coriander, Fennel, Cardamom, Ginger, Clove, Black Pepper, Asafoetida, Nutmeg, Cinnamon
	Astringents	Myrobalan, Black Catechu
	Drugs acting on nervous system	Hyoscyamus, Belladonna, Ephedra, Opium, Tealeaves, Coffee seeds, Coca
	Anti-hypertensive	Rauwolfia
	Anti-tussive	Vasaka, Tolu Balsam
	Anti-rheumatics	Colchicum seed
	Anti-tumour	Vinca, Podophyllum
	Anti diabetics	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, Guggul, Gelatine	
	Miscellaneous	Squill, Galls, Palecatechu, Ashwagandha, Vasaka, Tulsi, Guggul	
6	Plant fibers used as surgical dressings: Cotton, silk, wool and regenerated fibres Sutures–Surgical Cat gut and Ligatures		3
7	Basic principles involved in the traditional systems of Medicine like: Ayurveda, Siddha, Unani and Homeopathy		8
	Method of preparation of Ayurvedic formulations like: Arista, Asava, Gutika, Taila, Churna, Lehya and Bhasma		
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	Herbal cosmetics: Sources, chemical constituents, commercial preparations, therapeutic and cosmetic uses of: Aloe vera gel, Almond oil, Lavender oil, Olive oil, Rosemary oil, Sandalwood oil		4
11	Phytochemical investigation of drugs		2

Course Outcomes of ER 20-13T

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Identify the important/common crude drugs of natural origin	2	Em
CO2	Describe the uses of herbs in nutraceuticals and cosmeceuticals	2	Em
CO3	Discuss the principles of alternative system of medicines	2	Em
CO4	Describe the importance of quality control of drugs of natural origin	2	Em

CO-PO Mapping for ER 20-13T

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	2	1	1	1	2	1	2	2	1
CO2	2	1	2	1	2	2	3	1	2	3	2	1	2	1
CO3	2	2	2	1	2	2	1	1	2	2	1	2	2	1
CO4	3	2	2	2	1	2	2	2	1	3	2	2	2	1
Avg	2.25	1.75	1.75	1.25	1.75	2	1.75	1.25	1.5	2.5	1.5	1.75	2	1.00

PHARMACOGNOSY–PRACTICAL
Course Code: ER20-13P
75 Hours (3 Hours/week)

Scope: This course is designed to train the students in physical identification, morphological characterization, physical and chemical characterization and evaluation of commonly used herbal drugs.

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

1. Identification of the crude drugs based on their morphological characteristics
2. Various characteristic anatomical characteristics of the herbal drugs studied through transverse section

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, Nuxvomica, Vas aka

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.

Course Outcomes for ER 20-13 P

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should be able to know the fundamental Identify of the given crude drugs based on the morphological characteristics, Take a transverse section of the given crude drugs	2	Em, S
CO2	Students should be able to describe the anatomical characteristics of the given crude drug under microscopical condition	2	Em, S

CO3	Students should be able to identify the crude drug by. Physical and chemical tests to evaluate the given crude drugs	2	Em,S
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CO-PO Mapping for ER20-13P

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related- 0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	2	1	2	2	1	2	1	2	2	2	1
CO2	2	3	2	2	2	2	2	2	1	3	2	1	3	1
CO3	3	2	2	2	1	1	3	3	3	2	1	1	1	1
Avg	2.0	2.0	1.7	2.0	1.3	1.7	2.3	2.0	2.0	2.0	1.7	1.3	2.0	1.00



HUMAN ANATOMY AND PHYSIOLOGY –THEORY

Course Code: ER 20-14T

75 Hours (3 Hours/week)

Scope: This course is designed to impart basic knowledge on the structure and functions of the human body. It helps in understanding both homeostasis mechanisms and homeostatic imbalances of various systems of the human body.

Course Objectives: This course will discuss the following

1. Structure and functions of the various organ systems and organs of the human body
2. Homeostatic mechanisms and their imbalances in the human body
3. Various vital physiological parameters of the human body and their significances

Chapter	Topic	Hours
1	Scope of Anatomy and Physiology Definition of various terminologies	2
2	Structure of Cell: Components and its functions	2
3	Tissues of the human body: Epithelial, Connective, Muscular and Nervous tissues – their sub-types and characteristics.	4
4	Gaseous system: structure and functions of bones of Axial and appendicular skeleton Classification ,types and movements of joints, disorders of joints	3 3
5	Haemopoietic system <ul style="list-style-type: none"> ● Composition and functions of blood ● Process of Hemopoiesis ● Characteristics and functions of RBCs, WBCs and platelets ● Mechanism of Blood Clotting 	8
	<ul style="list-style-type: none"> ● Importance of Blood groups 	
6	Lymphatic system <ul style="list-style-type: none"> ● Lymph and lymphatic system, composition, function and its formation. ● Structure and functions of spleen and lymph node. 	3



7	Cardio vascular system <ul style="list-style-type: none"> ● Anatomy and Physiology of heart ● Blood vessels and circulation (Pulmonary, coronary and systemic circulation) ● Cardiac cycle and Heart sounds, Basics of ECG ● Blood pressure and its regulation 	8
8	Respiratory system <ul style="list-style-type: none"> ● Anatomy of respiratory organs and their functions. ● Regulation Mechanism of respiration. ● Respiratory volumes and capacities—definitions 	4
9	Digestive system <ul style="list-style-type: none"> ● Anatomy and Physiology of GIT ● Anatomy and functions of accessory glands ● Physiology of digestion and absorption 	8
10	Skeletal muscles <ul style="list-style-type: none"> ● Histology ● Physiology of muscle contraction ● Disorder of skeletal muscles 	2
11	Nervous system <ul style="list-style-type: none"> ● Classification of nervous system ● Anatomy and physiology of cerebrum, cerebellum, midbrain ● Function of hypothalamus, medulla oblongata and basal ganglia ● Spinal cord-structure and reflexes ● Names and functions of cranial nerves. ● Anatomy and physiology of sympathetic and parasympathetic nervous system (ANS) 	8
12	Sense organs-Anatomy and physiology of <ul style="list-style-type: none"> ● Eye ● Ear ● Skin ● Tongue 	6



