

Course Summery

Minimum Requirement 158 Credits

The credit distribution is given below:

A. General Education Requirement	18 Credits
B. Core Requirement	140 Credits
C. Pharmaceutical Research/Project (Within 140 Credits)	5 Credits
D. Industrial Training	
Total 158 Credits	

A. Compulsory General Education Requirement	18
Course Title	Credits
PHY 100 Introductory Physics	3
MAT 100 Mathematics	3
ENG 101 Basic English	3
ENG 102 Composition and Communication Skills	3
GEN 2226 Emergence of Bangladesh	3
GEN 207 Industrial Psychology	3

B. Core Requirement	140
Course Title	Credits
PHRM 101 Physical Pharmacy I	4
PHRM 102 Cell Biology and Anatomy	3
PHRM 103 Organic Pharmacy I	4
PHRM 201 Human Physiology I	4
PHRM 202 Basic Microbiology	4
PHRM 203 Pharmaceutical Analysis I	4
PHRM 204 Physical Pharmacy II	4
PHRM 205 Inorganic Pharmacy	4
PHRM 206 Biochemistry	4
PHRM 207 Pharmacognosy I	4
PHRM 208 Human Physiology II	4
PHRM 209 Statistics for Pharmaceutical Sciences	3
PHRM 210 Pharmaceutics I	4
PHRM 211 Organic Pharmacy II	3
PHRM 301 Pharmacology I	3
PHRM 302 Medicinal Chemistry I	3
PHRM 303 Pharmacognosy II	3
PHRM 304 Medicinal Chemistry II	4
PHRM 305 Pharmaceutical Microbiology	4
PHRM 306 Pharmacology II	4

PHRM 307	Pharmaceutical Technology I	3
PHRM 308	Pharmaceutics II	4
PHRM 309	Pharmaceutical Analysis II	4
PHRM 310	Toxicology	3
PHRM 311	Clinical & Hospital Pharmacy	3
PHRM 312	Pharmaceutical Analysis III	3
PHRM 401	Pharmaceutical Management & Marketing	3
PHRM 402	Pharmaceutical Technology II	4
PHRM 403	Drug Design and Development	3
PHRM 404	Pharmaceutical Research	5
PHRM 405	Pharmacy Quality Assurance	3
PHRM 406	Biopharmaceutics & Pharmacokinetics	4
PHRM 407	Pharmaceutical Biotechnology	3
PHRM 409	Advanced Pharmaceutical Analysis	4
PHRM 410	Pharmacy Law and Ethics	3
PHRM 411	Cosmetology	4
PHRM 412	Medicinal Chemistry III	3
PHRM 413	Pharmacology III	4
PHRM 414	Pharmaceutical Engineering	3

Course flow Chart

Semester ↓	Year I		Year II		Year III		Year IV	
	Course Code	Credits						
1st	ENG 101	3	GEN 201	3	PHRM305	4	PHRM 311	3
	Math 100	3	PHRM 205	4	PHRM 306	4	PHRM 403	4
	PHRM 101	4	PHRM 207	4	PHRM 307	3	PHRM 404	5
	PHRM 102	3	PHRM 208	4	PHRM 308	4	PHRM 405	3
	PHRM 103	4	PHRM 210	4	PHRM309	4	PHRM 406	4
	PHRM 202	4					PHRM 411	4
Sub-Total (Semester)		21			19			23
2nd	ENG 102	3	GEN 207	3	PHRM 304	4	PHRM 401	3
	Physics 100	3	PHRM 203	4	PHRM 310	3	PHRM 409	4
	PHRM 201	4	PHRM 206	4	PHRM 312	3	PHRM 410	3
	PHRM 204	4	PHRM 301	3	PHRM 402	3	PHRM 412	3
	PHRM 209	3	PHRM 302	3	PHRM407	3	PHRM414	3
	PHRM 211	3	PHRM303	3	PHRM 413	4		
Sub-Total (Semester)		20			20			16
Sub-Total (year)		41			39			39

Total credits of B.Pharm course : 158

Core Pharmacy Course to PO mapping

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
PHRM101		X										X
PHRM102				X								
PHRM103									X	X		X
PHRM 201				X								
PHRM 202		X					X			X		X
PHRM 203		X					X		X			
PHRM 204	X	X										X
PHRM 205			X	X								
PHRM 206		X		X								X
PHRM 207										X	X	
PHRM 208				X	X							
PHRM 209		X										
PHRM 210						X					X	X
PHRM 211									X			X
PHRM 301	X	X	X									
PHRM 302									X	X		
PHRM 303			X						X	X		
PHRM 304		X							X	X		X
PHRM 305		X		X			X					X
PHRM 306	X	X	X									X
PHRM 307	X					X						
PHRM 308		X				X	X					X
PHRM 309	X	X					X					
PHRM 310	X		X		X							
PHRM 311	X		X		X						X	
PHRM 312	X	X										
PHRM 401	X	X										X
PHRM 402	X					X						X
PHRM 403			X						X	X		
PHRM 404								X				X
PHRM 405							X					X
PHRM 406	X	X										
PHRM 407	X					X						
PHRM 409		X					X			X		
PHRM 410	X						X				X	
PHRM 411	X			X		X	X					
PHRM 412									X	X		
PHRM 413	X	X	X	X	X							X
PHRM 414	X					X						X

Course catalog (Bachelor of Pharmacy program)

PHRM 101: Physical Pharmacy I

Credits: 4; Prerequisite: None

Description:

This course has the objective to get the students well versed with some of the basic concepts of Physical Chemistry having application in pharmacy, which includes states of matter, solutions, pH, buffer and chemical kinetics. The course has been designed to offer comfort for the students in understanding some of the very cardinal areas of drug manufacturing, realizing the vast roles of numerous chemical kinetics and spelling out some of the unique mechanisms that govern the ADME process.

Course learning outcomes:

After completing this course, the students will be able to

1. Describe the properties and laws as well as use equation to solve various mathematical problems of states of matters: solid, liquid and gas
2. Display a thorough understanding of liquid solutions and colligative properties of dilute solutions
3. Apply the knowledge of the basic concepts of acids and bases, buffer systems and chemical kinetics to calculate the pH of solutions and order of reactions

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Describe the properties and laws as well as use equation to solve various mathematical problems of states of matters: solid, liquid and gas	PO2 & PO12
2	Display a thorough understanding of liquid solutions and colligative properties of dilute solutions	PO2 & PO12
3	Apply the knowledge of the basic concepts of acids and bases, buffer systems and chemical kinetics to calculate the pH of solutions and order of reactions	PO2 & PO12

PHRM 102: Cell Biology & Anatomy

Credits: 3; Prerequisite: None

Description:

This course deals with the molecular and cellular processes that occur for the development of human beings. The course will give an overview of basic structure and function of cells, cellular inclusions with anatomical focus. It also deals with anatomical structures and functions of tissues, organs and body systems, steps and histological perspectives of human development.

