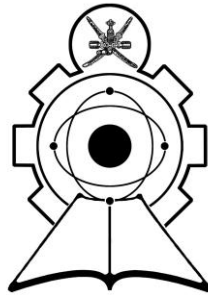


**SULTANATE OF OMAN
MINISTRY OF MANPOWER
HIGHER COLLEGE OF TECHNOLOGY**



**PHARMACY DEPARTMENT
ASSISTANT PHARMACY DIPLOMA – COURSE BOOK
2016 – 2017**

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Higher College of Technology
Pharmacy Department
I. Assistant Pharmacy Diploma – Degree Audit
September 2016

Semester-I (12 Credits)									
Course Code	Course Title	Prerequisite	Co-requisite	Passing Grade	Type	Credit Points	Theory Hours	Practical Hours	Contact Hours
PHAR6100	Pharmaceutical Terminology	-	-	C	MR	1	1	-	1
PHAR6200	First Aid	-	-	C	MR	1	1	-	1
PHAR3100	Fundamentals of Pharmacology	-	-	C	MR	3	2	2	4
CHEM1102	Fundamentals of Chemistry	-	-	C-	DR	3	2	2	4
PENG1100	English-I	-	-	D	CR	1	3	-	3
ENTW1100	Technical Writing-I	-	-	D	CR	3	4	-	4
Total						12	13	4	17
Semester-II (15 Credits)									
Course Code	Course Title	Prerequisite	Co-requisite	Passing Grade	Type	Credit Points	Theory Hours	Practical Hours	Contact Hours
PHAR1110	Pharmacy Practice & Dosage Forms -I	-	-	C	MR	4	3	2	5
PHAR2210	Biochemistry-I	CHEM1102	-	C	MR	2	1	2	3
PHAR2110	Pharmaceutical Chemistry-I	CHEM1102	-	C	MR	3	2	2	4
PHAR3210	Applied Therapeutics-I	-	-	C	MR	2	2	-	2
PENG1200	English-II	PENG1100	-	D	CR	1	3	-	3
ENTW1200	Technical Writing-II	ENTW1100	-	D	CR	3	4	-	4
Total						15	15	6	21

Summer Semester-I (4 Credits)									
Course Code	Course Title	Prerequisite	Co-requisite	Passing Grade	Type	Credit Points	Theory Hours	Practical Hours	Contact Hours
PHAR6300	Pharmacy Laws & Management	-	-	C	MR	1	1	-	1
PENG1300	Public Speaking & Communication Skills	-	-	D	CR	3	3	-	3
Total						4	4	-	4
Semester-III (13 Credits)									
Course Code	Course Title	Prerequisite	Co-requisite	Passing Grade	Type	Credit Points	Theory Hours	Practical Hours	Contact Hours
PHAR1120	Pharmacy Practice & Dosage Forms-II	PHAR1110	-	C	MR	4	3	2	5
PHAR2220	Biochemistry-II	PHAR2210	-	C	MR	1	1	-	1
PHAR3220	Applied Therapeutics-II	PHAR3210 PHAR3100	-	C	MR	3	2	2	4
PHAR2120	Pharmaceutical Chemistry-II	PHAR2110	-	C	MR	2	1	2	3
PHAR5110	Pharmaceutical Microbiology	-	-	C	MR	3	2	2	4
Total						13	9	8	17
Semester-IV (13 Credits)									
Course Code	Course Title	Prerequisite	Co-requisite	Passing Grade	Type	Credit Points	Theory Hours	Practical Hours	Contact Hours
PHAR1130	Pharmacy Practice-III	PHAR1120	PHAR1140	C	MR	4	3	2	5
PHAR2300	Medicinal Chemistry	PHAR2120	-	C	MR	2	2	-	2
PHAR1140	Dosage Forms-III & Quality Control	PHAR1120	PHAR1130	C	MR	4	2	4	6
PHAR3230	Applied Therapeutics-III	PHAR3220	-	C	MR	3	2	2	4
Total						13	9	8	17

Summer Semester-II (4 Credit)									
Course Code	Course Title	Prerequisite	Co-requisite	Passing Grade	Type	Credit Points	Theory Hours	Practical Hours	Contact Hours
PHAR5120	Public Health	PHAR5110	-	C	MR	1	1	-	1
PHAR4100	Natural Products from Medicinal Plants	-	-	C	MR	3	2	2	4
Total						4	3	2	5
Semester-V (12 Credits)									
Course Code	Course Title	Prerequisite	Co-requisite	Passing Grade	Type	Credit Points	Theory Hours	Practical Hours	Contact Hours
PHAR1150	Pharmacy Practice & Dosage Forms -IV	PHAR1130 PHAR1140	-	C	MR	3	3	-	3
PHAR3240	Applied Therapeutics-IV	PHAR3230	-	C	MR	3	2	2	4
PHAR1200	Departmental Pharmacy Training	PHAR1130 PHAR3230	-	C	MR	3	-	6	6
BAMG2111	Entrepreneurship	-	-	D	CR	3	3	-	3
Total						12	8	8	16
Semester-VI (2 Credits)									
Course Code	Course Title	Prerequisite	Co-requisite	Passing Grade	Type	Credit Points	Theory Hours	Practical Hours	Contact Hours
PHAR6400	Graduation Project	PHAR1150 PHAR3240 PHAR2300	None	C	MR	2	-	4	4
PHAR6500	On-the-Job Training (OJT)	PHAR1150 PHAR3240	None	C	MR	-	-	-	-

*** Total Credits = 75**

(CW = College Requirements = 14 Credits; DR = Departmental Requirements = 3 Credits; MR = Major Requirements = 58 Credits)

Assistant Pharmacy Diploma

II. Classification of Courses – Delivered by Pharmacy Department

Course Number	Course Title
<i>a) 1 Credit courses (only Theory)</i>	
PHAR6100	Pharmaceutical Terminology
PHAR6200	First Aid
PHAR6300	Pharmacy Laws & Management
PHAR2220	Biochemistry-II
PHAR5120	Public Health
<i>b) 2 Credit courses (only Theory)</i>	
PHAR3210	Applied Therapeutics-I
PHAR2300	Medicinal Chemistry
<i>c) 3 Credit courses (only Practical)</i>	
PHAR1200	Departmental Pharmacy Training
<i>d) 2 Credit courses (Theory & Practical–1 credit each)</i>	
PHAR2210	Biochemistry-I
PHAR2120	Pharmaceutical Chemistry-II
<i>e) 3 Credit courses (only Theory)</i>	
PHAR1150	Pharmacy Practice & Dosage Forms-IV
<i>f) 3 Credit courses (Theory–2 credits & Practical–1 credit)</i>	
PHAR3100	Fundamentals of Pharmacology
PHAR2110	Pharmaceutical Chemistry-I
PHAR3220	Applied Therapeutics-II
PHAR3230	Applied Therapeutics-III
PHAR3240	Applied Therapeutics-IV
PHAR5110	Pharmaceutical Microbiology
PHAR4100	Natural Products from Medicinal Plants
<i>g) 4 Credit courses (Theory–2 credits & Practical–2 credit)</i>	
PHAR1140	Dosage Forms-III & Quality Control
<i>h) 4 Credit courses (Theory–3 credits & Practical–1 credit)</i>	
PHAR1130	Pharmacy Practice-III
PHAR1110	Pharmacy Practice & Dosage Forms -I
PHAR1120	Pharmacy Practice & Dosage Forms -II
<i>i) Graduation project</i>	
PHAR6400	Graduation Project
<i>j) Training course</i>	
PHAR6500	On-the-Job Training (OJT)

III. Assistant Pharmacy Diploma – Evaluation Details

#	Type of Course	Theory				Practical				Total
		Course Work			Final	Course Work			Final	
		Quiz	Mid-Semester	Others*		Quiz	Mid-Semester	Others*		
1	1, 2 & 3 Credit courses (only Theory)	15	20	15	50	-	-	-	-	100
2	3 Credit courses (only Practical)	-	-	-	-	10	20	20	50	100
3	2 Credit courses (Theory & Practical–1 credit each)	8	10	7	25	15	20	15	-	100
4	3 Credit courses (Theory–2 credits & Practical–1 credit)	10	13	10	34	10	13	10	-	100
5	4 Credit courses (Theory–2 credits & Practical–2 credit)	8	10	7	25	15	20	15	-	100
6	4 Credit courses (Theory–3 credits & Practical–1 credit)	11	15	11	38	8	10	7	-	100

* Include “Student Centered Learning” approaches.

IV. HCT - Grading System

GPA	Percentage	Grade	Passing Grade
4	90-100	A	-
3.7	85-89	A-	-
3.3	80-84	B+	-
3	76-79	B	-
2.7	73-75	B-	-
2.3	70-72	C+	-
2	67-69	C	Major Requirements
1.7	60-66	C-	Departmental Requirement
1	55-59	D	College Requirement
0	≤ 54	F	-

V. Assistant Pharmacy Program

– Course Details –

PHAR1110	Pharmacy Practice & Dosage Forms-I	4 Credit hours
Prerequisite	None	
Hours/Week	3 (Theory) + 2 (Practical)	
Goal	To introduce the students to pharmaceutical drug preparations, definitions, classifications, uses along with the basic principles of compounding and dispensing including pharmaceutical calculations.	
Objectives		Outcomes
The course should enable the students to:		The students should be able to:
<ol style="list-style-type: none"> 1. Understand the classifications and the definitions of all the dosage forms. 2. Get acquainted with the fundamental operations in pharmaceutical practice such as weighing, drying, mixing, size reduction of particles, filtration, evaporation, sterilization, etc. 3. Deal with liquid dosage formulation related components like solvents, solubilizers, preservatives, stabilizers, sweetening agents, flavoring and coloring agents. 4. Gain knowledge about different types of containers, closures and packaging material along with labeling information for the dispensed products. 5. Understand the contents of prescription, its types and general dispensing procedures. 6. Study about the posology /doses of commonly used drugs and pharmaceutical calculations. 7. Understand good manufacturing practices (GMP) and good laboratory practices (GLP) in compounding and dispensing. 8. Get acquainted with the non-sterile aqueous and non aqueous solutions meant for oral and external use. 		<ol style="list-style-type: none"> 1. Get familiar with the pharmaceutical dosage forms. 2. Recall the role of gained information concerning unit operations to be applied in pharmacy practice e.g. size reduction, mixing, filtration, etc. 3. Realize the importance of each component in dosage forms e.g. solvents, solubilizers, preservatives, etc. 4. Select suitable containers for the dispensed products and compose appropriate labels. 5. Respond to different types of prescription reading and general dispensing procedures. 6. Carry out calculation of drug doses and pharmaceutical calculations. 7. Formulate simple extemporaneous preparation of some drugs by following GMP & GLP. 8. Apply the gained information about the equipment and machineries used in drug manufacturing.