	<ul style="list-style-type: none"> Nose 	
13	Urinary system <ul style="list-style-type: none"> Anatomy and physiology of urinary system Physiology of urine formation Renin- angio tensin system Clearance tests and micturition 	4
14	Endocrine system(Hormones and their functions) <ul style="list-style-type: none"> Pituitary gland Adrenal gland Thyroid and parathyroid gland Pancreas and gonads 	6
15	Reproductive system <ul style="list-style-type: none"> Anatomy of male and female reproductive system Physiology of menstruation Spermatogenesis and Oogenesis Pregnancy and parturition 	4

Course Outcomes for ER20-14T

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should be able to know the gross morphology, of various organs of the human body.	2	Em,S
CO2	Students should be able to Identify the various tissues and organs of different systems of human body	2	Em,S
CO3	Students should be able to establish the link between different subjects within the regime.	3	Em,S
CO4	Students should be able to know the structure and functions of various organs of the human body.	2	Em,S

CO-PO Mapping for ER-14T

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	1	1	1	2	1	2	2	1	1	1	1	2	1	1
CO 2	2	2	1	1	2	1	2	1	2	1	2	2	2	1
CO 3	2	3	2	2	1	2	2	3	3	2	1	2	2	1
CO 4	1	1	2	3	1	1	1	1	1	1	2	1	2	1
CO 5	1.5	1.75	1.5	2	1.25	1.5	1.75	1.5	1.75	1.25	1.5	1.75	1.75	1
Avg	1	1	1	2	1	2	2	1	1	1	1	2	1	1



HUMAN ANATOMY AND PHYSIOLOGY–PRACTICAL

Course Code: ER20-14P

75 Hours (3 Hours/week)

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

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. Study of appliances used in Haematological experiments (only identification and listing the appliances)
6. Determination of
 - a. Blood group
 - b. ESR
 - c. Hemoglobin content of blood
 - d. Bleeding time and Clotting time
7. Determination of WBC count of blood
8. Determination of RBC count of blood
9. Determination of Differential count of blood
10. Recording of Blood Pressure in various postures, different arms, before and after exertion and interpreting the results
11. 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
12. Recording Pulse Oxygen(before and after exertion)
13. Recording force of air expelled using Peak Flow Meter
14. Measurement of height, weight, and BMI
15. 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 Outcomes for ER20-14P

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/None (Use, for more than one)
CO1	Students should be able to know the gross morphology, of various organs of the human body.	2	Em,S
CO2	Students should be able to Identify the various tissues and organs of different systems of human body	2	Em,S
CO3	Students should be able to establish the link between different subjects within the regime.	2	Em,S

CO-PO Mapping for ER-20-14P

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	1	2	1	1	3	1	1	2	1	1	1	3	1	1
CO 2	2	2	2	3	1	2	1	1	3	3	2	1	1	1
CO 3	3	2	1	3	1	1	2	1	1	2	1	1	2	1
Avg	2.0	2.0	1.3	2.3	1.7	1.3	1.3	1.3	1.7	2.0	1.3	1.7	1.3	1.00



SOCIAL PHARMACY–THEORY

Course Code: ER20-15T

75 Hours (3Hours/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.

Chapter	Topic	Hours
1	<p>Introduction to Social Pharmacy</p> <ul style="list-style-type: none"> • 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) • Introduction to Millennium Development Goals, Sustainable Development Goals, FIP Development Goals(1) 	7
2	<p>Preventive healthcare – Role of Pharmacists in the following</p> <ul style="list-style-type: none"> • Demography and Family Planning (3) • Mother and child health, importance of breast feeding, ill effects of infant milk substitutes and bottle feeding(2) • Overview of Vaccines, types of immunity and immunization(5) 	18
	<ul style="list-style-type: none"> • 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(6) • 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) 	



3	<p>Nutrition and Health</p> <p>Basics of nutrition – Macronutrients and Micronutrients(2)</p> <p>Importance of water and fibers in diet (1)</p> <p>Balanced diet, nutrition deficiency diseases, ill effects of junk foods, calorific and nutritive values of various foods, fortification of food(3)</p> <ul style="list-style-type: none"> □ 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) 	7
4	<p>Introduction to Microbiology and common microorganisms(3)</p> <p>Epidemiology: Introduction to the terms Epidemiology, its applications, terms such as epidemic, pandemic, endemic, mode of transmission, quarantine, isolation, incubation period, contact tracing.(2)</p> <p>Causative agents, epidemiology and clinical presentation and Role of Pharmacists in educating the public in prevention of the following communicable diseases:</p> <ul style="list-style-type: none"> • 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(10) • Intestinal infections – poliomyelitis, viral hepatitis, cholera, acute diarrheal diseases, typhoid, amebiasis, worm infestations, food poisoning(8) • Arthropod-borne infections- dengue, malaria, filariasis and, chikungunya(4) <ul style="list-style-type: none"> • Surface infections – trachoma, tetanus, leprosy(3) • STDs, HIV/AIDS(3) 	33
5	Introduction to health systems and all ongoing National health programs in India, their objectives, functioning, outcome and the role of pharmacists.	5
6	Role of Pharmacists in disaster management.	2