Course learning outcomes:

At the end of the course the student will be able to

1. Define the different terminologies related to human anatomy
2. Describe the structure and function of the different anatomical structures in the human body
3. Explain the processes of different cellular transport systems, cell divisions and growth

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Define the different terminologies related to human anatomy	PO4
2	Describe the structure and function of the different anatomical structures in the human body	PO4
3	Explain the processes of different cellular transport systems, cell divisions and growth	PO4

PHRM 103: Organic Pharmacy I

Credits: 4; Prerequisite: None

Description:

The course is designed to study the basic concepts of organic chemistry, atoms and structure, properties, reactions and mechanisms of some important organic reactions to generate compounds of pharmaceutical importance. The study is focused on aliphatic, aromatic and

heterocyclic compounds. Synthesis and pharmaceutical uses of sulfa drugs, paracetamol, aspirin etc. will also be discussed.

Course learning outcomes:

At the end of the course the student will be able to

1. Explain the formation of different types of bonds and their properties
2. Identify, classify, organize, analyze, and draw structures of different organic molecule
3. Describe the physicochemical properties of organic chemicals
4. Apply the basic rules of organic nomenclature to convert between structures and names

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Explain the formation of different types of bonds and their properties	PO9
2	Identify, classify, organize, analyze, and draw structures of different organic molecule	PO9, PO10 & PO12
3	Describe the physicochemical properties of organic chemicals	PO9 & PO12
4	Apply the basic rules of organic nomenclature to convert between structures and names	PO9 & PO10

PHRM 201: Human Physiology I

Credits: 4; Prerequisite: PHRM 102

Description:

The essential concern of physiology is how living things work and, as physiology relates to man, it is the study of the normal functioning of the human body. Human Physiology I emphasizes the basic functions of organs, the interactions and coordination of these diverse functions, and attempts to analyze these functions in terms of physical and chemical processes. The overall objective of the course is to provide the students with an understanding of the specific functions of the major organs and systems of the body.

Course learning outcomes:

At the end of the course the student will be able to

1. Define terminologies related to human physiology
2. Describe the structure and function of the different human physiological structures

3. Apply the above knowledge to understand that a physiological malfunction leads to diseased state

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Define terminologies related to human physiology	PO4
2	Describe the structure and function of the different human physiological structures	PO4
3	Apply the above knowledge to understand that a physiological malfunction leads to diseased state	PO4

PHRM 202: Basic Microbiology

Credits: 4; Prerequisite: None

Description:

This course is designed to introduce students to the historical perspective in terms of major innovations in the field of Microbiology. Basic tools like microscopes of various types, their principles and uses will be covered in this course. Simultaneously, morphology, nutritional requirements, growth of bacteria, virus, fungi, moulds and yeast will be briefly studied.

Course learning outcomes:

After completing this course, the students will be able to

1. Explain the scopes and historical development of microbiology and role of microorganisms in studying molecular biology and genetic engineering
2. Elucidate basic structural and morphological features of different types of microorganisms
3. Describe the basic techniques associated with microscopic examinations in concert with various types of microscopy
4. Demonstrate laboratory techniques associated with sterilization and cultivation of bacteria along with sample preparation required for microbiological study

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
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1	Explain the scopes and historical development of microbiology and role of microorganisms in studying molecular biology and genetic engineering	PO10
2	Elucidate basic structural and morphological features of different types of microorganisms	PO2
3	Describe the basic techniques associated with microscopic examinations in concert with various types of microscopy	PO2
4	Demonstrate laboratory techniques associated with sterilization and cultivation of bacteria along with sample preparation required for microbiological study	PO2, PO7 & PO12

PHRM 203: Pharmaceutical Analysis –I

Credits: 4; Prerequisite: PHRM 101

Description:

The aim of this course is to enable the students understand the basics of pharmaceutical analysis like purity and management of pharmaceutical chemicals and finished products. The various aspects of pharmaceutical calculations would be taught based on some quantitative analytical procedures such as acid-base titrations, complexometric titrations, oxidation reduction titrations. The applications of all these techniques and of polarimetry in pharmaceutical analysis will also be discussed.

Course learning outcomes:

At the end of the course the student will be able to:

1. Develop an understanding of the principles of analytical techniques
2. Explain the principles of the major titrimetric methods of drug analysis
3. Understand the behavior of light in optically active compound, reason of polarization and application in pharmaceutical science
4. Assay the purity and content of different drugs and chemical reagents through laboratory experiments

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Develop an understanding of the principles of analytical techniques	PO2 & PO7
2	Explain the principles of the major titrimetric methods of drug analysis	PO2

3	Understand the behavior of light in optically active compound, reason of polarization and application in pharmaceutical science	PO2 & PO9
4	Assay the purity and content of different drugs and chemical reagents through laboratory experiments	PO2 & PO7

PHRM 204: Physical Pharmacy II

Credits: 4; Prerequisite: PHRM 101

Description:

The objective of this course is to provide knowledge about the principles of physico-chemical parameters involved in drug formulation processes and the factors effecting the formulations. This course specifically provides knowledge of the stability of drugs formulations, mechanism and rate of degradation by varied processes and different formulation approaches dealing with stabilization.

Course learning outcomes:

At the end of the course the student will be able to

1. Understand the thermodynamic aspects, phase diagrams and complexation of various systems and processes
2. Evaluate the fundamental and derived properties of different systems such as particle size, surface area, density, viscosity, flow properties, surface tension etc.
3. Analyze the stability of pharmaceutical products, their shelf life and factors behind such characteristics

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Understand the thermodynamic aspects, phase diagrams and complexation of various systems and processes	PO2 & PO12
2	Evaluate the fundamental and derived properties of different systems such as particle size, surface area, density, viscosity, flow properties, surface tension etc	PO2 & PO12
3	Analyze the stability of pharmaceutical products, their shelf life and factors behind such characteristics	PO1, PO2 & PO12

PHRM 205: Inorganic Pharmacy

Credits: 4; Prerequisite: None

Description:

The course offers knowledge of various inorganic compounds, which are used in different physiological systems. The mechanisms of action of inorganic compounds in our body, their physical and chemical properties, methods of preparation, assay in laboratory and their application as drugs will be discussed in this course.