Pharmacy Practice & Dosage Forms-I

Contents

Topics
1. Introduction to Dosage Forms: Liquid dosage forms and non-sterile liquid dosage forms.
2. Formulation considerations: additives e.g. solvents, stabilizers, preservative, organoleptic additives, etc.
3. Liquid Dosage Forms: a) Non-sterile monophasic liquid dosage forms, aromatic waters, syrups and aqueous solutions. Selection of containers, storage conditions, labeling and their applications. b) Oral and external solutions: Simple mixtures, oral drops, astringent solutions, anti-infective solutions, mouth washes, gargles, douches, nasal drops and enemas. Selection of containers, storage conditions, labeling and their applications. c) Non-aqueous pharmaceutical solutions: Elixirs, spirits, collodions, glycerites, liniments, ear drops and inhalations.
4. Pharmaceutical Processes: a) Pharmaceutical processes not involving application of heat: Size reduction, mixing, separation of solids from liquids and extractions. b) Pharmaceutical processes involving application of heat: Evaporation, drying, crystallization, distillation, sublimation and sterilization.
5. Fundamental operations in compounding: Weighing, measurement of liquids, mixing, dissolution, filtration, etc.
6. Good pharmaceutical practice in compounding and dispensing of drugs
7. Formulation of Dispensed Products
8. Containers & Closures for Dispensed Products: Packaging materials and packaging process.
9. Labeling of dispensed medicines: Information on the label, cautionary & advisory labels and preparation of labels.
10. Responding to Prescription: Types of prescription and general dispensing procedures.
11. Pharmaceutical Calculations: Alligation methods for alcohol dilutions, proof strength, ratio & proportions, reducing & enlarging formulas, density, specific gravity, etc.

PHAR1120	Pharmacy Practice & Dosage Forms-II	4 Credit hours
Prerequisite	PHAR1110 (Pharmacy Practice & Dosage Forms-I)	
Hours / Wk	3 (Theory) + 2 (Practical)	
Goal	To impart the methods of communication & counseling skills. To enlighten about some proprietary and OTC (Over- The- Counter) drug products acting on skin, eye, nose, and throat. Besides make the students thorough with the process and formulations of sterile and non-sterile liquid dosage forms.	
Objectives		Outcomes
The course should enable the students to:		The student should be able to:
<ol style="list-style-type: none"> 1. Understand the concept of patient compliance and concordance & learn the methods of counseling and communication skills with patients. 2. Understand the meaning and details of proprietary medicines and any related OTC drugs/ non prescription drugs acting on skin, eye, nose, oropharynx, and ear. 3. Learn the requirements, formulations and processing of non-sterile polyphasic liquid dosage form such as suspension, emulsion & colloids. 4. Understand the requirements and formulation of sterile dosage forms like parenterals, total parenteral nutrition (TPN) and ophthalmics. 5. Appreciate the importance of sterilization & aseptic techniques. 6. Understand the factors concerned with contamination of parenteral products, sterility, containers, preservations, etc. 		<ol style="list-style-type: none"> 1. Counsel and communicate with patients. 2. Gain the knowledge of proprietary medicines along with any related OTC drugs acting on skin, eye, nose, oropharynx and ear; Counsel and select an appropriate OTC product for the patient after due consideration about the patient condition, sex, age, other ailments and prescription drugs consumed. 3. Formulate non-sterile preparations of polyphasic dispersions like emulsions and suspensions. 4. Become familiar with the sterile preparations like parenterals, TPN and ophthalmics. 5. Recall the basic principles involved in the sterility, preservation, isotonicity and maintenance of pH of the sterile products. 6. Formulate some sterile preparations of parenteral and ophthalmic products.

Pharmacy Practice & Dosage Forms-II

Contents

Topics
1. Patient Compliance
2. Counseling
3. Proprietary Products-I and related OTC (Over- The - Counter) drug products: Various pharmaceutical preparations for pathological conditions of the organ/ system along with the strength, dosage forms, dose and their uses. The preference of various additives and vehicles for the preparations applicable for various pathological conditions of the system / organ. <ul style="list-style-type: none">a) Drugs acting on eyeb) Drugs acting on skinc) Drugs acting on nosed) Drugs acting on oropharynxe) Drugs acting on ear
4. Non-sterile Liquid Dosage Forms (Polyphasic disperse system): <ul style="list-style-type: none">a) Suspensions: Definition, types of suspensions, suspending agents, formulation, containers, storage conditions, formulation related problems, assessment (sedimentation volume and degree of flocculation) and its pharmaceutical applications.b) Emulsions: Definition, types of emulsions, emulsifying agents, surface active agents, HLB scale, formulation (wet and dry gum methods), theory of emulsion, stability studies, containers, storage conditions, labeling and its pharmaceutical applications.c) Colloids: Types and its pharmaceutical applications.
5. Sterile Liquid Dosage Forms: <ul style="list-style-type: none">a) Parenteral products: Types, requirements, various additives, sources of pyrogen contamination, methods of sterilization, formulation of thermolabile & thermostable products, various types of containers, details of chances of contamination in parenteral production, advantages, disadvantages, labeling, storage conditions and applications of parenterals.b) Total parenteral nutrition (TPN) and Home parenteral nutrition: Indications, basic requirements, routes of administration, compounding, labeling, storage and stability of TPN solutions.c) Ophthalmic products: Types, general requirements, various additives, formulation (eye drops/ lotions/ ointments), containers, storage conditions, labeling, pharmaceutical applications and newer dosage forms.

PHAR1130	Pharmacy Practice-III	4 Credit hours
Hours / Wk	3(Theory) + 2 (Practical)	
Prerequisite	PHAR1120 (Pharmacy Practice & Dosage Forms-II)	
Co-requisite	PHAR1140 (Dosage Forms-III & Quality Control)	
Goal	Introduces the students to various incompatibilities, besides providing knowledge about various categories of Over-the-counter (OTC) and proprietary drugs and their interactions with other drugs consumed concurrently. To provide sequentially about proprietary products and related OTC drug products used in the treatment of GIT, CVS, respiratory, endocrine systems as well as infectious diseases.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Develop the ability to utilize various sources to gather drug information. 2. Understand the role of assistant pharmacist in hospital pharmacy. 3. Understand the different types of incompatibility like physical, chemical and of therapeutic origin. 4. Understand various drug interactions of Over- the-counter (OTC) or non-prescription drugs, predict the possible drug interactions with other drugs taken simultaneously, identify the non-suitability of certain OTC drugs to some patients and offer patient counseling in selection and appropriate use of OTC products. 5. Understand the details of proprietary products and any related OTC drugs acting on respiratory, endocrine, gastrointestinal and cardiovascular systems. 6. Describe the proprietary products used in the treatment of infectious diseases. 7. Learn the formulation of semi-solid dosage forms like ointments, creams, pastes and poultices. Similarly the formulation of solid dosage forms that include powders, granules, tablets, capsules and suppositories. 		<p>The students should be able to:</p> <ol style="list-style-type: none"> 1. Generate, revise and retrieve drug information and data through various sources. 2. Familiarize with the role of Assistant pharmacist in hospitals pharmacy. 3. Apply the knowledge of incompatibility and drug interaction before dispensing an OTC product or prescriptions. 4. Select appropriate proprietary drugs and or OTC drugs for the treatment of respiratory, endocrine, cardiovascular and respiratory disorders. 5. Counsel and select an appropriate OTC product for the patient after due consideration about the patient condition, sex, age, other ailments and prescription drugs consumed. 6. Choose an appropriate chemotherapeutic agent to be used in the treatment of infectious diseases. 7. Compound different types of semi-solid dosage form e.g. ointments, creams, pastes, poultices and suppositories. 8. Formulate different dosage forms e.g. powders, granules, tablets, capsules and suppositories.

Pharmacy Practice-III

Contents

Topics
1. Drug information: Classification, types of sources and information retrieval
2. Hospital pharmacy: Hospital and pharmacy organization, role of various personnel, system of dispensing to in-patients, safe use of medications in the hospital, medication errors.
3. Incompatibility and drug interaction (OTC and proprietary products): Introduction, physical, chemical and therapeutic incompatibilities.
4. Proprietary products-II and related OTC (Over- The - Counter) drug products: Drugs acting on respiratory, endocrine, GIT, CVS and against infectious diseases. Various pharmaceutical preparations for pathological conditions of the organ/ system along with the strength, dosage forms, dose, and their uses. Preference of various additives and vehicles for the preparations applicable for pathological conditions of the system / organ. Over- the- counter drugs: (OTC) drugs included under above categories The list of OTC drugs approved by Ministry of Health (MOH), their trade names, common uses, precautions, contraindications and patient counseling for: Enteral drugs: Antacid- digestive- antiflatulent products, Anti-emetics –emetics, laxatives, antidiarrheals and hemorrhoid preparations. Cough, cold and allergy drugs: Antitussives, expectorants, decongestants and anti-histamines. Miscellaneous: Contraceptives & vaginal drugs (candidiasis)
1. Practical based on dosage forms-III: a. Ointments, Creams, Paste, Poultice b. Powders, Granules, Tablets, Capsules c. Suppositories