7	Pharmaco economics-basics, Health Insurance, Health Maintenance Organizations (HMOs), Health spending, Out-of-pocket expenses	3
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Course Outcomes for ER20-15T

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/None (Use, for more than one)
CO1	Students should be able to know roles of pharmacists in the various national health program	2	Em,S
CO2	Students should be able to various sources of health hazards and disease preventive measures	2	Em,S
CO3	Students should be able to establish the health care issues associated with food and nutritional substances	2	Em,S

CO-PO Mapping for ER-20-15T

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	1	2	1	1	3	1	1	2	1	1	1	3	1	1
CO 2	2	2	2	3	1	2	1	1	3	3	2	1	1	1
CO 3	3	2	1	3	1	1	2	1	1	2	1	1	2	1
Avg	2.0	2.0	1.3	2.3	1.7	1.3	1.3	1.3	1.7	2.0	1.3	1.7	1.3	1.00



SOCIAL PHARMACY–PRACTICAL

Course Code: ER 20-15P

75Hours(3

Hours/week)

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

Practicals

1. National immunization schedule for children, adult vaccine schedule, Vaccines not included in the National Immunization Program.
RCH–reproductive and child health–nutritional aspects
 2. Family planning devices
 3. Microscopical observation of different microbes (readymade slides)
 4. Oral Health and Hygiene
 5. Personal hygiene and etiquettes–hand washing techniques, Cough and sneeze tiquettes. Various types of masks, PPE gear, wearing/using them, and disposal.
 6. Menstrual hygiene, products used
 7. Marketed preparations of disinfectants, antiseptics, fumigating agents, antilarval agents, mosquito repellents, etc.
 8. Health Communication: Audio / Video podcasts, Images, Power Point Slides, Short Films, etc. in regional language(s) for mass communication / education /awarenesson5 different communicable diseases, their signs and symptoms, and prevention
 9. Water purification techniques, use of water testing kit, calculation of content/percentage of KMnO₄, bleaching powder to be used for wells/tanks
 10. Counseling children on junk foods, balanced diets– using Information, Education and Communication (IEC),counseling, etc.(Simulation Experiments)
 11. 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
 12. Tobacco cessation, counseling, identifying various tobacco containing products through charts/pictures
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13. First Aid – Theory, basics, demonstration, hands on training, audio-visuals, and practices, BSL (Basic Life Support) Systems [SCA - Sudden Cardiac Arrest,FBAO- ForeignBodyAirwayObstruction,CPR,Defibrillation(usingAED)(includeCPRtechniques,FirstResponder)



Course Outcomes for ER20-15P

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/None (Use, for more than one)
CO1	Students should be able to know roles of pharmacists in the various national health program	2	Em,S
CO2	Students should be able to various sources of health hazards and disease preventive measures	2	Em,S
CO3	Students should be able to establish the health care issues associated with food and nutritional substances	2	Em,S

CO-PO Mapping for ER-20-15P

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	1	2	1	1	3	1	1	2	1	1	1	3	1	1
CO 2	2	2	2	3	1	2	1	1	3	3	2	1	1	1
CO 3	3	2	1	3	1	1	2	1	1	2	1	1	2	1
Avg	2.0	2.0	1.3	2.3	1.7	1.3	1.3	1.3	1.7	2.0	1.3	1.7	1.3	1.00



2 Year
PHARMACOLOGY–THEORY

Course Code: ER20-21T

75 Hours (3 Hours/week)

Scope: This course provides basic knowledge about different classes of drugs available for the pharmacotherapy of common diseases. The indications for use, dosage regimen, routes of administration, pharmacokinetics, pharmacodynamics, and contraindications of the drugs discussed in this course are vital for successful professional practice.

Course Objectives: This course will discuss the following:

1. General concepts of pharmacology including pharmacokinetics, pharmacodynamics, routes of administration, etc.
2. Pharmacological classification and indications of drugs
3. Dosage regimen, mechanisms of action, contraindications of drugs
4. Common adverse effects of drugs

Course Outcomes: Upon successful completion of this course, the students will be able 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. Advise the dosage regimen, route of administration and contraindications for a given drug
4. Describe the common adverse drug reactions

Chapter	Topic	Hours
1	<p>General Pharmacology</p> <ul style="list-style-type: none"> • Introduction and scope of Pharmacology • Various routes of drug administration- advantages and disadvantages • 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, route of drug excretion • General mechanisms of drug action and factors modifying drug action 	10



2.	<p>Drugs Acting on the Peripheral Nervous System</p> <ul style="list-style-type: none"> • Steps involved in neuro humoral transmission • Definition,classification,pharmacologicalactions,dose,indications, andcontraindicationsof <ul style="list-style-type: none"> 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 anaesthetic agents h) Non-Steroidal Anti-Inflammatory drugs(NSAIDs) 	11
3	<p>Drugs Acting on the Eye Definition, classification,pharmacologicalactions,dose,indicationsandcontraindications of</p> <ul style="list-style-type: none"> • Miotics • Mydriatics • Drugs used in Glaucoma 	2
4	<p>Drugs Acting on the Central Nervous System Definition, classification, pharmacological actions, dose, indications and contraindicationsof</p> <ul style="list-style-type: none"> • General anaesthetics • Hypnotics and sedatives • Anti-Convulsant drugs • Anti-anxiety drugs • Anti-depressant drugs • Anti-psychotics • Non tropicl agents • Centrally acting muscle relaxants • Opioid analgesics 	8
5	<p>Drugs Acting on the Cardio vascular System Definition, classification, pharmacological actions,dose, indications and contraindications of</p> <ul style="list-style-type: none"> • Anti-hypertensive drugs • Anti-anginal drugs • Anti-arrhythmic drugs • Drugs used in atherosclerosis and • Congestive heart failure 	6
6	<p>Drugs Acting on Blood and Blood Forming Organs</p>	4