Course learning outcomes:

At the end of the course the student will be able to

1. Explain the basic theories underlying acids and bases, buffers, water and glass and the applications of pharmaceutical aids and necessities
2. Describe the metabolic functions of the physiological ions, mechanisms of their homeostatic balance and clinical manifestation of their deficiency or excess
3. Discuss the principles, mechanisms and applications of inorganic agents employed for the management and treatment of various disorders

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Explain the basic theories underlying acids and bases, buffers, water and glass and the applications of pharmaceutical aids and necessities	PO4
2	Describe the metabolic functions of the physiological ions, mechanisms of their homeostatic balance and clinical manifestation of their deficiency or excess	PO4
3	Discuss the principles, mechanisms and applications of inorganic agents employed for the management and treatment of various disorders	PO3

PHRM 206: Biochemistry

Credits: 4; Prerequisite: PHRM 103

Description:

The course offers the students to understand the nature of carbohydrates, proteins, lipids, nucleic acids, their structures, reactions, uses, metabolism and synthesis. The course will focus

on energy changes, electron transport and ATP generation, enzyme substrate reaction, competitive and non-competitive inhibition processes. Vitamins, minerals, hormones and their uses as drug molecules will also be discussed.

Course learning outcomes:

By the end of the course, students should be able to

1. Describe various biomolecules and their functions
2. Explain different metabolic and biosynthetic pathways of bio-molecules
3. Demonstrate the structure of biomolecules and their application in drug design

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Describe various biomolecules and their functions	PO4
2	Explain different metabolic and biosynthetic pathways of bio-molecules	PO4
3	Demonstrate the structure of biomolecules and their application in drug design	PO2, PO4 & PO12

PHRM 207: Pharmacognosy I

Credits: 4; Prerequisite: None

Description:

The course is focused on the natural products employed both in traditional and allopathic system of medicine. The basic research of pharmaceutical raw materials from plants and animals and origin of medicine will be discussed. The students will be familiar with varieties of molecular armature having different potential bioactivity. They will get an idea how the concept and development of novel molecular armature of modern medicine come from natural bioactive molecules. Pharmaceutical use of different phytoconstituents with existing plant classification systems will be discussed in this course.

Course learning outcomes:

At the end of the course the student will be able to

1. Discuss the origin and history of pharmacognosy and its importance in drug design and development
2. Explain the classification, preparation, evaluation and adulteration of crude drugs.

- Describe the chemistry, sources, biosynthesis, preparation, identification, classification and pharmaceutical uses of various types of phytochemicals

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Discuss the origin and history of Pharmacognosy and its importance in drug design and development	PO10
2	Explain the classification, preparation, evaluation and adulteration of crude drugs.	PO11
3	Describe the chemistry, sources, biosynthesis, preparation, identification, classification and pharmaceutical uses of various types of Phyto-chemicals	PO11

PHRM 208: Human Physiology II

Credits: 4; Prerequisite: PHRM 201

Description:

This course will deal with the transport, metabolism (wherever applicable) of major biomolecules e.g., carbohydrates, lipids, proteins and nucleic acids including their building blocks (monomers). Mechanism of action of hormones; physiological role of different hormones; regulation of hormone secretion; different hormonal disorders and their control will also be discussed.

Course learning outcomes:

After completing this course, the students will be able to

- Define the basic concept of metabolism, endocrine and reproductive system
- Describe the different pathways related metabolism, endocrine system and reproductive system with their regulations
- Apply the knowledge of metabolism, endocrinology, and reproductive system in normal and disease states

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Define the basic concept of metabolism, endocrine and reproductive system	PO4 & PO5

2	Describe the different pathways related metabolism, endocrine system and reproductive system with their regulations	PO4 & PO5
3	Apply the knowledge of metabolism, endocrinology, and reproductive system in normal and disease states	PO4 & PO5

PHRM 209: Statistics for Pharmaceutical Sciences

Credits: 3; Prerequisite: PHRM 204

Description:

The objective of the course is to equip students with the basic statistical knowledge. The overall objective is to enable the students to understand and use the concepts of statistics as a decision-making and problem-solving tool in pharmaceutical manufacturing, quality assurance, research and marketing.

Course learning outcomes:

At the end of the course the student will be able to

1. Understand the statistical approach, Research Design and Method Development in pharmaceutical science
2. Elucidate, Analyze, Summarize, Predict and Find errors from a set of data in a presentable manner
3. Make relation between programming and data analysis

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Understand the statistical approach, Research Design and Method Development in pharmaceutical science	PO2
2	Elucidate, Analyze, Summarize, Predict and Find errors from a set of data in a presentable manner	PO2
3	Make relation between programming and data analysis	PO2

PHRM 210: Pharmaceutics I

Credit: 4; Prerequisite: PHRM 204

Description:

The objective of the course is to give an introduction to basic aspects of Pharmacy, drug, dosage form and drug delivery systems. The students will understand the overall concepts and outlines of pharmaceutical dosage forms and related excipients from this course.

Course learning outcomes:

At the end of the course the student will be able to

1. Define the terminologies and basic aspects of pharmaceuticals and prescription.
2. Design, develop and manufacture of pharmaceutical dosage forms.
3. Evaluate the pharmaceutical formulations and packaging.

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Define the terminologies and basic aspects of pharmaceuticals and prescription.	PO11
2	Design, develop and manufacture of pharmaceutical dosage forms	PO6, PO11 & PO12
3	Evaluate the pharmaceutical formulations and packaging	PO6

PHRM 211: Organic Pharmacy II

Credit: 3; Prerequisite: PHRM103

Description:

The course is designed to provide advanced knowledge of organic chemistry to the students of Pharmacy. The course includes studies of mechanism of organic reactions like SN1, SN2, E1, E2 etc., stereochemistry, heterocyclic compounds (five membered, six membered fused ring systems) and the chemistry of natural compounds (polyhydroxy alcohols, alkaloids, terpenes etc.).

Course learning outcomes:

At the end of the course the student will be able to

1. Describe various reactions mechanisms of organic compounds
2. Design a synthetic pathway of organic compounds applying important name reactions

3. Describe structure and physic chemical properties of different organometallic and hetero cyclic compounds
4. Discuss the basic concept of stereochemistry and draw various configuration of molecules

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Describe various reactions mechanisms of organic compounds	PO9
2	Design a synthetic pathway of organic compounds applying important name reactions	PO9 & PO12
3	Describe structure and physic chemical properties of different organometallic and hetero cyclic compounds	PO9
4	Discuss the basic concept of stereochemistry and draw various configuration of molecules	PO9 & PO12

PHRM 301: Pharmacology I

Credits: 3; Prerequisite: PHRM 208

Description:

In this course we set out general principles for explaining how drugs work in the living system, the interaction between drugs and different types of drug-receptors in the body. The primary objective of this course is to give the knowledge of drugs, but most importantly, those that are relevant to effective and safe use for medicinal purposes. This course includes physiological and biochemical effects of drugs and their mechanism of actions.