PHAR1140	Dosage Forms-III & Quality Control	4 Credit hours
Hours/Week	2 (Theory) + 4 (Practical)	
Prerequisite	PHAR 1120 (Pharmacy Practice & Dosage forms-II)	
Co-requisite	PHAR1130 (Pharmacy Practice & Dosage Forms-III)	
Goal	To introduce the students to various semi-solid and solid dosage forms in practice. It also imparts the basic principles of pharmaceutical & chemical quality control testing using various laboratory techniques and instruments for the qualitative and quantitative analysis of Dosage forms and their active constituents.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Know various types and components that constitute semi-solid dosage forms like ointments, creams, pastes and poultices. 2. Know various types, components that constitute solid dosage forms like powders, granules, tablets, capsules and suppositories. 3. Understand the processes of tablet compression and coating, single and multiple compressed tablets, chewable tablets etc. 4. Recognize the difference between hard and soft gelatin capsules. 5. Understand the process of microencapsulation. 6. Be acquainted with the process used in the formulation of suppositories. 7. Develop familiarity for the packaging, storage and labeling of solid and semisolid dosage forms. 8. Understand the role of quality assurance and quality control in the pharmaceutical sector. 9. Understand the principles of pharmaceutical quality control testing of various dosage forms like tablets, capsules, liquids, parenteral products, ophthalmic preparations, ointments, suppositories and aerosols. 10. Understand the principles of chemical quality control, sampling techniques, instrumentation and various principles involved in the testing of drugs in the dosage forms by qualitative and quantitative analysis. 		<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Review different kinds of semi-solid dosage forms like ointments, creams and paste and poultices. 2. Recall solid dosage forms like bulk and divided powders, effervescent and non- effervescent granules. 3. Become familiar with some other solid dosage forms like tablet, capsules(hard and soft), microencapsules and suppositories. 4. Familiarize with the role of Quality assurance, quality control, documentation and good practices in pharmaceutical sector. 5. Carry out the quality control testing of various dosage forms like tablets, capsules, liquids, parenteral products, ophthalmic preparations, ointments, suppositories and aerosols. 6. Apply the various titrimetric and instrumental techniques for quantitative analysis of pharmaceutical compounds (drugs) in various dosage forms.

Dosage Forms-III & Quality Control

Contents

Topics
<p>Dosage Forms-III:</p> <ol style="list-style-type: none">1. Semisolid dosage forms (ointments, creams, paste and poultice): Definition, types of bases, classification, formulations, containers, storage conditions, labeling and their therapeutic applications.2. A. Solid dosage forms (powders and granules): Definition, classification, types, requirements, formulations and their pharmaceutical applications. B. Solid dosage forms (Tablets): Definition, classification, advantages & disadvantages, excipients, manufacturing of compressed tablets by different methods, tablet machines, processing problems, coating techniques (film, sugar and compression coating), enteric coating, coating equipments and special tablets (chewable, buccal, sublingual, effervescent and long acting types).3. Solid dosage forms (capsules and microencapsulation): Definition, types, requirements, formulation, equipments, packaging, labeling, storage conditions, applications and microencapsulation techniques.4. Suppositories: Definition, advantages, suppository bases, method of preparation, packaging, labeling and storage conditions.
<p>Pharmaceutical Quality Control:</p> <ol style="list-style-type: none">5. Introduction to quality assurance and quality control: General information about QC & QA, SOP's, GMP & GLP, validation process and documentation.6. Tablet: General appearance, size and shape (diameter and thickness), hardness, friability, disintegration test, dissolution rate, active content, uniformity of weight and content.7. Capsules: Size of capsules, disintegration time, dissolution rate, active content, uniformity of weight and content.8. A. Parenteral preparations: Pyrogen test, LAL test, sterility test, test for perfect sealing, clarity test, uniformity of weight for powders for injection, uniformity of active drug content and alkalinity test for glass containers. B. Ophthalmic preparations: Sterility testing and finished product closure efficiency test. C. Semisolids (ointments): Homogeneity, state of oxidation, consistency, test for sterility (eye ointments) and test for the type of ointment. D. Liquids: Volume, clarity and color of the solutions, sedimentation rate and volume and specific viscosity.9. Suppositories: Uniformity of weight, uniformity of content, disintegration, melting point, fracture point test for mechanical properties and release pattern.10. Aerosols: Uniformity of weight, flame projection test, leaker test, leakage rate test and delivery rate testing.
<p>Chemical Quality Control:</p> <ol style="list-style-type: none">11. Quantitative estimation of active ingredients in tablets, mixtures, capsules, suppositories, elixirs, eye drops, paste, injections and emulsions.

PHAR1150	Pharmacy Practice & Dosage Forms-IV	3 Credit hours
Hours / Wk	3 (Theory)	
Pre-requisite	PHAR1130 (Pharmacy Practice-III)	
Goal	To emphasize the use of computers in generating any information related to pharmacy field and research. Introduces the students to various irrational uses of drugs, the role of Assistant Pharmacist in community pharmacy, proprietary products and any related OTC drugs products for central nervous system; malignancy; storage- stabilization of drugs and prediction of shelf-life. It also imparts knowledge about the essential background in the production of newer drug delivery systems and new trends of sustained release including site specific delivery systems.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Use computers to generate, revise and retrieve any information and data in hospital, community pharmacy, industry or education and in research. 2. Know the role of assistant pharmacist specifically in community pharmacy. 3. Understand the irrational use of drugs and the reasons concerning them. 4. Gain knowledge about the prediction of shelf life, stabilization and storage of different drugs. 5. Understand the pharmacy practice aspect of the proprietary products and related OTC drug products acting on central nervous system. 6. Understand various chemotherapeutic agents used in malignancy (cancer) 7. Understand the concepts involved in the newer drug delivery systems i.e., controlled / sustained release and site specific delivery systems like occuserts, intrauterine device (IUD), transdermal patches and implants. 		<p>The students should be able to:</p> <ol style="list-style-type: none"> 1. Generate, revise and retrieve any information and data through computers. 2. Recall the role of assistant pharmacists in community pharmacy. 3. Apply and find remedy for the irrational use of drugs by the health professionals and community. 4. Become familiar with the storage and stabilization and shelf life of drugs. 5. Recall the proprietary products and related OTC drug products encompassed under the central nervous system. 6. Identify the chemotherapeutic cocktail to be used in the treatment of cancer. 7. Counsel and select an appropriate OTC product for the patient after due consideration about the patient condition, sex, age, other ailments and prescription drugs consumed. 8. Identify various types of controlled drug delivery systems. Describe the mechanism of drug release from the newer drug delivery systems.

Pharmacy Practice & Dosage Forms-IV

Contents

Topics
1. Computers in pharmacy: Role of computer in Hospital pharmacy, Community pharmacy, pharmaceutical industry and in research.
2. Role of assistant pharmacist in community and hospital pharmacy
3. Irrational use of drugs: Error due prescribing practice, dispensing practice or patient's attitudes; measures to minimize these errors.
4. Storage , stability and stabilization of drugs: Storage conditions, mechanism of drug decomposition, protection of products against degradation and prediction of shelf life
5. Proprietary products-III and related OTC drug products: Study of pharmacy practice aspect of hypnotics, anxiolytics, antidepressants, analgesics, anesthetics, anti-epileptics and drugs used for the therapy of Parkinson's disease, rheumatism and malignancy (cancer). Various pharmaceutical preparations for pathological conditions of the organ/ system along with the strength, dosage forms, dose, and their uses. Over-the-counter drugs: (OTC) drugs included under above categories Centrally acting drugs: Analgesics–antipyretics, sleep aids, stimulants and appetite suppressants. Miscellaneous: Dental products, hematinics, sex hormones (endocrine) vitamins& mineral supplements.
6. Controlled drug delivery system: Difference between sustained and controlled release preparations, classification of sustained release drug delivery systems based on dosage forms and mechanism of action, routes of administration and some market products.
7. Targeted and site specific drug delivery systems: The components, formulation and the applications of aerosols, intraocular drug delivery system, transdermal drug delivery system, implants, intravaginal and intrauterine devices.

PHAR2110	Pharmaceutical Chemistry-I	3 Credit hours
Hours / Wk	2 (Theory) + 2 (Practical)	
Pre-requisite	ASAC1100 (Fundamentals of Chemistry)	
Goal	Introduce the students to essential background in pharmaceutical chemistry including a deep insight into the classification, nomenclature, preparation and properties of various classes of organic compounds that foster the correct approach to those majoring in pharmacy. It also provides some representative biologically active products and their pharmaceutical applications.	
Objectives		Outcomes
The course should enable the students to:		The student should be able to:
<ol style="list-style-type: none"> 1. Identify the chemical structure and classify organic compounds according to the functional groups present with special emphasis to biologically active significant molecules. 2. Describe the reactions of hydrocarbons (alkanes, cycloalkanes, alkenes, alkynes, benzene & its homologues), alcohols, phenols, ethers, thioalcohols, aldehydes & ketones, carboxylic Acids & its derivatives, phosphate Esters/ anhydrides and amines 3. Understand the relation of organic chemistry to some representative pharmaceutical products. 		<ol style="list-style-type: none"> 1. Identify main types of organic reactions of the different functional group compounds. 2. Compare the structure of benzene with other aromatics. 3. Describe the structure of biologically significant molecules of various classes of organic compounds. 4. Review the role of organic chemistry in relation to pharmacy.

Pharmaceutical Chemistry-I

Contents

Topic
1. The main classes of organic compounds including IUPAC nomenclature
2. Spatial distribution of bonds in hydrocarbons
3. General methods of preparation, physical-chemical properties and biological significance: Hydrocarbons (alkanes, cycloalkanes, alkenes, alkynes, benzene & its homologues), alcohols, phenols, aromatic alcohols, ethers, thioalcohols, aldehydes & ketones, carboxylic acids & their derivatives and amines.
4. Phosphate Esters and Anhydrides

PHAR2120	Pharmaceutical Chemistry-II	2 Credit hours
Hours / Wk	1 (Theory) + 2 (Practical)	
Pre-requisite	PHAR2110 (Pharmaceutical Chemistry-I)	
Goal	Introduce the students to essential background in pharmaceutical chemical analysis including a deep insight into the various analytical protocols involved in the quantification of various classes of pharmaceutical compounds.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the concepts involved in pharmaceutical chemical analysis. 2. Understand the different methods of expressing concentration in chemical analysis. 3. Understand the principle and application of various techniques of quantitative chemical analysis such as volumetric analysis, precipitation titrations, complexometric titrations, redox titrations, gravimetric analysis and spectrophotometric analysis. 		<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Apply the basic concepts of chemical analysis in the quantification of pharmaceutical compounds. 2. Apply the appropriate method of expressing concentration in various chemical analyses. 3. Apply the various analytical techniques such as titrimetric, gravimetric and spectrophotometric for quantitative analysis of pharmaceutical compounds.