	Definition, classification, pharmacological actions, dose, indications and contraindications of <ul style="list-style-type: none"> • Hematinic agents • Anti-coagulants • Anti-platelet agents • Thrombolytic drugs 	
7	Definition, classification, pharmacological actions, dose, indications and contraindications of <ul style="list-style-type: none"> • Bronchodilators • Expectorants • Anti-tussive agents • Mucolytic agents 	2
8	Drugs Acting on the Gastro Intestinal Tract Definition, classification, pharmacological actions, dose, indications and contraindications of <ul style="list-style-type: none"> • Anti-ulcer drugs • Anti-emetics • Laxatives and purgatives • Anti-diarrheal drugs 	5
9	Drugs Acting on the Kidney Definition, classification, pharmacological actions, dose, indications, and contraindications of <ul style="list-style-type: none"> • Diuretics • Anti-Diuretics 	2
10	Hormones and Hormone Antagonists Physiological and pathological role and clinical uses of <ul style="list-style-type: none"> • Thyroid hormones • Anti-thyroid drugs • Parathormone • Calcitonin • Vitamin D • Insulin • Oral hypoglycemic agents • Estrogen • Progesterone • Oxytocin • Corticosteroids 	8
11	Autocoids <ul style="list-style-type: none"> • Physiological role of Histamine, 5 HT and Prostaglandins • Classification, clinical uses and adverse effects of Antihistamines and 5 HT antagonists 	3



12	<p>Chemotherapeutic Agents: Introduction, basic principles of chemotherapy of infections, infestations and neoplastic diseases, Classification, dose, Indication and contraindications of drugs belonging to</p> <ul style="list-style-type: none"> • Penicillins • Cephalosporins • Aminoglycosides • Fluoroquinolones • Macrolides • Tetracyclines • Sulphonamides • Anti-tubercular drugs • Anti-fungal drugs • Anti-viral drugs • Anti-amoebic agents • Anthelmintics • Anti-malarial agents • Anti-neoplastic agents 	12
13	<p>Biologicals Definition, types and indications of biological agents with examples</p>	2

Course Outcomes for ER 20-21 T

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should have pharmacological knowledge of drugs.	2	Em
CO2	Students should be able to know the mode of action of every drug,	2	Em
CO3	Students should be able to know the toxicology of different drugs	2	Em
CO4	Students should have knowledge of pharmacokinetics and pharmacodynamics of drug.	2	Em
CO5	Students should be able to know the side effect and adverse effect of drug	2	Em



CO-PO Mapping for ER 20-21 T

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	2	1	1	1	2	1	2	2	1
CO2	2	1	2	1	2	2	3	1	2	3	2	1	2	1
CO3	2	2	2	1	2	2	1	1	2	2	1	2	2	1
CO4	3	2	2	2	1	2	2	2	1	3	2	2	2	1
CO5	2.25	1.75	1.75	1.25	1.75	2	1.75	1.25	1.5	2.5	1.5	1.75	2	1
Avg	2	2	1	1	2	2	1	1	1	2	1	2	2	1



PHARMACOLOGY–PRACTICAL

Course Code: ER 20-21P

50 Hours (2 Hours/week)

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

Practicals

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

1. Introduction to experimental pharmacology
2. Study of laboratory animals
 - (a) Mice (b) Rats (c) Guinea pigs (d) 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).

- 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 Convulsimeter
- 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 (any2) on isolated heart
- Effect of drugs on ciliary motility on frog's buccal cavity
 1. Pyrogen testing by rabbit method
 2. Introduction to High Through put screening
 3. Introduction to ELISA test
 4. Intro to Allergy Testing
 5. Intro to Toxicity Studies
 6. Drugs available as pediatric formulations
 7. Drug Facts Labels of USFDA
 8. Antimicrobial Resistance
 9. Introduction to Bioassays
 10. Pre-clinical studies in new drug development



Course Outcomes for ER 20-21 P

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should be able to know the pharmacokinetic and pharmacodynamic drug actions.	2	Em
CO2	Students should be able to know the developing an insight of pharmacology and toxicology.	2	Em
CO3	Students should be able to know ADR monitoring.	2	Em

CO-PO Mapping for ER 20-21 P

Course Outcomes	Program Outcomes (Course Articulation Matrix (HighlyMapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2	2	2	1	2	2	3	3	1	1	2	2	2	1
CO2	2	2	1	2	3	3	2	3	2	2	3	2	1	1
CO3	2	1	1	2	2	3	1	2	1	2	2	1	2	1
Avg.	2.0	1.7	1.3	1.7	2.3	2.7	2.0	2.7	1.3	1.7	2.3	1.7	1.7	1.0



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

1. Establishing and running a community pharmacy and its legal requirements
2. Professional aspects of handling and filling prescriptions
3. Patient counseling on diseases, prescription and or non-prescription drugs
4. Scope for performing basic health screening in 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Definition, types of communication skills • Interactions with professional sand patients 	6
	<ul style="list-style-type: none"> • Verbal communication skills (one-to-one, over the telephone) • Written communication skills • Body language • Patient interview techniques 	



5	Patient counseling <ul style="list-style-type: none"> • Definition and benefits of patient counseling • Stages of patient counseling - Introduction, counseling content, counseling process and closing the counseling session • Barriers to effective counseling-Types and strategies to overcome the barriers • Patient counseling 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 <ul style="list-style-type: none"> • 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 ,gums swelling 	15
10	Community Pharmacy Management <ul style="list-style-type: none"> • Legal requirements to set up a community pharmacy • Site selection requirements • Pharmacy designs and interiors • Vendors election and ordering 	25