Course learning outcomes:

At the end of the course the student will be able to

1. Explain basic principles of pharmacokinetics and pharmacodynamics; pathophysiology of disease and clinically important drug classes to treat them
2. Describe the mechanism of action, indication, contraindication, drug-drug interaction and side effects of drugs
3. Illustrate pharmacokinetic parameters and use knowledge, facts and data to effectively solve clinical cases

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Explain basic principles of pharmacokinetics and pharmacodynamics; pathophysiology of disease and clinically important drug classes to treat them	PO1, PO2 & PO3
2	Describe the mechanism of action, indication, contraindication, drug-drug interaction and side effects of drugs	PO3
3	Illustrate pharmacokinetic parameters and use knowledge, facts and data to effectively solve clinical cases	PO1 & PO3

PHRM 302: Medicinal Chemistry I

Credits: 3; Prerequisite: PHRM 211

Description:

This course has been developed to make undergraduate students familiar with design and syntheses of organic and heterocycles having potential bioactivities. The course encompasses the chemistry of medicines including structure activity relationship, biochemical and physicochemical properties of different therapeutic classes of medicines.

Course learning outcomes:

At the end of the course the student will be able to

1. Understand the rational approach to drug design and development
2. Elucidate the structure-activity relationships in relation to drug-target interactions
3. Understand the chemical pathways of drug synthesis

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Understand the rational approach to drug design and development	PO9
2	Elucidate the structure-activity relationships in relation to drug-target interactions	PO9
3	Understand the chemical pathways of drug synthesis	PO10

PHRM 303: Pharmacognosy II

Credits: 3; Prerequisite: PHRM 207

Description:

This course includes phytochemistry and pharmaceutical uses of the plant constituents like alkaloids, glycerides, volatile oils and related terpenoids, flavonoids, resin and tannin containing drugs. Its scope includes study of physical, chemical, biochemical and therapeutic properties as well as biosynthesis of drugs from natural sources especially from plants.

Course learning outcomes:

At the end of the course the student will be able to

1. Understand biosynthetic pathways for the formation of natural products e.g. Alkaloids, Terpenoids, Volatile oils, Flavanoids, Resin, Tanin, Glycerides secondary metabolites. Structure of natural compounds and classification are correlated with the synthesis and retrosynthetic approach of the molecule synthesis for the drug development
2. Macroscopical, microscopical description of the crude drugs and plant morphology to understand scientific literature in pharmacognosy with scientific descriptions of plants and crude drugs. Sources, geographical distribution, cultivation and propagation of the medicinal plants as a source of crude drugs
3. Structure based therapeutic uses of the natural compounds. Identification tests of the crude drugs and concept of extraction isolation and purification of natural products are focused

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Biosynthetic pathways for the formation of natural products e.g. Alkaloids, Terpenoids, Volatile oils, Flavanoids, Resin, Tanin, Glycerides secondary metabolites. Structure of natural compounds and classification are correlated with the synthesis and retrosynthetic approach of the molecule synthesis for the drug development	PO9
2	Macroscopical, microscopical description of the crude drugs and plant morphology to understand scientific literature in pharmacognosy with scientific descriptions of plants and crude drugs. Sources, geographical distribution, cultivation and propagation of the medicinal plants as a source of crude drugs	PO10

3	Structure based therapeutic uses of the natural compounds. Identification tests of the crude drugs and concept of extraction isolation and purification of natural products are focused	PO3 & PO10
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PHRM 304: Medicinal Chemistry II

Credits: 4; Prerequisite: PHRM 302

Description:

The course aims at providing an idea about the discovery, synthesis and structural modification of drugs. It enables the students to understand the concepts of how the chemical natures of small molecules influence or exhibit biological activities and how the structural modification influences potential activity. It also emphasizes the influences of the structures on the mechanism of actions of the chemical compounds. Along with these, this course also gives an idea about some name reactions that are used to synthesize many compounds important for the medical science.

Course learning outcomes:

At the end of the course the student will be able to

1. Illustrate chemical classification of different types of drugs and discuss their historical development
2. Describe drug-target interactions and scopes of modification for different drugs
3. Understand chemical pathways of drug synthesis

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Illustrate chemical classification of different types of drugs and discuss their historical development	PO2, PO9 & PO10
2	Describe drug-target interactions and scopes of modification for different drugs	PO2, PO9 & PO10
3	Understand chemical pathways of drug synthesis	PO2, PO9, PO10 & PO12

PHRM 305: Pharmaceutical Microbiology

Credits: 4; Prerequisite PHRM 202

Description:

This course offers a general overview of the applied aspects of microbiology including sterilization processes, sterility tests of various pharmaceutical products, aseptic techniques and immunological preparations. The objective of this course is to provide a practical and theoretical foundation in the area of pharmaceutical microbiology.

Course learning outcomes:

At the end of the course the student will be able to

1. Know various advanced sterilization procedure like sterilization by gas, radiation etc. and perform practical procedures to demonstrate competence of aseptic manipulation used in pharmaceutical microbiology
2. Gather clear knowledge about the design, maintenance and air flow of an aseptic room as well as know about various bacteriological media and different evaluation techniques in microbiology
3. Evaluate the sterility testing of various pharmaceutical products especially parenteral products and prepare various immunological products like vaccine. They will also have a clear vision about basic immunology

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Know various advanced sterilization procedure like sterilization by gas, radiation etc. and perform practical procedures to demonstrate competence of aseptic manipulation used in pharmaceutical microbiology	PO2
2	Gather clear knowledge about the design, maintenance and air flow of an aseptic room as well as know about various bacteriological media and different evaluation techniques in microbiology	PO2 & PO12
3	Evaluate the sterility testing of various pharmaceutical products especially parenteral products and prepare various immunological products like vaccine. They will also have a clear vision about basic immunology	PO4 & PO7

PHRM 306: Pharmacology II

Credits: 4; Prerequisite: PHRM 301

Description:

The course gives a basic idea about the different types of compounds used in infectious diseases, central nervous system disorders and cardiovascular system disorders. It includes the specific examples along with the mechanism of action, pharmacokinetic profiles, indications, contraindications, side effects etc. of the individual molecules. In the lab classes, this course emphasizes the actions of some compounds commonly used as medical practices. This provides the basic idea of research about the activities of the unknown compounds.