Pharmaceutical Chemistry-II

Contents

Topic
1. Introduction, Definition and classification of pharmaceutical chemical analysis.
2. Different methods of expressing concentration in chemical analysis.
3. Volumetric Analysis: Fundamentals, acid-Base titrations, hydrogen ion component, indicators and non-aqueous titrations.
4. Precipitation Titrations: Basic principles and application.
5. Complexometric Titrations
6. Reduction / Oxidation (Redox) Titrations: Assigning oxidation numbers, redox reactions & equations. Calculation with molarity and normality in redox titrations.
7. Gravimetric Analysis
8. Spectrophotometric Analysis

PHAR2300	Medicinal Chemistry	2 Credit hours
Hours / Wk	2 (Theory)	
Pre-requisite	PHAR2120 (Pharmaceutical Chemistry-II)	
Goal	Introduce the students to essential background in medicinal chemistry including a deep insight into the various physico-chemical properties that influence pharmacokinetic - pharmacodynamic properties and the structure activity relationship of drug entities.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the various physico-chemical properties that influence biological activity. 2. Understand the classification, mechanism of action, clinical uses and structure-activity relationship of the following class of drugs: Analgesic agents, sedatives-hypnotics, cholinergic-antispasmodics, anticonvulsant or antiepileptic drugs, central nervous system stimulants, cardiovascular agents, anti-infective agents, oral hypoglycemic drugs and diuretics. 		<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Predict the influence of certain physico-chemical properties to drug absorption, distribution, metabolism, excretion and pharmacodynamic properties. 2. Identify the appropriate classification, source, advantages, mechanism of action, clinical uses, precautions & side effects of important classes of drugs. 3. Understand the concept of structure-activity relationship (importance of certain functionalities, three-dimensional structure, optical properties and drug-receptor interaction) of drug molecules which is the gateway of new drug discovery.

Medicinal Chemistry

Contents

Topic
1. Introduction to medicinal chemistry
2. Physical – Chemical properties and biological activity
3. Analgesic agents
4. Anxiolytics–Hypnotics
5. Antiepileptic drugs
6. Central nervous system stimulants
7. Cholinergics and Anticholinergics
8. Cardiovascular drugs
9. Diuretics
10. Oral hypoglycemic drugs
11. Anti-infective agents

PHAR2210	Biochemistry-I	2 Credit Hours
Hours / Wk	1 (Theory) + 2 (Practical)	
Pre-requisites	ASAC1100 (Fundamentals of Chemistry)	
Goal	Introduce pharmacy students to the chemistry of biologically important molecules that constitute the body (carbohydrates, lipids, proteins, nucleic acids, enzymes and vitamins).	
Objectives		Outcomes
The course should enable the students to:		The student should be able to:
<ol style="list-style-type: none"> 1. Identify the elemental & molecular composition of the body. 2. Define, classify and describe the structure and function of carbohydrates of biological significance. 3. Describe the structure and function of lipids of biological significance. 4. Define and classify amino acids, peptides and proteins of biological importance. 5. Define, classify and describe the structure and function of nucleotides & nucleic acids of biological significance. 6. Define and classify enzymes of biological significance. 7. Define water-soluble vitamins and identify their coenzyme function. 		<ol style="list-style-type: none"> 1. Recall the elemental and molecular composition of the body. 2. Name and describe the structure & function of carbohydrates, design a systematic scheme and carry out laboratory tests to analyze carbohydrates, lipids and proteins. Recognize the structure and function of carbohydrates, lipids & proteins of biological importance. 3. Conduct laboratory experiments e.g. Saponification of oil, reduction of surface tension of water. 4. Name and describe the structure & function of amino acids, peptides & proteins. 5. Name and describe the structure & function of nucleotides and nucleic acids. Recognize the structure and function of nucleotides, nucleic acids of biological importance. 6. Recognize the structure and function of enzymes of biological importance. 7. Recall the biological importance of water-soluble vitamins for body health. 8. Carry out biochemical testing for the detection of pathological constituents of urine.

Biochemistry-I

Contents

Topic
1. Elemental and molecular composition of the body and biologically significant molecules
2. Carbohydrates of Biological Significance: Definition, classification & biomedical importance of monosaccharides, disaccharides, polysaccharides & mucopolysaccharides
3. Lipids of Biological Significance: Definition, classification, biomedical importance and fat soluble vitamins (A, D, E & K).
4. Amino acids, Peptides and Proteins of Biological Significance: Structure, classification properties and biomedical importance of amino acids. Peptides of biological & biomedical importance. Structure of proteins (primary, secondary, tertiary & quaternary structures), classification, denaturation and isoelectric point and biomedical importance of proteins.
5. Nucleotides and Nucleic Acids of Biological Significance: Definition, structure, classes and function of nucleic acids. mRNA, rRNA & tRNA, genetic code, mutation, major steps of protein synthesis and biomedical importance of nucleotides.
6. Enzymes (Biological Catalysts): Definition, mechanism of enzyme catalysis, enzyme co-factors, holoenzymes, proenzymes and isoenzymes. Factors that affect the rate of enzyme catalyzed reactions, enzyme inhibition, classification of enzymes and enzymes in medicine. Water-soluble vitamins & coenzymes and their functions.

PHAR2220	Biochemistry-II	1 Credit hour
Hours / Wk	1 (Theory)	
Pre-requisites	PHAR2210 (Biochemistry-I)	
Goal	Introduce the students to the structure and biochemical function of sub cellular organelles and the major metabolic pathways that take place in mammalian tissues.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Identify cell structure and sub-cellular organelles; their structure and functions. 2. Describe the main biochemical reactions and pathways involved in carbohydrates metabolism. 3. Describe the reactions of Krebs cycle and their role in intermediary metabolism. 4. Appreciate the role of mitochondrial respiratory chain in energy transduction. 5. Identify the role of hormones in the regulation of carbohydrates metabolism. 6. Describe the main metabolic reactions involved in lipid metabolism. 7. Identify the role of plasma lipoprotein fractions in lipid transport. Recognize the role of plasma lipoprotein in the pathogenesis of cardiovascular diseases. 8. Describe the main biochemical reactions involved in protein and amino acids. Describe the role of biologically active molecules obtained from amino acids, e.g. heme, histamine, serotonin, adrenaline, thyroxin, GABA, etc. 9. Appreciate the role of biochemical lab analysis data in the diagnosis of disease & in drug therapy. 		<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Specify the intracellular location of the various biochemical reactions. 2. Define the role of Krebs cycle reactions in the metabolism of acetyl-CoA. 3. Recognize the effect of some active agents on the mitochondrial respiratory chain & ATP production. 4. Apply the acquired knowledge in the control and treatment of disorders of carbohydrate, lipid and amino acids metabolism. 5. Apply the acquired information in the control and treatment of disorders associated with dyslipidemias. 6. Make use of biologically active molecules derived from amino acids as therapeutic agents. 7. Make use of information about biochemical laboratory data including enzymes, analytes and hematological parameters in diagnosis of disease. 8. Avoid interference between drug therapy and biochemical laboratory data.

Biochemistry-II

Contents

Topic
I. Cell structure: Structure & functions of endoplasmic reticulum, golgi apparatus, mitochondria, lysosomes, peroxisomes, nucleus, nucleolus, cytoskeleton, and plasma membrane.
II. Metabolism: A. Carbohydrate Metabolism: Digestion of carbohydrates, glycolysis, Krebs cycle, respiratory chain, glycogenesis, glycogenolysis, hexose monophosphate shunt, hormone regulation of carbohydrate metabolism. B. Lipid metabolism: Catabolism, biogenesis, and plasma lipoproteins. C. Protein metabolism: Urea cycle and biologically important molecules obtained from amino acids.
III. Application of biochemical analysis data in the diagnosis of disease including: A. Enzymes B. Analytes C. Hematological parameters
IV. Importance of Biochemical Analysis Data in Drug Therapy

PHAR3100	Fundamentals of Pharmacology	3 Credit hours
Hours / Wk	2 (Theory) + 2 (Practical)	
Prerequisite	None	
Goal	To make the student well exposed to basic aspects in pharmacology - drug names, mechanism of action, their side effects, contraindications, precautions, doses forms, doses and uses. To acquaint the students in drug interactions and safe use of drugs.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the pharmacokinetics of drugs. 2. Understand the mechanism of action of drugs and drug response. 3. Know about the autonomic nervous system and its physiology including the function of autonomic neurotransmitters in the human body. 4. Know about the various drugs acting on the ANS, the mode of drug action on autonomic receptors, their pharmacokinetics, side effects, contraindications and precautions to be followed during drug therapy. 5. Understand the principles of treatment of diseases involving ANS. 6. Explain the types of autacoids, their actions and the therapeutic value of different autacoids antagonists. 		<p>The student should:</p> <ol style="list-style-type: none"> 1. Know the absorption, distribution, metabolism and excretion of drugs and its significance. 2. Know the mode of action of drugs, variation in drug response and its significance. 3. Know about the therapy of diseases involving ANS. 4. Know about the therapy of allergic conditions using autocoid antagonists. 5. Know the mechanism of action, pharmacokinetics, side effect, contraindications and precautions of above discussed drugs.