	<ul style="list-style-type: none"> • Procurement, inventory control methods, and inventory management • Financial planning and management • Accountancy in community pharmacy–Daybook,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 	
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Course Outcomes for ER 20-22 T

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should have knowledge of the establishment ,legal requirements and effective administration of a community pharmacy	2	Em
CO2	Students should be able to know the Professionally handle prescriptions and dispense medications	2	Em
CO3	Students should be able to know the Counsel patients about the disease ,prescription and command on prescription drugs	2	Em
CO4	Students should have knowledge of Perform basic health screening on patient s and interpret the reports in the community pharmacy settings	2	Em



CO-PO Mapping for ER 20-22 T

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	2	1	1	1	2	1	2	2	1
CO2	2	1	2	1	2	2	3	1	2	3	2	1	2	1
CO3	2	2	2	1	2	2	1	1	2	2	1	2	2	1
CO4	3	2	2	2	1	2	2	2	1	3	2	2	2	1
Avg	6.75	5.5	5.5	3.5	6.25	2	5.5	3.5	4.5	2.5	1.5	1.75	2	1



COMMUNITY PHARMACY AND MANAGEMENT–PRACTICAL

Course Code: ER 20-22P

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 the simulated community pharmacy.

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.

1. Handling of prescriptions with professional standards, reviewing prescriptions, checking for legal compliance and completeness (minimum5)
2. Identification of drug-drug interactions in the prescription and follow-up actions(minimum2)
3. Preparation of dispensing label and auxiliary labels for the prescribed medications(minimum5)
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 counseling 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
6. Providing counseling 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.
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


Course Outcomes for ER 20-22 P

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should have knowledge of Handle and fill prescriptions in a professional manner.	2	Em
CO2	Students should be able to know the Professionally handle prescriptions and dispense medications	2	Em
CO3	Students should be able to know the Counsel patients about the disease ,prescription and non-prescription drugs	2	Em
CO4	Students should have knowledge of Perform basic health screening on patient s and interpret the reports in the community pharmacy settings	2	Em

CO-PO Mapping for ER 20-22 P

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	2	1	1	1	2	1	2	2	1
CO2	2	1	2	1	2	2	3	1	2	3	2	1	2	1
CO3	2	2	2	1	2	2	1	1	2	2	1	2	2	1
CO4	3	2	2	2	1	2	2	2	1	3	2	2	2	1
Avg	6.75	5.5	5.5	3.5	6.25	2	5.5	3.5	4.5	2.5	1.5	1.75	2	1



BIOCHEMISTRY & CLINICAL PATHOLOGY– THEORY

Course Code: ER20-23T

75 Hours(3 Hours/week)

Scope: This course is designed to impart basic knowledge on the study of structure and functions of biomolecules and the chemical processes associated with living cells in normal and abnormal states. The course also emphasizes on the clinical pathology of blood and urine.

Chapter	Topic	Hours
1	Introduction to biochemistry: Scope of biochemistry in pharmacy; Cell and its biochemical organization.	2
2	Carbohydrates <ul style="list-style-type: none"> • Definition, classification with examples, chemical properties • Mono saccharides-Structure of glucose, fructose and galactose • Disaccharides-structure of maltose, lactose and sucrose • Polysaccharides-chemical nature of starch and Glycogen • Qualitative tests and biological role of carbohydrates 	5
	Proteins <ul style="list-style-type: none"> • Definition, classification of proteins based on composition and solubility with examples • Definition, classification of amino acids based on chemical nature and nutritional requirements with examples • Structure of proteins (four levels of organization of protein structure) • Qualitative tests and biological role of proteins and amino acids • Diseases related to malnutrition of proteins. 	5
4	Lipids <ul style="list-style-type: none"> • Definition, classification with examples • Structure and properties of tri glycerides (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 the body • Qualitative tests and functions of lipids 	5



5	Nucleic acids <ul style="list-style-type: none"> • Definition, purine and pyrimidine bases • Components of nucleosides and nucleotides with examples • Structure of DNA(Watson and Crick model), RNA and Their functions 	4
6	Enzymes <ul style="list-style-type: none"> • Definition, properties and IUB and MB classification • Factors affecting enzyme activity • Mechanism of action of enzymes, Enzyme inhibitors • Therapeutic and pharmaceutical importance of enzymes 	5
7	Vitamins <ul style="list-style-type: none"> • Definition and classification with examples • Sources, chemical nature, functions, coenzyme form, recommended dietary requirements, deficiency diseases of fat-and water-soluble vitamins 	6
8	Metabolism (Study of cycle/pathways without chemical structures)	20
	<ul style="list-style-type: none"> • 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 Keto acidosis, 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, phenyl ketonuria, alkaptonuria and Jaundice. • Biological oxidation: Electron transport chain And Oxidative phosphorylation 	
9	Minerals: Functions, Deficiency diseases, recommended dietary requirements of calcium, phosphorus, iron, sodium and chloride	05



10	Water and Electrolytes <ul style="list-style-type: none"> • Distribution, functions of water in the body • Water turns over and balance • Electrolyte composition of the body fluids, Dietary intake of electrolyte and Electrolyte balance • Dehydration, causes of dehydration and oral Rehydration therapy 	05
11	Introduction to Biotechnology	01
12	Organ function tests <ul style="list-style-type: none"> • 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 	06
13	Introduction to Pathology of Blood and Urine <ul style="list-style-type: none"> • Lymphocytes and Platelets, their role in health and disease • Erythrocytes -Abnormal cells and their significance • Normal and Abnormal constituents of Urine and their significance 	06