Course learning outcomes:

At the end of the course the student will be able to

1. Define terminologies and list the major clinically important drugs
2. Demonstrate the pathophysiological changes with their underlying causes; describe the mechanism of action of drugs to treat those disease conditions
3. Describe the drug classes including their indications, contraindications, pharmacokinetic properties, major adverse effects and clinically significant drug interactions; and be able to use knowledge, facts and data to effectively solve clinical cases

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Define terminologies and list the major clinically important drugs	PO1
2	Demonstrate the pathophysiological changes with their underlying causes; describe the mechanism of action of drugs to treat those disease conditions	PO2
3	Describe the drug classes including their indications, contraindications, pharmacokinetic properties, major adverse effects and clinically significant drug interactions; and be able to use knowledge, facts and data to effectively solve clinical cases	PO2, PO3 & PO12

PHRM 307: Pharmaceutical Technology I

Credits: 3; Prerequisite: PHRM 210

Description:

This course intends to introduce the students to three major aspects of industrial manufacturing of drugs dosage forms, preformulation studies and drug product developments

etc. Here students will be familiar with industrial manufacturing of liquid dosage forms, suspensions, emulsions and suppositories.

Course learning outcomes:

At the end of the course the student will be able to

1. Define different terminologies and describe various aspects of pre-formulation.
2. Design, develop and manufacture different types of dispersed, semisolid and sterile dosage forms.
3. Evaluate different pharmaceutical formulations and its packaging.

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Define different terminologies and describe various aspects of pre-formulation.	PO1
2	Design, develop and manufacture different types of dispersed, semisolid and sterile dosage forms.	PO6
3	Evaluate different pharmaceutical formulations and its packaging.	PO1 & PO6

PHRM 308: Pharmaceutics II

Credits: 4; Prerequisite: PHRM 210

Description:

The overall objective of this course is to enable students to acquire knowledge and understanding of different types of solid dosage forms. The solid dosage forms include formulation and manufacturing of different types of tablets and capsules, drug release mechanisms, microencapsulation, sustained release dosage forms, advantages, disadvantages and evaluation of these dosage forms.

Course learning outcomes:

At the end of the course the student will be able to

1. Distinguish different types of solid dosage forms, their manufacturing and quality control tests
2. Elaborate methods of coating and microencapsulation
3. Explain different types of incompatibility and methods of overcoming those

4. Preparation and quality evaluation of different types of solid dosage forms in the laboratory

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Distinguish different types of solid dosage forms, their manufacturing and quality control tests	PO2, PO6 & PO7
2	Elaborate methods of coating and microencapsulation	PO6 & PO7
3	Explain different types of incompatibility and methods of overcoming those	PO6
4	Preparation and quality evaluation of different types of solid dosage forms in the laboratory	PO2, PO7 & PO12

PHRM 309: Pharmaceutical Analysis II

Credits: 4; Prerequisite: PHRM 203

Description:

The objective of the course is to equip the students with the knowledge of pharmaceutical analysis of the dosage forms following more precise methods such as volumetric analysis, aquametry, nonaqueous titrations, spectrophotometry and fluorometry.

Course learning outcomes:

At the end of the course the student will be able to

1. Identify, formulate, analyze and solve problems in the analysis of chemical compounds
2. Design and carry out a method of pharmaceutical and chemical analysis, including instrumental analysis
3. Outline fundamental and applied aspects of chemical analysis as well as prepare written laboratory reports that provide a description of the experiment, explain the experiment and reasoning clearly, and provide an appropriate conclusion

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Identify, formulate, analyze and solve problems in the analysis of chemical compounds	PO1
2	Design and carry out a method of pharmaceutical and chemical analysis, including instrumental analysis	PO7
3	Outline fundamental and applied aspects of chemical analysis as well as prepare written laboratory reports that provide a description of the experiment, explain the experiment and reasoning clearly, and provide an appropriate conclusion	PO2

PHRM 310: Toxicology

Credits: 3; Prerequisite: PHRM 301

Description:

This course has been designed to explain the fundamental principles of toxicology, some basic toxicology terminologies, routes of exposure of different toxicants, and different levels of exposures. The course also emphasizes the toxicokinetics (disposition, metabolism and elimination) and toxicodynamics of various toxicants with a comprehensive knowledge and understanding of the different types and levels of toxicity effects and their mechanisms, e.g. toxicity or poisoning of heavy metals, organic compounds, carcinogens, environmental toxins, etc. It also covers the mechanism of cytotoxicity of various toxicants and responses of different organs to these along with evaluation of toxicity of these agents.

Course learning outcomes:

At the end of the course the student will be able to

1. Explain the principles of toxicology and risks associated with exposure to toxicants and toxins
2. Describe the mechanism of development of toxicity and carcinogenesis and human body's response to eliminate or adapt the respective effects
3. Discuss the effects and clinical management of toxicity

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Explain the principles of toxicology and risks associated with exposure to toxicants and toxins	PO1 & PO5

2	Describe the mechanism of development of toxicity and carcinogenesis and human body's response to eliminate or adapt the respective effects	PO3 & PO5
3	Discuss the effects and clinical management of toxicity	PO1 & PO5

PHRM 311: Clinical & Hospital Pharmacy

Credits: 3; Prerequisite: PHRM 301

Description:

The primary objective of the course is to provide students with a comprehensive idea about a hospital and its organizational pattern, drug distribution system and inventory management & documentation. This course also emphasizes overall understanding of practice of clinical pharmacy including stages of life, management of different types of diseases in hospital settings, mechanism of drug interaction & adverse drug reactions and their managements. The case studies of different diseases of different age groups are also to be discussed in this course.

Course learning outcomes:

At the end of the course the student will be able to

1. Describe the basic concepts of hospital and clinical pharmacy
2. Discuss how drugs are procured, controlled and distributed, including special classes of drugs in hospital practice
3. Discuss the pharmacokinetic and pharmacodynamic changes in specific classes of population, along with manifestation of common disorders and their management

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Describe the basic concepts of hospital and clinical pharmacy	PO1, PO3 & PO11
2	Discuss how drugs are procured, controlled and distributed, including special classes of drugs in hospital practice	PO1 & PO11
3	Discuss the pharmacokinetic and pharmacodynamic changes in specific classes of population, along with manifestation of common disorders and their management	PO3 & PO5

PHRM 312: Pharmaceutical Analysis III

Credits: 3; Prerequisite: PHRM 309

Description:

This course is offered to give the detailed knowledge of the principle, methodology and application of thin layer chromatography (TLC), column chromatography, gas chromatography, ion-exchange chromatography etc. The principle, instrumentation of infra-red (IR) spectroscopy, chemical structures/functional groups showing IR spectra, and their applications in pharmaceutical analysis will also be discussed.