Fundamentals of Pharmacology

Contents

Topic
1. Principles of drug action: Some basic definitions, factors affecting absorption, transport, distribution, metabolism (biotransformation) excretion of drugs, mechanism of drug action, factors affecting drug action and some aspects of drug action.
2. Autonomic nervous system: Physiological background, divisions (Sympathetic and parasympathetic nervous system), biosynthesis, release and fate of neurotransmitters. Effect of sympathetic and parasympathetic stimulation.
3. Effect of drugs on autonomic function: Sympathomimetics & sympatholytics, parasympathomimetics & parasympatholytics and drugs acting on autonomic ganglia.
4. Autacoids: Histamine, serotonin (5-HT), prostaglandins and their antagonists.

PHAR3210	Applied Therapeutics –I	2 Credit Hours
Hours / Wk	2 (Theory)	
Pre-requisite	None	
Goal	Introduce the students to the physiological background of human organs and to expose them towards various pathological conditions and their management.	
Objectives	Outcomes	
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the human physiologies of various external organs. 2. Study about the disorders of external organs of human body. 3. Explain the cause of diseases and precautions to be followed against them. 4. Learn the simple medicaments used in some disorders of external organs. 5. Learn how the environment has influence on human body and its sensitive organs. 	<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Gain knowledge about some of the external organs of the human body. 2. Identify the commonly occurring diseases of external organs. 3. Realize the cause of common disorders of skin, eye, ear, nose and throat. 4. Gain knowledge about medications used in the disorders of external organs. 5. Gain knowledge about precautions to be followed for these diseases 	

Applied Therapeutics - I

Contents

Topic
1. Skin: Structure, functions and diseases of the diseases - dry skin, acne, sunburn and suntan, corn, callus, warts, athletes foot, eczema, psoriasis, urticaria, pediculosis and scabies.
2. Eye: Functional structures, sight, accessory organs of eye and diseases of eye - stye, conjunctivitis, trachoma, corneal ulcer, glaucoma and cataract.
3. Nose & Throat: Nose, pharynx, larynx and their functions, diseases of the nose and throat - nasal obstruction, rhinitis, sinusitis, tonsillitis and pharyngitis.
4. Ear: Functional structures, hearing and diseases of the ear - external otitis, acute otitis, chronic otitis, labyrinthitis and meniere's diseases

PHAR3220	Applied Therapeutics-II	3 Credit hours
Hours / Wk	2 (Theory) + 2 (Practical)	
Prerequisites	PHAR3210 (Applied Therapeutics-I) PHAR3100 (Fundamentals of Pharmacology)	
Goal	Introduce the students to the physiology of cardiovascular system, urinary system, and digestive system. It also imparts the knowledge of the disorders of these systems, their therapy, side effects and drug interactions in pharmacotherapy.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the anatomy and physiology of cardiovascular system. 2. Learn the drug of choice for treatment of diseases concerned with cardio vascular system (hypertension, congestive heart failure, cardiac arrhythmias, angina pectoris, hyperlipidemia, and atherosclerosis) and blood related disorders (thrombosis and anemia), 3. Understand the anatomy & physiology of urinary system and the process of urine formation. 4. Understand the therapy of urinary system disorders (urinary incontinence, urinary retention and acute renal failure). 5. Understand the anatomy & physiology of digestive system, digestive process and the role of glands in normal physiological conditions. 6. Understand the therapy of digestive system disorders (hyperacidity, peptic ulcer, diarrhea, constipation, nausea and vomiting). 		<p>The student should:</p> <ol style="list-style-type: none"> 1. Know the pathophysiology, management and therapy of CVS diseases. 2. Know the blood physiology and the therapy of blood disorders. 3. Know the therapy of diseases of urinary system. 4. Know the therapy of diseases of digestive system. 5. Know the mechanism of action, pharmacokinetics, side effects, drug interactions, contraindications and precautions of above discussed drugs.

Applied Therapeutics-II

Contents

Topic
1. Functional structure of the heart & vascular system and hemodynamics
2. Cardiovascular diseases: Pathophysiology and therapy of hypertension, congestive heart failure, cardiac arrhythmia, angina pectoris, hyperlipidemia, thrombosis and anemia.
3. Urinary system: functional structures (kidney, ureters, urinary bladder, urethra) and renal disorders (urinary incontinence, urinary retention and acute renal failure) and their therapies.
4. Gastro intestinal system: Functional structures, gastro intestinal disorders and therapy (Peptic ulcer, diarrhea, constipation, nausea and vomiting).

PHAR3230	Applied Therapeutics-III	3 Credit hours
Hours / Wk	2 (Theory) + 2(Practical)	
Pre-requisite	PHAR3220 (Applied Therapeutics-II)	
Goal	This course exposes the students to therapy of disorders associated with the respiratory, endocrine systems and the chemotherapy of various infectious diseases and cancer.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the functional structure of the respiratory system, associated diseases and their therapy. 2. Understand the physiological functions and disease states associated with hypo & hyper function of the pituitary, thyroid, parathyroid, adrenal gland, endocrine pancreas and gonads (ovary & testes). 3. Understand the management and therapeutics of different endocrine disorders. 4. Appreciate the use of chemotherapeutic agents in the treatment of bacterial, fungal, viral, protozoal infections, helminthic infestation and cancer. 		<p>The student should know:</p> <ol style="list-style-type: none"> 1. Pathophysiology, management and therapeutics of the disorders associated with respiratory system. 2. Pathophysiology, management and therapeutics of the disorders associated with pituitary, thyroid, parathyroid, adrenal gland, endocrine pancreas and gonads (ovary & testes). 3. Chemotherapy of bacterial, fungal, viral, protozoal infections, helminthic infestation and cancer. 4. Mechanism of action, pharmacokinetics, side effects, drug interactions, contraindications and precautions of above drugs.

Applied Therapeutics-III

Contents

Topic
1. Respiratory system: Introduction, mechanism of respiration, asthma, COPD and cough.
2. Endocrine system: Introduction, pituitary gland, thyroid hormones, parathyroid hormones, adrenocortical steroids, insulin & glucagon, gonads, gonadal hormones and oral contraceptives.
3. Chemotherapy: Introduction and classification of antimicrobials, antimycobacterial, antiparasitic, antifungal, antiviral, antineoplastic agents and immunomodulation therapy.

PHAR3240	Applied Therapeutics-IV	3 Credit hours
Hours / Wk	2 (Theory) + 2 (Practical)	
Pre-requisite	PHAR3230 (Applied Therapeutics-III)	
Goal	This course provides the students with information about central nervous system, its disorders and treatment. It also provides an introduction about anesthesia and toxicology.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Describe the general features of the CNS. 2. Describe pathophysiology and treatment of various psychiatric disorders: mood disorders, anxiety, sleep disorders, schizophrenia and alcoholism 3. Describe drug abuse and the potential drugs of abuse. 4. Describe pathophysiology and treatment of various neurological disorders: Parkinson's disease, Alzheimer's disease, seizure disorders and pain management. 5. Understand the use of analgesics and neuromuscular blockers. 6. Understand the various aspects and types of anesthesia. 7. Understand the general principles of treatment of poisoning. 		<p>The student should be able to know:</p> <ol style="list-style-type: none"> 1. The therapy of various psychiatric disorders. 2. Rehabilitation therapy for drug abuse. 3. The management and therapy of neurological disorders. 4. The management of various pain conditions. 5. Types of anesthesia and the various anesthetic agents. 6. The mechanism of action, side effects, drug interactions, contraindications and precautions of above drugs. 7. The antidotes and methods of treatment of poisoning.

Applied Therapeutics-IV

Contents

Topics
1. Introduction to CNS
2. Psychological Disorders: Psychosis, anxiety, affective disorders (mania & depression) and sleep disorders.
3. Alcoholism, drug dependence and drug abuse
4. Neurological Disorders: Parkinsonism, epilepsy, Alzheimer disease, pain disorders and neuromuscular disease.
5. Anesthesia: General and local anesthesia.
6. Toxicology

PHAR4100	Natural Products from Medicinal Plants	3 Credit hours
Hours / Wk	2 (Theory) + 2 (Practical)	
Pre-requisite	None	
Goal	Introduces the students to the essential basis of Pharmacognosy. It intends to highlight the use of natural remedies in the different systems of medicine (Allopathy, Complementary, Alternative, Herbal, Traditional and Homeopathy). It explains the factors affecting production of crude drugs, their preservation and storage. It illustrates the chemistry of bioactive compounds (medicines) derived from plants and other natural sources. The course also offers the general methodology for extraction, isolation, purification and identification of plant chemical constituents.	
Objectives		Outcomes
The course should enable the students to:		The student should be able to:
<ol style="list-style-type: none"> 1. Understand the importance of the role of crude drugs in therapeutics. 2. Understand the different origins of crude drugs as well as pure medicines derived from plants and other natural sources. 3. Understand the use of natural remedies in the different systems of medicine (Allopathy, Complementary, Alternative, Traditional, Herbal and Homeopathy). 4. Understand the various factors affecting the production of crude drugs, their preservation and storage. 5. Understand the different arrangements of crude drugs for study [viz. botanical, morphological, chemical and pharmacological]. 6. Understand the various pharmacological classes of crude drugs. 7. Understand the various chemical classes of active constituents in crude drugs [e.g. carbohydrates, lipids, alkaloids, glycosides, tannins, essential oils, resins, etc]. 8. Understand the use of herbal naturaceuticals and OTC products. 9. Understand the factors causing herb-drug interactions and some important examples. 10. Understand the principle methodology for extraction, isolation, purification and identification of the different chemical constituents of plants. 11. Understand the parameters required for evaluation of crude drugs (WHO guidelines). 		<ol style="list-style-type: none"> 1. Know the basic concepts of Pharmacognosy, the importance of crude drugs and their immense therapeutic potential. 2. Acquire the knowledge of the origins of crude drugs and pure medicines derived from them. 3. Acknowledge the concept of the use of natural remedies in the various systems of medicine (viz. Western medicine, complementary, traditional, etc). 4. Know the factors affecting the production of crude drugs and their preservation. 5. Realize the different arrangements of crude drugs for study. 6. Understand the various pharmacological categories of crude drugs. 7. Understand the various chemical classes of bioactive constituents in crude drugs. 8. Acknowledge the use of herbal naturaceuticals and OTC products. 9. Know the basics of herb-drug interaction and how to avoid it. 10. Understand the general methods of extraction, isolation, identification of chemical constituents from plants. 11. Know the WHO guidelines for the evaluation of crude drugs.