Course Outcomes for ER20-23 T

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should be able to know the role of various protein, carbohydrates, co-enzymes and vitamins including normal and abnormal metabolism.	2	Em,S
CO2	Students should be able to understand the catalytic role of co-enzymes	2	Em,S
CO3	Students should be able to know the importance of enzyme inhibitors in design of new drugs.	2	Em,S
CO4	therapeutic and diagnostic applications of co- enzymes	2	Em,S
CO5	Students should be able to understand the pathology of body fluids and their importance.	2	Em,S



CO-PO Mapping for ER 20-23 T

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	2	2	1	3	1	2	2	1
CO2	2	3	1	1	1	2	2	2	1	3	2	1	1	1
CO3	2	2	1	2	1	1	2	2	2	3	3	2	2	1
CO4	1	2	2	1	2	2	2	2	2	1	2	2	1	1
CO5	2	2	3	2	1	2	1	1	1	3	1	2	2	1
Avg	1.8	2.2	1.8	1.6	1.4	1.8	1.8	1.8	1.4	2.6	1.8	1.8	1.6	1.0

BIOCHEMISTRY & CLINICAL PATHOLOGY – PRACTICAL

Course Code: ER20-23P
75 Hours (3 Hours/week)

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

Practicals

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

Course Outcomes for ER 20-23P

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/None (Use, for more than one)
CO1	Students should be able to clinical diagnosis of diseases.	2	Em,S
CO2	Students should be able to perform the detection test of proteins, amino acids, and lipids in given samples	2	Em,S
CO3	Students should be able to normal range of biochemical values in human body.	2	Em,S

CO-PO Mapping for ER-20-23P

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	1	2	1	1	3	1	2	2	2	1	1	2	1	1.0
CO2	2	1	3	3	1	2	2	2	2	3	2	1	1	1.0
CO3	2	2	2	3	1	1	2	2	1	2	2	1	2	1.0
Avg	1.67	1.67	2.00	2.33	1.67	1.33	2.00	2.00	1.67	2.00	1.67	1.33	1.33	1.00

PHARMACOTHERAPEUTICS -THEORY

Course Code: ER 20-24T
75 Hours (3Hours/week)

Scope: This course is designed to impart basic knowledge on etiopathogenesis of common diseases and their management along with quality use of medicines.

Chapter	Topic	Hours
1	Pharmacotherapeutics – Introduction, scope and objectives. Rational use of Medicines, Evidence Based Medicine, Essential Medicines List, Standard Treatment Guidelines (STGs)	10
2	Definition, etiopathogenesis, clinical manifestations, non-pharmacological and pharmacological management of the diseases associated with	
	(a) Cardiovascular System <ul style="list-style-type: none"> • Hypertension • Angina and Myocardial infarction • Hyperlipidaemia • Congestive Heart Failure 	8
	(b) Respiratory System <ul style="list-style-type: none"> • Asthma • COPD 	4
	(c) Endocrine System <ul style="list-style-type: none"> • Diabetes • Thyroid disorders-Hypo and Hyperthyroidism 	5
	(d) Central Nervous System <ul style="list-style-type: none"> • Epilepsy • Parkinson’s disease • Alzheimer’s disease • Stroke • Migraine 	8
	(e) Gastro Intestinal Disorders <ul style="list-style-type: none"> • Gastro esophageal reflux disease • Peptic Ulcer Disease • Alcoholic liver disease • Inflammatory Bowel Diseases (Crohn’s Disease and Ulcerative Colitis) 	8
	(f) Haematological disorders <ul style="list-style-type: none"> • Iron deficiency anaemia • Megalo blastic anaemia 	4

(g) Infectious diseases <ul style="list-style-type: none"> • Tuberculosis • Pneumonia • Urinary tract infections • Hepatitis • Gonorrhoea and Syphilis • Malaria • HIV and Opportunistic infections • Viral Infections (SARS, CoV2) 	12
(h) Musculo skeletal disorders <ul style="list-style-type: none"> • Rheumatoid arthritis • Osteoarthritis 	3
(i) Dermatology <ul style="list-style-type: none"> • Psoriasis • Scabies • Eczema 	3
(j) Psychiatric Disorders <ul style="list-style-type: none"> • Depression • Anxiety • Psychosis 	4
(k) Ophthalmology <ul style="list-style-type: none"> • Conjunctivitis (bacterial and viral) • Glaucoma 	2
(l) Anti-microbial Resistance	2
(m) Women's Health <ul style="list-style-type: none"> • Polycystic Ovary Syndrome • Dysmenorrhea 	4
<ul style="list-style-type: none"> • Premenstrual Syndrome 	

Course Outcomes for ER20-24 T

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should be able to help assessing the subjective and objective parameters of patients in common disease conditions.	2	Em,S
CO2	Students should be able to understand to Assist the health care provides to analyze drug related problems and provide therapeutic interventions.	2	Em,S
CO3	Students should be Participate in planning the rational medicine therapy for common diseases.	2	Em,S
CO4	Students should be able to understand Design and deliver discharge counseling for patients.	2	Em,S

CO-PO Mapping for ER 20-24 T

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	P O 3	P O 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PS O2	PSO3
CO1	2	2	2	2	2	2	2	2	1	3	1	2	2	1
CO2	2	3	1	1	1	2	2	2	1	3	2	1	1	1
CO3	2	2	1	2	1	1	2	2	2	3	3	2	2	1
CO4	1	2	2	1	2	2	2	2	2	1	2	2	1	1
Avg	1.75	2.2	1. 5	1. 6	1.5	1.7 5	1.8	2	1.5	2.5	2	1.75	1.5	1.00

PHARMACOTHERAPEUTICS–PRACTICAL

Course Code: ER20-24P
25 Hours (1Hour/week)

Scope: This course is designed to train the students in the basic skills required to support the pharmaceutical care services for selected common disease conditions.