Course learning outcomes:

After completing this course, the students will be able to

1. Describe the basic aspects of chromatography and the principles of different chromatographic techniques recognize the importance of each of the chromatographic technique in pharmaceutical and other fields
2. Analyze mixtures by separating them using proper chromatographic procedure and solve related problems
3. Analyze compounds using infra-red spectroscopy and find out the functional groups present in their structure from the spectrum

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Describe the basic aspects of chromatography and the principles of different chromatographic techniques recognize the importance of each of the chromatographic technique in pharmaceutical and other fields	PO1 & PO2
2	Analyze mixtures by separating them using proper chromatographic procedure and solve related problems	PO1 & PO2
3	Analyze compounds using infra-red spectroscopy and find out the functional groups present in their structure from the spectrum	PO1 & PO2

PHRM 401: Pharmaceutical Management and Marketing

Credits: 3; Prerequisite: PHRM 301

Description:

This course has been designed with an objective to orient the students to the fundamental principles of Marketing Management and its application to the pharmaceutical industry. The

course will help to develop a conceptual framework about how pharmaceutical marketing works with respect to various external factors like economic, social, political, legal, technological and ethical factors.

Course learning outcomes:

At the end of the course the student will be able to

1. Understand the principles of marketing, differentiate between customer need, want and demand
2. Prepare an integrated marketing plan, Branding, Pricing, SWOT analysis, PEST analysis
3. Learn how to develop and launch a new product, Product life-cycle, Promotion and Marketing forces

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Understand the principles of marketing, differentiate between customer need, want and demand	PO1 & PO12
2	Prepare an integrated marketing plan, Branding, Pricing, SWOT analysis, PEST analysis	PO1 & PO2
3	Learn how to develop and launch a new product, Product life-cycle, Promotion and Marketing forces	PO1 & PO2

PHRM 402: Pharmaceutical Technology II

Credits: 4; Prerequisites: PHRM 307

Description:

The course is introduced to educate the students regarding the engineering aspects of pharmaceutical production technology and the principles involved in drying, freeze drying, filtration, centrifugation, mixing and pelletization etc.

Course learning outcomes:

At the end of the course the student will be able to

1. Understand various manufacturing processes used in pharmaceutical industry and factors affecting those processes along with their regulation and management

2. Explain mechanisms of various machines and equipment used for the manufacturing processes mentioned above as well as their applications, advantages-disadvantages
3. Design the best manufacturing conditions for a particular process and choose the best equipment for that process

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Understand various manufacturing processes used in pharmaceutical industry and factors affecting those processes along with their regulation and management	PO6 & PO12
2	Explain mechanisms of various machines and equipment used for the manufacturing processes mentioned above as well as their applications, advantages-disadvantages	PO6
3	Design the best manufacturing conditions for a particular process and choose the best equipment for that process	PO1, PO6 & PO12

PHRM 403: Drug Design and Development

Credits: 3; Prerequisite: PHRM 304

Description:

This course will give a preliminary idea about the necessity of drug design based on lead compounds, modification of the lead structures to improve the activity and to reduce the side-effects. It will also enable the students learn various processes of molecular modification to improve drug receptor interactions and pharmacokinetic properties giving emphasis on some special processes like simplification and rigidification of lead structures, isosteric and bioisosteric approaches, QSAR, pro-drug approach and their role in drug discovery and development. The use of computers in drug designing and applications of combinatorial chemistry in drug design will also be discussed.

Course learning outcomes:

At the end of the course the student will be able to

1. Categorize synthetic strategies and techniques for the synthesis of relevant new medicinal agents as a process of drug discovery and development
2. Explain the approaches and steps involved in the evaluation of safe and effective drug design. Account for decision points in drug design and development process. Carry out searches in databases to retrieve information relevant to the development of a new drug

- Critical evaluation and rationalize the structural and biological activity-based drug design, conduct, analyse and interpret results of an experiment, and effectively communicate these in written reports. Describe and justify the role and importance of the various disciplines involved in the different phases of drug discovery and development

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Categorize synthetic strategies and techniques for the synthesis of relevant new medicinal agents as a process of drug discovery and development	PO9 & PO10
2	Explain the approaches and steps involved in the evaluation of safe and effective drug design. Account for decision points in drug design and development process. Carry out searches in databases to retrieve information relevant to the development of a new drug	PO10
3	Critical evaluation and rationalize the structural and biological activity-based drug design, conduct, analyse and interpret results of an experiment, and effectively communicate these in written reports. Describe and justify the role and importance of the various disciplines involved in the different phases of drug discovery and development	PO3 & PO10

PHRM 404: Pharmaceutical Research

Credits: 5; Prerequisite: Minimum 90 Credits Completed.

Description:

The course is introduced as a means of providing an opportunity for exposure to investigational research. The course is designed principally to help students in practicing the various research patterns in graduate studies. The student undertakes a research project, involves him/herself in through field/lab procedures intensively under the guidance of faculty members and submits a report in a research paper format.

Course learning outcomes:

At the end of the course the student will be able to

- Search and cite scientific literature
- Develop research methodology, research protocol, research hypothesis and synopsis writing
- Conduct research and explain experimental detail along with data analysis

4. Present research outcome

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Search and cite scientific literature	PO8
2	Develop research methodology, research protocol, research hypothesis and synopsis writing	PO8
3	Conduct research and explain experimental detail along with data analysis	PO8
4	Present research outcome	PO12

PHRM 405: Pharmacy Quality Assurance

Credits: 3; Prerequisite: PHRM 307, PHRM 308, PHRM 309

Description:

Quality assurance (QA) is an essential component in the process of pharmaceutical manufacturing. Its coverage starts from the raw materials to the finished products store. Now-a-days its coverage extends up to intake of those medicines by patients. This course will provide insights on WHO's good manufacturing practice (GMP), the standard principles of quality control (QC), good laboratory practice (GLP) and good clinical practice (GCP). This course will also deal with validation of manufacturing processes, in-process control methods, analytical methodologies, instruments and chemicals and reagents used in pharmaceutical industries. Additionally, this course will describe the procedures to perform stability studies of new products and stored samples. Finally, this course will shed some light on the most recent concept of total quality management (TQM).