Natural Products from Medicinal Plants

Contents

Topic
1. Introduction to Pharmacognosy
2. Crude Drugs
3. Plants in the current systems of medicine
4. Factors affecting production of crude drugs from plants
5. Classification/arrangement of crude drugs for study
6. Pharmacological classifications of crude drugs
7. Classes of chemical constituents in crude-drugs: Primary metabolites- Carbohydrates, Proteins and Lipids
8. Secondary metabolites: Alkaloids
9. Glycosides
10. Tannins
11. Essential oils
12. Resins & its combinations
13. Bitter principles and Marine drugs
14. Nutraceuticals - OTC Products
15. Plants with toxic principles; Narcotic plant products and Natural Pesticides
16. Herb-drug interactions
17. Phytochemical methods for extraction and analysis of crude drugs
18. Chromatography
19. WHO guidance for evaluation of crude drugs

PHAR5110	Pharmaceutical Microbiology	3 Credit hours
Hours / Wk	2 (Theory) & 2 (Practical)	
Pre-requisite	None	
Goal	Introduce the students to the essential background of type of microorganisms that infect humans, the method of diagnosis and the drug of choice in treatment.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the classification of microorganisms. 2. Explain the disease caused by each microorganisms and the method of laboratory diagnosis. 3. Understand different infection of skin, upper respiratory, cardiovascular and digestive systems. 4. Understand the immunity and immunization. 5. Understand the different methods of sterilization and application in pharmaceutical preparations. 6. Understand sources and control of contamination of pharmaceutical preparation. 		<p>The student should be able to</p> <ol style="list-style-type: none"> 1. Gain knowledge about different types of microorganisms, bacteria, fungus, virus and parasites. 2. Realize the type of antibiotics and their uses in treatment for each type of pathogen. 3. Realize the causative agent of infection in different parts of the body. 4. Apply proper antimicrobial agents to different type of infection. 5. Gain knowledge about different type of infectious disease and its management. 6. Gain knowledge about the different types of sterilization. 7. Realize the method and the management of contamination.

Pharmaceutical Microbiology

Contents

Topics
1. Introduction: General microbiology, pharmaceutical microbiology & importance of microorganisms in our life.
2. Classification of microorganisms, morphology & structure of bacteria
3. Pathogenic bacteria: Staphylococci, Streptococci & gram positive bacilli, Clostridium species, Mycobacteria
4. Pathogenic bacteria: Gram negative - Neisseria species, Bordetella, Brucella, Enterobacteriaceae, Vibrio cholerae & Helicobacter pylori.
5. Pathogenic bacteria: Intracellular pathogenic organisms (Mycoplasma, Chlamydia, & Rickettsia).
6. Mycology: Morphology, structure, environmental adaptation, reproduction, importance & types of mycoses.
7. Pathogenic fungi: Dermatophytes and Candida albicans.
8. Viruses: Characteristics, structure, classification, isolation and cultivation.
9. Viruses: Bacteriophages, multiplication, effect on animal cells, mechanism of pathogenesis & immuno-pathogenesis. RNA & DNA viruses
10. Growth & nutrition of bacteria
11. Microbial contamination of pharmaceutical preparations.
12. Sterilization, disinfection, antisepsis, & preservation
13. Chemotherapeutic antimicrobial agents, serology & immunology
14. Microbial infections: Infections of skin & mucous membranes, eye, respiratory tract, GIT, CVS, UT, reproductive and nervous system.

PHAR5120	Public Health	1 Credit hour
Hours / Wk	1 (Theory)	
Pre-requisite	PHAR5110 (Pharmaceutical Microbiology)	
Goal	Introduce the students to the essential back ground of health promotion and health education for prevention and protection of the community from infectious/communicable diseases.	
Objectives	Outcomes	
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the meaning of health, health promotion and healthcare. 2. Study health education and methods of application in the community. 3. Understand hospital infection and the health care to maternal and child in the community. 4. Understand the different types and causes of diseases. 5. Understand communicable and sexually transmitted diseases. 6. Understanding the idea of nutrition in clinical medicine and nutrient–drug interactions. 7. Identify types of nutrition- macro and micro nutrients, roughages and water. 8. Understand the importance of each type of nutrients and deficiency diseases. 9. Recognize methods of parenteral feeding in case of illness. 	<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Gain Knowledge about health care. . 2. Apply some component of health promotion more specifically by making the individual more aware of the factors which help to maintain good health and prevent illness. 3. Assist in managing their medicine and disease state as well as promoting health and improving the quality of life. 4. Apply some component of health promotion and protection in communicable diseases. 5. Assist in maintaining good health. 6. Gain knowledge about different types of nutrients and health consequences of their deficiency. 7. Apply knowledge about the techniques of feeding in disease states. 8. Explain some genetic disorders caused by impairment in some metabolic pathways. 	

Public Health

Contents

Topic
1. Definitions: Health, public health, aim of public health, health care and health promotion.
2. How can pharmacist /assistant pharmacist assist in helping to achieve the government's target in health promotion?
3. Factors affecting health and well-being.
4. Health education.
5. Disease: Sequences of developing disease and types of diseases.
6. How microorganism causes disease?
7. Virulence factors.
8. Communicable disease.
9. Hospital infection.
10. Immunization.
11. Maternal and child health.
12. Nutrition: Macronutrient (carbohydrate, protein & fats), micronutrient (vitamins, minerals), fibers and water.
13. Nutrition in clinical medicine, parenteral nutrition, nutrient-drug interaction, food additives & contaminants.
14. Medical parasitology - Protozoology, helminthology and arthropodial infestations.

PHAR6100	Pharmaceutical Terminology	1 Credit hour
Hours / Wk	1 (Theory)	
Pre-requisite	None	
Goal	To impart the knowledge of creating and defining a selection of key terms in pharmacy and pharmaceutical sciences.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Analyze individual word parts such as prefixes, suffixes, combining forms and word roots. 2. Understand selected combining forms (root + combining vowel) related to pharmaceutical sciences. 3. Recognize some pharmaceutical abbreviations used in medical prescriptions and pharmaceutical terminology. 4. Understand pharmacy-relevant vocabulary and terms used in health and disease states; and words used in pharmaceutical preparations, their constituents and uses. 		<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Figure out unfamiliar terms by recognizing their building blocks from which they are constructed (prefixes, suffixes, combining forms and roots). 2. Construct many words correctly by learning to put these building blocks together in a proper way. 3. Determine the meanings of terms that they have never seen before and which are used in pharmaceutical fields. 4. Communicate with the patients as well as physicians, pharmacists, dentists, or other medical professionals.

Pharmaceutical Terminology

Contents

Topic
1. Basic word structure: Basic components of selected pharmaceutical and medical terminology. These include prefixes, suffixes, roots, combining vowels, and combining forms.
2. Combining forms: Components of the combining forms (root + a combining vowel), their meanings and pharmaceutical & medical terms related to such combining forms.
3. Suffixes: Selected suffixes, their meanings and examples of pharmaceutical & medical terms containing these suffixes.
4. Prefixes: Selected prefixes, their meanings and examples of pharmaceutical & medical terms including these prefixes.
5. Abbreviations: Selected abbreviations used in medical prescriptions and in pharmaceutical terminology.
6. Vocabulary: Selected pharmaceutical and medical terms relevant to health & diseases states, medical diagnosis & procedures, pharmaceutical preparations, their constituents and uses. Terms concerning different medical and pharmaceutical studies and different health professionals.

PHAR6300	Pharmacy Laws & Management	1 Credit hour
Hours / Wk	1 (Theory)	
Pre-requisite	None	
Goal	Introduce the students to essential background in the law of pharmacy practice as specified by the Directorate General of Pharmaceutical Affairs & Drug control, Ministry of Health, Sultanate of Oman.	
Objectives		Outcomes
<p>The course should enable the students to understand the rules pertaining to:</p> <ol style="list-style-type: none"> 1. Pharmaceutical establishments (Pharmacy, medical store, pharmaceutical companies & scientific offices) - conditions of proprietorship, cancellation of license and inspection 2. Organization of pharmacy profession. 3. Conditions and procedures of licensing to practice the profession of pharmacist and an assistant pharmacist. 4. Registration particulars of pharmacists and assistant pharmacists. 5. Retail Pharmacies, Medical stores, Pharmaceutical companies (Drug factories) and scientific offices: Types, licensing, working hours (regular and night shifts), general, health and technical conditions. 		<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Apply the regulations related to Pharmaceutical establishments, registration, licensing and other requirements of law of pharmacy in the professional practice. 2. To follow professional and moral ethics in pharmacy practice.