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)

Course Outcomes for ER 20-24P

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurs hip (En)/None (Use, for more than one)
CO1	Students should be able to clinical diagnosis of diseases.	2	Em,S
CO2	Students should be able to perform the detection test of proteins, amino acids, and lipids in given samples	2	Em,S
CO3	Students should be able to normal range of biochemical values in human body.	2	Em,S

CO-PO Mapping for ER-20-24P

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	1	2	1	1	3	1	2	2	2	1	1	2	1	1.0
CO2	2	1	3	3	1	2	2	2	2	3	2	1	1	1.0
CO3	2	2	2	3	1	1	2	2	1	2	2	1	2	1.0
Avg	1.67	1.67	2.00	2.33	1.67	1.33	2.00	2.00	1.67	2.00	1.67	1.33	1.33	1.00

HOSPITAL AND CLINICAL PHARMACY –THEORY

Course Code: ER20-25
75Hours (3 Hours/week)

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

S.No.	Topic	Hours
1	Hospital Pharmacy <ul style="list-style-type: none"> • Definition, scope, national and international scenario • Organizational 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 NABH Accreditation and Role of Pharmacists 	6
2	Different Committees in the Hospital <ul style="list-style-type: none"> • Pharmacy and Therapeutics Committee-Objectives, Composition and functions • Hospital Formulary - Definition, procedure for Development and use of hospital formulary 	4
	<ul style="list-style-type: none"> • Infection Control Committee–Role of Pharmacist in preventing Antimicrobial Resistance 	
4	Supply Chain and Inventory Control <ul style="list-style-type: none"> • Preparation of Drug lists - High Risk drugs, Emergency drugs, ScheduleH1 drugs,NDPSdrugs,reservedantibiotics • 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 their disposal methods e.g., Narcotics • Documentation -purchase and inventory 	14

5	Drug distribution <ul style="list-style-type: none"> • 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
8	Application of computers in Hospital Pharmacy Practice, Electronic health records, Softwares used in hospital pharmacy	2
9	<p>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.</p> <p>Daily activities of clinical pharmacists: Definition, goal and procedure of</p> <ul style="list-style-type: none"> • Ward round participation • Treatment Chart Review • Adverse drug reaction monitoring • Drug information and poisons information • Medication history • Patient counselling • Inter professional collaboration <p>Pharmaceutical care: Definition, classification of drug related problems. Principles and procedure to provide pharmaceutical care</p> <p>Medication Therapy Management, Home Medication Review</p>	12
10	Clinical laboratory tests used in the evaluation of disease states- significance and interpretation of test results <ul style="list-style-type: none"> • Hematological, 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
12	Pharmacovigilance <ul style="list-style-type: none"> • 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

Course Outcomes for ER 20-25 T

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/Skill(S)/Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should be able to know the clinical parameters of hospitals	2	Em
CO2	Students should be able to Know about the IPD and OPD of the hospitals.	2	Em
CO3	Students should be able to know the layout and working culture of hospitals	2	Em
CO4	Students should be able to know the function and definition of various items in hospitals	2	Em

CO-PO Mapping for ER 20-25 T

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	2	1	1	1	2	1	2	2	1
CO2	2	1	2	1	2	2	3	1	2	3	2	1	2	1

CO3	2	2	2	1	2	3	1	1	2	2	1	2	2	1
CO4	3	2	2	2	1	2	2	2	1	3	2	2	2	1
Avg	2.25	1.75	1.75	1.25	1.75	2.25	1.75	1.25	1.5	2.5	1.5	1.75	2	1

HOSPITAL AND CLINICAL PHARMACY–PRACTICAL

Course Code: ER20-25P
25 Hours (1 Hour/Week)

Scope: This course is designed to train the students to assist other health care providers in the basic services of hospital and clinical pharmacy.

Practicals

1. Systematic approach to drug information queries using primary /secondary/ tertiary resources of information (2cases)
2. Interpretation of laboratory reports to optimize the drug therapy in a given clinical case(2cases)
3. Filling up IPC's ADR Reporting Form and perform causality assessments using various scales(2cases)
4. Demonstration / simulated/ hands-on experience on the identification, types, use/application/administration of
 - Orthopaedic 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 case and role play – any 2 cases)
7. Vaccination and injection techniques (IV, IM, SC) using mannequins (5 activities)

Course Outcomes of ER 20-25P

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should be able to working in hospital and management of clinical pharmacy.	2	Em
CO2	Students should be able for the preparation and management of infusions.	2	Em
CO3	Students should be able to know the sterilization and evaluation of surgical dressings and other hospital supplies	2	Em

CO PO Mapping of ER 20-25 P

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO 3	PO 4	P O 5	PO 6	PO 7	P O 8	P O 9	PO 10	PO 11	PSO 1	PS O2	PS O3
CO1	2	2	2	2	2	2	3	3	1	2	2	2	2	1
CO2	1	2	3	2	2	2	1	1	3	2	2	2	2	1
CO3	2	1	1	2	2	3	1	1	3	2	2	3	2	1
Avg.	1.7	1.7	1.3	2.0	2.0	1.3	1.7	1.7	2.3	2.0	2.0	1.7	2.0	1

PHARMACY LAW AND ETHICS–THEORY

Course Code: ER20-26T

75 Hours(3Hours/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

1. General perspectives, history, evolution of pharmacy law in India
2. Act and Rules regulating the profession and practice of pharmacy in India
3. Important code of ethical guidelines pertaining to various practice standards
4. 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

1. Describe the history and evolution of pharmacy law in India
2. Interpret the act and rules regulating the profession and practice of pharmacy in India
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