Course learning outcomes:

At the end of the course the student will be able to

1. Justify pharmaceutical quality control and quality assurance to a range of specialist medicines management areas in pharmaceutical technology and quality assurance
2. Create evidence-based judgements regarding the quality assurance issues with the guideline of "Good manufacturing Practice" in pharmaceutical practice: lead on enhancing the achievement of standards and upholding necessary standards and legal requirements in specific areas of practice
3. Combine pharmaceutical quality assurance tools (QBD, cGMP, USFDA, UKMHRA, TGA etc. and create improvement plan a self-reflective role in critical steps of "Quality Assurance" in pharmaceutical manufacturing, patient care as well as in "research and Development (R&D) of pharmaceutical products

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Justify pharmaceutical Quality control and quality assurance to a range of specialist medicines management areas in pharmaceutical technology and quality assurance	PO7 & PO12
2	Create evidence-based judgements regarding the quality assurance issues with the guideline of “Good manufacturing Practice” in pharmaceutical practice: lead on enhancing the achievement of standards and upholding necessary standards and legal requirements in specific areas of practice	PO7 & PO12
3	Combine pharmaceutical quality assurance tools (QBD, cGMP, USFDA, UKMHRA, TGA etc. and create improvement plan a self-reflective role in critical steps of “Quality Assurance” in pharmaceutical manufacturing, patient care as well as in “research and Development (R&D) of pharmaceutical products	PO7 & PO12

PHRM 406: Biopharmaceutics & Pharmacokinetics

Credit: 4; Prerequisite: PHRM 308

Description:

This course explores how the functions of drugs in the body are influenced by physiological and biochemical processes. It will give an overview of time course of drug action in human body. It incorporates the basic techniques to determine the dose in normal and pathological conditions and has an orientation where the knowledge can be applied in a clinical set-up (case based analysis).

Course learning outcomes:

At the end of the course the student will be able to

1. Describe the basic principles related to biopharmaceutics and pharmacokinetics
2. Derive the necessary equations of study of biopharmaceutics and pharmacokinetics
3. Discuss the application of derived equations in the clinical study

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Describe the basic principles related to biopharmaceutics and pharmacokinetics	PO1
2	Derive the necessary equations of study of biopharmaceutics and pharmacokinetics	PO2
3	Discuss the application of derived equations in the clinical study	PO1 & PO2

PHRM 407: Pharmaceutical Biotechnology

Credits: 3; Prerequisite: PHRM 206, PHRM 305

Description:

The course offers modern biotechnological approaches like recombinant DNA technology, gene therapy, antisense oligonucleotide therapy, vaccine technology; immobilization of enzymes and fermentation technology. Gene cloning will also be introduced in terms of their innovations and uses/applications for pharmaceutical purposes.

Course learning outcomes:

At the end of the course the student will be able to

1. Impart a comprehension of basic skills necessary for employing biotechnology principles and technologies, achieve better understanding of the different pharmaceutical parameters and applications of the current and future biotechnology products
2. Accomplish a working knowledge of different formulations such as protein and peptide drugs, monoclonal antibodies and other immunological products and gene therapy
3. Deliver insights about the recent and future advancement of techniques implied in the research field of biotechnology, biosafety and ethical regulations

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Impart a comprehension of basic skills necessary for employing biotechnology principles and technologies, achieve better understanding of the different pharmaceutical parameters and applications of the current and future biotechnology products	PO1 & PO6

2	Accomplish a working knowledge of different formulations such as protein and peptide drugs, monoclonal antibodies and other immunological products and gene therapy	PO6
3	Deliver insights about the recent and future advancement of techniques implied in the research field of biotechnology, biosafety and ethical regulations	PO6

PHRM 409: Advanced Pharmaceutical Analysis

Credits: 4; Prerequisite: PHRM 312

Description:

The objective of this course is to orient students with the principles, instrumentation and applications of NMR Spectroscopy and Mass Spectrometry in order to understand characterization of the structure of unknown compounds by the combined application of all spectrosopic methods. It will also enable the students to understand the principles, instrumentation and application of HPLC in advanced pharmaceutical analysis. Some advanced analytical techniques for pharmaceutical products like Atomic Absorption Spectroscopy and Radioimmunoassay will also be discussed in detail.

Course learning outcomes:

At the end of the course the student will be able to

1. Apply high performance liquid chromatographic technique in the analysis of different pharmaceutical dosage forms for quality control of the process, checking the purity of raw materials, identifying the impurities and purification of raw materials of active pharmaceuticals
2. Demonstrate an understanding of the theory and applications of proton and carbon nuclear magnetic resonance spectroscopy and mass spectroscopy in pharmaceutical analysis. Able to determine the structure of organic drug molecules by applying those techniques
3. Demonstrate an understanding of the theory and applications of atomic absorption spectroscopy in pharmaceutical analysis of metallic elements
4. Demonstrate an understanding of the theory and applications of highly sensitive radio-immunoassay method of analysis

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
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1	Apply high performance liquid chromatographic technique in the analysis of different pharmaceutical dosage forms for quality control of the process, checking the purity of raw materials, identifying the impurities and purification of raw materials of active pharmaceuticals	PO2 & PO7
2	Demonstrate an understanding of the theory and applications of proton and carbon nuclear magnetic resonance spectroscopy and mass spectroscopy in pharmaceutical analysis. Able to determine the structure of organic drug molecules by applying those techniques	PO2, PO7 & PO10
3	Demonstrate an understanding of the theory and applications of atomic absorption spectroscopy in pharmaceutical analysis of metallic elements	PO2 & PO7
4	Demonstrate an understanding of the theory and applications of highly sensitive radio-immunoassay method of analysis	PO2

PHRM 410: Pharmacy Law and Ethics

Credits: 3; Prerequisite: None

Description:

This course provides an insight into how pharmacy had evolved in relation to the evolution of civilizations, myths and histories contained in them, code of ethics as followed by a pharmacist, and various relevant regulations evolved in this sub-continent, especially in the country to control the production, sale and use of medicines. Knowledge of this historical development of pharmacy with the moral philosophy and ethical principles, the status of pharmacy practice, regulatory bodies like Pharmacy Council of Bangladesh and Drug Administration, study of the drug policies, various regulations and laws relating to the practice of pharmacy, standing of controlling drug advertisements and price of drugs, the national and global position of drug abuse and their control measures etc. are to be dealt with in this course.