Pharmacy Laws & Management

Contents

Topics
1. Definitions: The ministry, the minister, pharmacy profession, licensed pharmacist & assistant pharmacist, medicine, poisons, narcotics and psychotropic, etc.
2. Pharmacy Ethics
3. Organization of pharmacy profession and Pharmaceutical establishments (Institutions): a) Conditions & procedures of licensing to: practice the profession of a Pharmacist, work as an assistant pharmacist. Registration of particulars of pharmacists & assistant pharmacists. b) Regulations governing pharmaceutical institutions (establishments): Pharmacies (Types, licensing a public pharmacy, licensing, health conditions, technical conditions, rules (regular basis), daily working hours and duty during the night shift), Medical stores, Drug factories and scientific offices. c) Pharmacies Conditions of proprietorship of a new pharmaceutical establishment. Cancelling the license of pharmaceutical establishment. Inspection of pharmaceutical institutions.
4. Import, Export and Registration of Pharmaceutical companies, products and pricing: a) Import & Export of Pharmaceutical products and herbal medicines. b) Registration requirement and cancellation of pharmaceutical companies, c) Registration requirement and cancellation of pharmaceutical products and herbal medicines. d) Pricing of pharmaceutical products.
5. Poisons, Narcotic and Psychotropic drugs. a) Regulation governing poisons: licensing, Import & export, Production and manufacturing, Dealing and dispensing of poisons. b) Regulation governing narcotic and psychotropic drugs: classification, plantation, manufacturing and production, Import, export, transportation and trading of CDs, Dealing with CDs, Prescription and registration requirement.
6. Penalties

PHAR6200	First Aid	1 Credit hour
Hours / Wk	1 (Theory)	
Pre-requisites	None	
Goal	Introduce the students to general principles of first aid to be applied during critical emergency situations	
Objectives	Outcomes	
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Recognize emergency situations by signs and symptoms of the patient. 2. Know how to maintain temperament and give first aid in emergency. 3. Explain various types of emergency situations like cardiac failure, fainting, asphyxia, fire accidents, etc. 4. Understand the responsibilities, aim and role of the first aid provider. 5. Explain how to assess the victim who needs first aid. 6. Understand general infection control precautions, different pathogens and their mode of transmission. 7. Explain techniques of CPR (cardio pulmonary resuscitation) and artificial respiration. 8. Explain the situations which need first aid e.g. asphyxia, choking, anaphylactic shock, fainting, heart attack & stroke. 9. Explain different types of injuries, wounds, burns & injuries to bone, muscles and joints and how to care victims of these injuries. 10. Identify human body systems, their functions and main parts, different body cavities and the organs they encompass. 	<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Identify different emergency situations in which first aid can be applied e.g. asphyxia, choking, fainting, heart attack, etc. 2. Recognize the basic responsibilities of the first aid provider. 3. Apply first aid measures using basic common techniques of case examination. 4. Apply general methods of infection control against various pathogenic organisms. 5. Apply some basic techniques of CPR, artificial respiration and abdominal thrusts. 6. Apply appropriate techniques in caring for different types of injuries, wounds, burns, bone fracture and use the apt dressings, bandages, splints and slings. 7. Apply first aid measures to deal with foreign bodies in the eye and ear. 8. Identify different body systems and cavities; the organs they contain with their functions. 	

First aid

Contents

Topic
1. Introduction
2. Aim and general principle
3. Responsibilities of first aid provider
4. Basic common techniques of case examination
5. Prevention of disease transmission & universal precautions
6. Basic first aid measures: Assessing the victim, unconscious, asphyxia (respiratory emergency), choking, anaphylactic shock, fainting, heart attack, stroke, injuries (bleeding, wounds & burns), dressings, bandages and dealing with foreign bodies
7. Human body systems: Functions and main parts. Body cavities and the organs encompassed within.

PHAR1200	Departmental Pharmacy Training	3 Credit hours
Hours / Wk	6 (Practical)	
Pre-requisites	PHAR1130 (Pharmacy Practice-III) PHAR3230 (Applied Therapeutics-III)	
Goal	To involve the students in a simulated professional work environment through case studies of different disease conditions and help gain knowledge of dispensing, patient counseling and communication skills.	
Objectives		Outcomes
<p>This training activity, through role play approach, should enable the students to:</p> <ol style="list-style-type: none"> 1. Get familiarized with the prescription reading and its contents while dispensing drugs used in the treatment of skin, eye, nose, oropharynx, cardio-vascular, gastro-intestinal, urinary tract, respiratory, endocrine and CNS disorders. 2. Develop skills for obtaining drug information from various resources such as BNF, ONF and online web search. 3. Identify different aspects of drug related interactions such as drug-drug, drug-food, and drug- disease interactions encountered during the process of dispensing of drugs. Recall the drug description including their side effects, contra-indications, dosage forms, strength and precautions. 4. Gain practical skills and experience to deal with technical problems encountered during dispensing of various prescriptions under conditions simulating work environment. 5. Develop communication and counseling skills for handling different cases. 		<p>The student should be able to: (under simulated conditions)</p> <ol style="list-style-type: none"> 1. Practice dispensing of various groups of drugs used in the treatment of skin, eye, nose, throat, cardiovascular, GIT, urinary tract, respiratory, endocrine and CNS disorders. 2. Demonstrate to the patient how to use medical devices such as metered dose inhalers and insulin pen. 3. Avoid drug-drug interactions and possible incompatibilities that may be encountered during therapeutic treatment of the above-mentioned disease conditions. 4. Implement the basic principles of communication skills while counseling patients. 5. Use drug information resources to retrieve specific information regarding a drug or drug treatment of a disease condition.

Departmental Pharmacy Training

Delivery Plan

Topics
1. General introduction to DPT and Communication skills
2. Overview on Drug interactions/ Incompatibilities and Model role play
3. Calculations and conversions
4. Drugs acting on Gastro intestinal tract
5. Drugs acting on Cardiovascular system
6. Drugs acting on Respiratory system
7. Drugs acting on Central nervous system
8. Drugs acting on Infections
9. Drugs acting on Endocrine system
10. Drugs as Nutrition supplements
11. Drugs acting on Muscular skeletal system

CHEM1102	Fundamentals of Chemistry	3 Credit hours
Hours / Wk	3 (Theory) + 2 (Practical)	
Pre-requisite	None	
Goal	Introduce the students to the basic concepts of chemistry, which form an integral part of those majoring in science and an essential background for those majoring in other disciplines.	
Objectives	Outcomes	
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Know the particles in an atom, the simple structure of the atom using the s, p, d and f notations, use the concept of significant figures. 2. Convert names of compounds into formulae and represent chemical reaction using formulae and balanced equations 3. Clarify the mole concept and apply it in chemical calculation and state concentrations of solutions by different methods 4. Distinguish between organic and inorganic compounds and explain fractional distillation of petroleum 5. Name organic compounds with different functional groups and write some reactions of hydrocarbons 6. Distinguish the properties and reactions of acids and bases, express the strength of acids and bases with respect to pH 7. Define redox in terms of electron transfer and identify common oxidizing and reducing agents, redox reaction with two half ionic equations and full ionic reaction 8. Apply Faraday's first and second law to calculate the amount of a metal deposited during electrolysis 9. Predict the products of electrolysis of fused salts and solutions 	<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. <ol style="list-style-type: none"> a. Distinguish between gases, liquids and solids at the molecular level. b. Apply the idea of particles to explain the changes in the states of matter. c. Use the concept of significant figures. 2. <ol style="list-style-type: none"> a. Describe the particles in an atom. b. Describe early experimental evidence for the existence of the electron and the nucleus. c. Describe the simple structure of the atom using the s, p, d and f notations. 3. <ol style="list-style-type: none"> a. Translate names of compounds into formulae. b. Represent chemical reaction using formulae and balanced equations. c. Determine and distinguish between empirical formulae and molecular formulae. d. Use chemical equations to calculate amount of reactant consumed or product formed in a chemical reaction. 4. <ol style="list-style-type: none"> a. Explain the mole concept and apply it in chemical calculations. b. Express concentrations of solutions by different methods. 5. <ol style="list-style-type: none"> a. Explain the differences between organic and inorganic compounds. b. Explain fractional distillation of petroleum. c. Name organic compounds with different functional groups. d. Write some reactions of hydrocarbons. 6. <ol style="list-style-type: none"> a. Explain the properties and reactions of acids and bases. b. Express the strength of acids and bases with respect to pH. c. Review the methods of the preparation of soluble and insoluble salts. 7. <ol style="list-style-type: none"> a. Define redox in terms of electron transfer and identify common oxidizing and reducing agents. b. Represent a redox reaction with two half ionic equations and use two half ionic equations to write a full ionic redox reaction. 8. <ol style="list-style-type: none"> a. Apply Faraday's first and second law to calculate the amount of a metal deposited during electrolysis. b. Predict the products of electrolysis of fused salts and solutions. c. Design an electrolytic cell to isolate a pure metal from its ore. 	

PENG1100	English-I	1 Credit hour
Hours / Wk	4 (Theory)	
Pre-requisite	None	
Goal	This English Language course assumes an advanced level of general language proficiency. It emphasizes skills required for students' professional purposes, including knowledge of specific names and symptoms of diseases and vocabulary related to the pharmaceutical field. The course also provides practice in the skills of speaking, listening, reading and writing. This involves exposure to medical literature so that they understand active ingredients, indications, dosage, side effects and contra indications.	
Objectives		Outcomes
<p>To refresh the student's knowledge of English language in order to help them cope with</p> <ol style="list-style-type: none"> 1. Simple everyday work situations 2. Academic instructions in pharmacology 		<p>At the end of the course the students will be able to do the following in the skill areas listed below:</p> <ol style="list-style-type: none"> 1. Listening 2. Reading 3. Speaking 4. Writing skills 5. Vocabulary 6. Employability

English-I

Contents

Topics
1. Listening: <ul style="list-style-type: none">• Understand the gist and get specific details from simple conversations at a natural rate of speech, spoken in familiar and unfamiliar contexts• Interpret medical terminology in conversations• Follow simple instructions and requests• Listen and recall some of the major information and sequence of events• Listen and transfer information onto forms
2. Reading: <ul style="list-style-type: none">• Discuss a topic from a passage using the information from the texts and one's own opinions and ideas about the topic• Find specific information in texts consisting mostly of familiar words and some unfamiliar words• Get the meaning of unfamiliar words from the context if the topic is familiar• Read and understand various types of written, simple and straightforward authentic material from subject related texts of various lengths• Understand the meaning of acronyms and medical abbreviations
3. Speaking: <ul style="list-style-type: none">• Apply basic stress, intonation and phonology to speak intelligibly• Ask and respond to familiar questions including wh-questions• Give suggestions/advice• Give instructions• Conduct interviews and hold dialogues with patients.• Participate in meetings• Convey information briefly and clearly• Explain simple cause and effect relationships• Explain simple problems and offer solutions.• Express ideas, opinions and plan clearly in simple language using different grammatical structures• Apply pronunciation rules to medical terminology• Use basic medical terminology in conversations.• Demonstrate care and understanding through dialogue with patients.
4. Writing: <ul style="list-style-type: none">• Write well-organized, well-developed essays of problem/solution• Show knowledge of basic grammar, usage, and sentence structure• Adhere to the conventions of the mechanics of writing, paying attention to layout, spelling and punctuation.• Recognize and write numbers (time, money, phone numbers, ID numbers, dates, etc.) to meet daily needs
5. Vocabulary: Understand and effectively use pharmaceutical vocabulary and abbreviations
4. Employability: <ul style="list-style-type: none">• Communication• Team work• Gathering information• Thinking critically