Chapter	Topics	Hours
1	General Principals 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	23

	<p>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.</p> <p>Study of schedule C and C1, G,H,H1,K,P,M,N,X and Y.</p> <p>Sale of Drugs – Wholesale, Retail sale and Restricted license, Records to be kept in a pharmacy Drugs Prohibited for manufacture and sale in India</p> <p>Administration of the Act and Rules – Drugs Technical Advisory Board, Central Drugs Laboratory ,Drugs Consultative Committee, Government analysts, licensing authorities, controlling authorities, Drug Inspectors.</p>	
4	<p>Medicinal and Toilet Preparations Act 1955: Objectives, Definitions, Licensing, Offences and Penalties</p>	2
5	<p>Narcotic Drugs and psychotropic substances Act 1985 and Rules Objectives, Definitions, Authorities and Officers, Prohibition, Control and Regulation, Offences and Penalties.</p>	2
6	<p>Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties.</p>	2
7	<p>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.</p>	2
8	<p>Poisons Act-1919: Introduction, objective, definition, possession, possession for sales and sale of any poison, import of poisons</p>	2
9	<p>FSSAI (Food Safety and Standards Authority of India) Act and Rules: brief overview and aspects related to manufacture, storage, sale and labeling of Food Supplements.</p>	2

10	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	5
	Policy 2002, National List of Essential Medicines (NLEM)	
11	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
12	Medical Termination of Pregnancy Act and Rules–basic understanding/salient features	2
13	Role of all the government pharma regulator bodies– Central Drugs Standards Control Organization(CDSCO), Indian Pharmacopoeia Commission(IPC)	1
14	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
15	Introduction to BCS system of classification, Basic concepts of Clinical Trials, ANDA, NDA, New Drug development, Schedule Y. Brand v/s Generic, Trade name concept, Introduction to Patent Law and Intellectual Property Rights, Emergency Use Authorization	5
16	Blood bank–basic requirements and functions	2
17	Clinical Establishment Act and Rules–Aspects related to Pharmacy	2
18	Biomedical Waste Management Rules2016– Basic aspects, and aspects related to pharma manufacture to disposal of pharma/medical waste at homes, pharmacies, and hospitals	2
19	Bioethics-Basic concepts, history and principles. Brief over view of ICMR's National Ethical Guidelines for Biomedical and Health Research involving human Participants	2
20	Introduction to the Consumer Protection Act	2
21	Medical Devices–Categorization, basic aspects related to Manufacture and sale	2

Course Outcomes for PR1206

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (Use, for more than one)
CO1	Students should be able to know the rules to run a pharmacy college	2	Em
CO2	Students should be able to know the legislation of Pharmacy Council of India	2	Em
CO3	Students should be able to know the regulation of the pharmacy acts	2	Em
CO4	Students should be able to know the regulation for sale and purchase of the medicine	2	Em
CO5	Students should be able to know the different schedule of pharmacy acts	2	Em

CO-PO Mapping for PR1206

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	1	2	3	1	2	2	2	2	2	1	1
CO2	2	3	2	3	2	3	3	2	2	2	3	1	3	1
CO3	2	3	2	3	2	3	3	2	2	2	3	2	3	1
CO4	2	3	2	3	2	3	3	2	2	2	2	2	3	1
CO5	2	1	2	1	2	3	1	2	2	2	2	1	1	1
Avg.	2	2.2	2	2.2	2	3	2.2	2	2	2	2.4	1.6	2.2	1

Appendix –1

A typical format for the assessment of an Assignment

Name of the College:

Name of the Student:	
Academic Year of the Student:	
Name of the Subject:	
Title of the Assignment:	
Date on which the Assignment was given:	
Date on which the Assignment was submitted:	
Name & Designation of the Evaluator:	
Signature of the Evaluator with Date:	

Directions: For evaluations, enter rating of the student utilizing the following scale:5–Excellent;4-VeryGood;3–Good;2–Satisfactory;1-Poor

Assessment Criteria	Score	Comments if any
a. Relevance with the content		
b. Use of resource material		
c. Organization & mechanical accuracy		
d. Cohesion & coherence		
e. Language proficiency & Timely submission		
Total Score		

Signature of the Student with Date:

Appendix –2

A typical format for the assessment of a Field Visit Report

Name of the College:

Name of the Student:	
Academic Year of the Student:	
Name of the Subject:	
Name & full address of the organization visited:	
Date and Duration of Visit:	
Name & Designation of the Evaluator:	
Signature of the Evaluator with Date:	
Objectives set for the field visit: (give 2– 4 objectives one by one)	
Prior preparation of the student for the field visit: (minimum 100 words)	
Describe the general experiences during the field visit: (minimum 100 words)	
Learning points: Describe what theoretical concept that is correlated during the field visit: (minimum 300 words)	



Appendix –3

**List of instruments and equipments required for the conduct of D.Pharm programs
perER-2020**

As per ER 2020 regulation;

At least four laboratories specified below should be provided for:

1. Pharmaceutics Lab.
2. Pharm.Chemistry Lab.
3. Physiology, Pharmacology and Pharmacognosy Lab.
4. Biochemistry, Clinical Pathology, Hospital and Clinical Pharmacy Lab.

The institutions shall provide “Model Pharmacy” as per following details

Model Pharmacy	No.	Area
<u>Essential:</u> Running Model Community Pharmacy <u>Desirable:</u> Drug Model Store	01	80Sq.Mts.(Including10Sq.mt.forDrug InformationCentre&10Sq.mt.forPat ientCounselling)

Note: Wherever animal experimentations are prescribed in the curriculum, the required knowledge and skill should be impacted by using computer assisted modules.