Course learning outcomes:

At the end of the course the student will be able to

1. Know the way pharmacy developed worldwide and also in Bangladesh
2. Understand the ethical considerations during pharmacy practice
3. Know about different governmental bodies regulating the pharmacy profession in Bangladesh
4. Have an idea on how the pharmacy profession or practice is governed by different policies and laws of Bangladesh
5. Get an idea of controlling drug abuse

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Know the way pharmacy developed worldwide and also in Bangladesh	PO11
2	Understand the ethical considerations during pharmacy practice	PO1, PO7 & PO11
3	Know about different governmental bodies regulating the pharmacy profession in Bangladesh	PO1 & PO11
4	Have an idea on how the pharmacy profession or practice is governed by different policies and laws of Bangladesh	PO1 & PO11
5	Get an idea of controlling drug abuse	PO1, PO7 & PO11

PHRM 411: Cosmetology

Credits: 4; Prerequisites: PHRM 307, PHRM 308

Description:

This course provides an in-depth understanding of the technology and advancements on various common cosmetics preparations. The students will understand the art of compounding and quality control procedures of cosmetic preparations. As a science, cosmetics manufacture has grown considerably in recent years. In this course, the students will be able to enhance their knowledge and skill by a thorough and wide-ranging approach to new developments.

Course learning outcomes:

At the end of the course the student will be able to

1. Know how cosmetics evolved worldwide
2. Identify the anatomical construction of the skin, hair, tooth and their related structures
3. Categorize different cosmetic preparations and identify appropriate ingredients to formulate a cosmetic dosage form
4. Recognize the rationales behind the use of coloring agents, and fragrances and perfumes in cosmetics and understand the science behind successful blending of colors and flavors

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

SI.	CLOs	POs
1	Know how cosmetics evolved worldwide	PO6
2	Identify the anatomical construction of the skin, hair, tooth and their related structures	PO4
3	Categorize different cosmetic preparations and identify appropriate ingredients to formulate a cosmetic dosage form	PO1, PO6 & PO7
4	Recognize the rationales behind the use of coloring agents, and fragrances and perfumes in cosmetics and understand the science behind successful blending of colors and flavors	PO6 & PO7

PHRM 412: Medicinal Chemistry III

Credits: 3; Prerequisites: PHRM 304

Description:

The objectives of this course are to help the students understand the role of stereochemistry in case of showing the optimal medicinal activity, asymmetric synthesis, stereoselective and stereospecific reactions, pharmaceutical importance of stereospecificity. Besides, this course will also enable the students to learn about some important classes of drugs like synthetic antibacterial agents viz. quinolones, nitrofurans, methenamine and its salts, urinary analgesics etc.; antiviral drugs, antithyroid drugs, immunosuppressive agents, agents used in gene therapy; their syntheses, structure activity relationships and pharmaceutical importance from an advanced level. Some outstanding reactions for organic syntheses will also be discussed.

Course learning outcomes:

At the end of the course the student will be able to

1. Understand the fundamental concepts of chirality, optical isomerism and asymmetric synthesis
2. Describe about the classification, chemistry, SAR, synthesis and therapeutic uses of Immunosuppressant agent's Antiviral drugs, Antithyroid drugs, Antibacterial agents and anticancer drugs
3. Explain about important heterocyclic compounds, their syntheses and application in Medicinal Chemistry

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Understand the fundamental concepts of chirality, optical isomersim and asymeric synthesis	PO9
2	Describe about the classification, chemistry, SAR, synthesis and therapeutic uses of Immunosuppressant agent's Antiviral drugs, Antithyroid drugs, Antibacterial agents and anticancer drugs	PO9 & PO10
3	Explain about important heterocyclic compounds, their syntheses and application in Medicinal Chemistry	PO9 & PO10

PHRM 413: Pharmacology III

Credits: 4; Prerequisites: PHRM 301

Description:

The course gives a basic idea about many important therapeutic classes of compounds used in common disorders. Its main focus is on the drugs acting on the gastrointestinal tract, respiratory tract and on various hormonal compounds, contraceptives, anticancer drugs etc. where it includes specific examples along with the mechanism of actions, pharmacokinetic profiles, indications, contraindications, side effects etc. of the individual molecules. It also provides an idea about some other important classes of drugs like vitamins, chelating agents, vaccines, gene therapy products etc. In the lab classes, this course will emphasize the actions of some compounds commonly used as medical practices related to the theory topics. This will provide some basic idea of research about the activities of the unknown compounds.

Course learning outcomes:

At the end of the course the student will be able to

1. Define terminologies and list the major clinically important drugs
2. Demonstrate the pathophysiological changes with their underlying causes; describe the mechanism of action of drugs to treat those disease conditions
3. Describe the drug classes including their indications, contraindications, pharmacokinetic properties, major adverse effects and clinically significant drug interactions; and be able to use knowledge, facts and data to effectively solve clinical cases

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Define terminologies and list the major clinically important drugs	PO1 & PO3
2	Demonstrate the pathophysiological changes with their underlying causes; describe the mechanism of action of drugs to treat those disease conditions	PO4
3	Describe the drug classes including their indications, contraindications, pharmacokinetic properties, major adverse effects and clinically significant drug interactions; and be able to use knowledge, facts and data to effectively solve clinical cases	PO2, PO3, PO5 & PO12

PHRM 414: Pharmaceutical Engineering

Credits: 3; Prerequisites: None

Description:

This course provides an insight into how pharmaceutical industries adopt various engineering operations, the pharmaceutical machineries involved and the correct procedures a pharmacist should follow as per the standard GMP. After completion of this course, a student will be able to understand the theories and mechanisms behind these engineering operations vis-à-vis select or design the machineries as required.

Course learning outcomes:

At the end of the course the student will be able to

1. Understand the principles of psychrometry and its uses; comprehend the mechanism of action of different machineries used in pharmaceutical industries e.g. humidifiers, humidifiers, refrigeration, air conditioning, and HVAC systems
2. Differentiate among various types of refrigeration, air conditioning, HVAC systems and to be able to choose the most appropriate one for specific area of a pharmaceutical plant
3. Apply knowledge of the pharmaceutical engineering to implement HVAC system in different areas of a pharmaceutical sector and design a lay-out for the factory
4. Apply the knowledge on recognizing and mitigating the industrial waste and health care waste

Mapping of course learning outcomes (CLOs) with program outcomes (POs):

Sl.	CLOs	POs
1	Understand the principles of psychrometry and its uses; comprehend the mechanism of action of different machineries used in pharmaceutical industries e.g. humidifiers, humidifiers, refrigeration, air conditioning, and HVAC systems	PO1 & PO6
2	Differentiate among various types of refrigeration, air conditioning, HVAC systems and to be able to choose the most appropriate one for specific area of a pharmaceutical plant	PO1 & PO6
3	Apply knowledge of the pharmaceutical engineering to implement HVAC system in different areas of a pharmaceutical sector and design a lay-out for the factory	PO1, PO6 & PO12
4	Apply the knowledge on recognizing and mitigating the industrial waste and health care waste	PO1