PENG1200	English-II	1 Credit hour
Hours / Wk	4 (Theory)	
Pre-requisite	PENG1100 (English-I)	
Goal	This English Language course assumes an advanced level of general language proficiency. It is a continuation of PENG 1100 Pharmacy English I. It provides practice in the skills of speaking, listening, reading and writing. This involves exposure to medical literature and development of presentation skills. The course also focuses on skills required for student's professional purposes, including letter writing, knowledge of pharmaceutical vocabulary and specific names and symptoms of diseases.	
Objectives		Outcomes
<p>To refresh the students' knowledge of English language in order to help them cope with</p> <ol style="list-style-type: none"> 1. Simple everyday work situations, 2. Academic instructions in pharmacology 		<p>At the end of the course the students will be able to do the following in the skill areas listed below:</p> <ol style="list-style-type: none"> 1. Listening 2. Reading 3. Speaking 4. Writing 5. Vocabulary 6. Employability

English-II

Contents

Topics
1. Listening: <ul style="list-style-type: none">• Understand the gist and get specific details from simple conversations and talks at a natural rate of speech, spoken in familiar and unfamiliar contexts• Interpret medical terminology in conversations• Follow simple instructions and requests• Listen and recall some of the major information and sequence of events• Listen and transfer information onto forms• Understand a range of technical terminology to handle typical work situations• Discriminate between facts and opinions
2. Reading: <ul style="list-style-type: none">• Discuss a topic from a passage using the information from texts and one's own opinions and ideas about the topic• Find specific information in texts consisting mostly of familiar words and some unfamiliar words• Get the meaning of unfamiliar words from the context if the topic is familiar• Read and understand various types of written, simple and straightforward authentic material from subject related texts of various lengths• Transfer information into a chart, table, or form• Understand the meaning of acronyms and medical abbreviations
3. Speaking: <ul style="list-style-type: none">• Apply basic stress, intonation and phonology to speak intelligibly• Convey information briefly and clearly• Express ideas, opinions and plans clearly in simple language using different grammatical structures• Apply pronunciation rules to medical terminology• Give effective oral presentations using suitable visual aids
4. Writing: <ul style="list-style-type: none">• Write well-organized, well-developed letters to hospitals and medical companies• Express ideas in clear, acceptable English using a wide range of grammatical structures• Adhere to the conventions of the mechanics of writing, paying attention to layout, spelling and punctuation.
5. Vocabulary: Understand and effectively use pharmaceutical vocabulary and abbreviations
6. Employability: <ul style="list-style-type: none">• Communication• Team work• Gathering information• Thinking critically

PENG1300	Public Speaking & Communication Skills	3 Credit hours
Hours / Wk	3 (Theory)	
Pre-requisite	None	
Goal	This is a non-major graduate credit course, which is designed to improve students' performance in Public Speaking and Oral Communication. The course covers speech research, preparation, outlining, delivery and evaluation.	
Objectives		Outcomes
To introduce students to the principles of Public Speaking, and to foster critical thinking and equip them with the skills necessary for producing effective and credible presentations that are suitable for their audience and purpose.		<p>A student who successfully completes the course will have reliably demonstrated the ability to:</p> <ul style="list-style-type: none"> • Develop skills in speech development strategies and delivery techniques • Develop skills in rhetorical sensitivity and critical thinking • Observe, analyze and provide feedback on the effectiveness of a speech/presentation • Demonstrate the ability to collect, analyze and use information to develop and adapt messages for particular audiences, purposes and settings • Organize ideas and create an outline for presentation • Prepare visual aids proper to the purpose of the speech/presentation • Organize ideas and supporting materials in a coherent message • Identify and refine personal speaking styles to business, government and industry functions

ENTW1100	Technical Writing–I	3 Credit hours
Hours / Wk	4 (Theory)	
Pre-requisite	None	
Goal	This course teaches basic academic and technical writing skills to enable students to communicate effectively and clearly. It also develops critical thinking skills. Students will learn to analyze required readings and discover ideas that they can use for writing essays. They will also learn to use basic vocabulary relevant to different technical contexts. In addition, they will learn research skills pertinent to their subject area studies and future work environments.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ul style="list-style-type: none"> ▪ Promote active learning ▪ Encourage discussions ▪ Provide writing practice specific to academic and technical situations 		<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Demonstrate organizational skills in writing. 2. Write well-organized, well-developed essays of comparison/contrast of at least four paragraphs. 3. Write well-organized, well-developed business and scientific descriptive essays of at least four paragraphs to describe place, animals and things (e.g. objects, services) 4. Write a well-organized, well-developed paragraph to interpret/discuss results/charts. 5. Effectively use basic vocabulary relevant to different technical contexts. 6. Demonstrate critical thinking skills. 7. Demonstrate the research skills of paraphrasing, quoting, referencing and interpreting/discussing charts. 8. Monitor, check and revise one’s own work or that of other course participants, giving feedback.

ENTW1200	Technical Writing–II	3 Credit hours
Hours / Wk	4 (Theory)	
Pre-requisite	ENTW1100 (Technical Writing–I)	
Goal	This course is a continuation of ENTW 1100. It teaches basic academic and technical writing skills to enable students to communicate effectively and clearly. It also develops critical thinking skills. Students will learn to analyze readings and discover ideas that they can use for writing essays and reports relevant to their majors. They will also learn to use basic vocabulary relevant to different technical contexts. In addition, they will learn research skills pertinent to their subject area studies and future work environments.	
Objectives		Outcomes
The course should enable the students to: <ul style="list-style-type: none"> • Promote active learning • Encourage discussions • Provide writing practice specific to academic and technical situations 		The student should be able to: <ol style="list-style-type: none"> 1. Demonstrate organizational skills in writing. 2. Reinforce the research skills of paraphrasing, quoting, and referencing. 3. Write well-organized, well-developed summaries. 4. Write well-organized, well-developed syntheses. 5. Write well-organized, well-developed process essays of at least four paragraphs. 6. Write well-organized, well-developed business and scientific reports, incorporating tables. 7. Effectively use basic vocabulary relevant to different technical contexts. 8. Demonstrate critical thinking skills. 9. Monitor, check and revise one’s own work or that of other course participants, giving feedback.

BAMG2111	Entrepreneurship	3 Credit hours
Hours / Wk	4	
Pre-requisites	None	
Goal	To introduce the student to the entrepreneurship phenomenon.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. The student will be exposed to the theory as well the practical experience associated with entrepreneurship. 2. The students will be able to develop clear and structured understanding of a business plan with support systems available to new business ventures. 		<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Develop the basic concepts of entrepreneurship, its traits and types. 2. Develop clear identification of creativity and innovation in entrepreneurship and their impact on the Oman's economy. 3. Explain small business and identify the industries in which most small firms are established. 4. Compare the advantages and disadvantages of small business. 5. Utilize Feasibility Plan as a tool to test a business model to ensure its viability. 6. Articulate and develop a new business in a well-written venture plan. 7. Explore the opportunities for entrepreneurship in Oman in Government and private sectors.

PHAR6400	Graduation Project	2 Credit hours
Hours / Wk	4	
Pre-requisites	PHAR1150 (Pharmacy Practice & Dosage Forms-IV) PHAR3240 (Applied Therapeutics-IV) PHAR2300 (Medicinal Chemistry)	
Goal	This course provides pharmacy students to conduct simple research project on a selected topic of interest.	
Objectives		Outcomes
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Learn the different methodologies utilized in research. 2. Get familiarized with the systematic information collection from various sources. 3. Learn statistical and/or analytical techniques to run the analyses and compute results. 4. Write reports 5. Utilize power-point and other presentation techniques for delivering the seminar 6. Develop communication/presentation skills 7. Defend their project research work 		<p>The student should be able to:</p> <ol style="list-style-type: none"> 1. Systematically collect information from various sources on a particular topic of need. 2. Summarize the obtained information into a scientific report. 3. Operate some statistical programs and/or perform some analytical techniques 3. Prepare Audio-visual presentations of the collected information and defend the scientific content of it.

PHAR6500	On-the-Job Training (OJT)	Non- Credited
Hours/Wk	25 hours (5 hrs/day x 5 days) = Total 300 hours	
Prerequisites	PHAR1150 (Pharmacy Practice & Dosage Forms-IV) PHAR3240 (Applied Therapeutics-IV)	
Goal	To train the students in medical stores, private pharmacy outlets and hospital pharmacies so as to get acquainted with the organization, functioning and actual working environment.	
Objectives		Outcomes
<p>The training activity through OJT should enable the assistant pharmacy students to:</p> <ol style="list-style-type: none"> 1. Understand the arrangement and storage of drugs, pharmaceuticals and related products in medical stores, retail pharmacy outlets and in hospital pharmacies. 2. Get acquainted with the trade names of the drug products available in the market. 3. Deal with reading prescriptions and dispensing various drugs in actual working environment. 4. Deal with different types of drug-drug and drug-food interactions that may be encountered in dispensing therapeutic drugs. 5. Monitor different types of incompatibilities that may be encountered in some prescriptions. 6. Learn the communication and counseling skills. 7. Get familiar with over-the-counter drug products in retail pharmacy outlets. 8. Should acquire the etiquette to communicate with their supervisors, peers and sub-ordinates. 		<p>The students should be able to:</p> <ol style="list-style-type: none"> 1. Identify the placement of drugs in different storage conditions. 2. Read and dispense the prescriptions. 3. Apply the gained experience to avoid drug interactions and incompatibilities. 4. Recognize any drug-drug or drug food interactions. 5. Implement the basic principles of communication skills while counseling patients, and acquire courteous behavior with their supervisor, peers and the sub-ordinates. 6. Encourage patient compliance. 7. Know to prepare an order in both hospital and private pharmacy. 8. Know to check the stock & ordering process.