



4-Year Bachelor of Pharmacy (B.Pharm) Curriculum and Syllabus
Course Structure
Second Semester

Subject Code	Name of Subject	No.of hours	Tutorial	Credit points
TIU-UBP-201T	Human Anatomy and Physiology II-Theory	3	1	4
TIU-UBP-202T	Pharmaceutical Organic Chemistry I-Theory	3	1	4
TIU-UBP-203T	Biochemistry–Theory	3	1	4
TIU-UBP-204T	Pathophysiology-Theory	3	1	4
TIU-UBP-205T	Computer Applications in Pharmacy– Theory*	3	-	3
TIU-UBP-206T	Environmental Sciences–Theory*	3	-	3
TIU-UBP-207P	Human Anatomy and Physiology II - Practical	4	-	2
TIU-UBP-208P	Pharmaceutical Organic Chemistry I-Practical	4	-	2
TIU-UBP-209P	Biochemistry-Practical	4	-	2
TIU-UBP-210P	Computer Applications in Pharmacy – Practical*	2	-	1
Total		32	4	29

*Non University Examination (NUE)



B.PHARM SYLLABUS

SEMESTER – II

Human Anatomy and Physiology II-Theory (TIU-UBP-201T)

Contact hours: 45 hr

Course Objectives

1. To gain knowledge of the gross morphology, structure and functions of various organs of the human body.
2. To understand the various homeostatic mechanisms and their imbalances.
3. To identify the various tissues and organs of different systems of human body.
4. To Describe the hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
5. To understand the coordinated working pattern of different organs of each system
6. To understand the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

Course Outcomes

Upon completion of the course, the student shall be able

CO1. **Describe** the anatomy and physiology of nervous system.

CO2. **Summarize** the anatomy and physiology of digestive system.

CO3. **Explain** the anatomy and physiology of respiratory and urinary system.

CO4. **Demonstrate** the anatomy and physiology of endocrine system.

CO5. **Discuss** the anatomy and physiology of reproductive system and Demonstrate genetics.

Course Content

45 Hours

Unit I

10 hours

Nervous system

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. structure and functions of brain (cerebrum, brainstem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)

Unit II

06 hours

Digestive system

Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

Energetics



Formation and role of ATP, Creatinine Phosphate and BMR.

Unit III

10 hours

Respiratory system

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

Urinary system

Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

Unit IV

10 hours

Endocrine system

Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

Unit V

09 hours

Reproductive system

Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition

Introduction to genetics

Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance

Reference Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Taylor. Williams & Wilkins Co, Riverview, MI USA
4. Text book of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.
9. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterjee, Academic Publishers Kolkata



Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Describe the anatomy and physiology of nervous system.	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3
CO2	Summarize the anatomy and physiology of digestive system.	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3
CO3	Explain the anatomy and physiology of respiratory and urinary system.	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3
CO4	Demonstrate the anatomy and physiology of endocrine system.	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3
CO5	Discuss the anatomy and physiology of reproductive system and Demonstrate genetics.	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3

Course Code	Course Title	Pharmaceutical Knowledge Problem solving Conduct, analyze and interpret data Ability to design and formulating a process Ability to understand mechanism Demonstrate skills in problem solving Professional and ethical responsibilities Communication to present a technical report Impact on society and responsibilities Leadership qualities Self educating and Life-long Learning Preparation for competitive examinations Building a theoretical knowledge base along with necessary practical skills To build a strong foundation as per the requirements of pharmaceutical Industries, Community and Hospital Training students to achieve expertise																
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3		
TIU-UBP-201T	Human Anatomy and Physiology II - Theory	3	-	-	-	3	-	-	-	-	-	3	3	3	3	3		

1=weakly mapped
2= moderately mapped
3=strongly mapped



Human Anatomy and Physiology II – Practical (TIU-UBP-207P)

Contact hours: 4hr/wk

Course Objectives

1. To know the anatomy of various organs of human body.
2. To know the physiology of different organs of human body.
3. To understand the various sensory organs.

Course Outcomes:

After successful completion of this course, students will be able to:

- CO1. **Demonstrate** the various organ system and special senses.
- CO2. **Estimate** the different types of taste and lung capacity.
- CO3. **Describe** reflex activity, body temperature and feedback system.
- CO4. **Summarize** family planning devices and pregnancy diagnosis test
- CO5. **Discuss** the permanent slides of vital organs and gonads.

Course Content

4 Hours/Week

1. To study the integumentary and special senses using specimen, models, etc.,
2. To study the nervous system using specimen, models, etc.,
3. To study the endocrine system using specimen, models, etc
4. To demonstrate the general neurological examination
5. To demonstrate the function of olfactory nerve
6. To examine the different types of taste.
7. To demonstrate the visual acuity
8. To demonstrate the reflex activity
9. Recording of body temperature
10. To demonstrate positive and negative feedback mechanism.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

Reference Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypeebrothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, ChurchillLivingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams &WilkinsCo,Riverview,MI USA



4. Text book of Medical Physiology- Arthur C, Guyton and John E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.
9. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterjee, Academic Publishers Kolkata

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Demonstrate the various organ system and special senses.	PO1, PO5, PO11, PO12, PEO1
CO2	Estimate the different types of taste and lung capacity.	PO1, PO2, PO3, PO5, PO6, PO11, PO12, PEO1, PEO2, PEO3
CO3	Describe reflex activity, body temperature and feedback system.	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3
CO4	Summarize family planning devices and pregnancy diagnosis test	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3
CO5	Discuss the permanent slides of vital organs and gonads.	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-207P	Human Anatomy	3	2	2	-	3	2	-	-	-	-	3	3	2	3	3



and Physiology II- Practical																	
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1=weakly mapped

2= moderately mapped

3=strongly mapped

Pharmaceutical Organic Chemistry I-Theory (TIU-UBP-202T)

Contact hours: 45 hr

Course Objectives

1. To understand the structure, name and the type of isomerism of the organic compound
2. To explain the reaction, name the reaction and orientation of reactions.
3. To have an overall idea on the account for reactivity/stability of compounds.
4. To gain knowledge on the identification/confirmation of the organic compound

Course Outcomes

Upon completion of the course, the student shall be able to

CO1. **Demonstrate** and understand the concept of nomenclature of organic compounds and isomerism.

CO2. **Demonstrate** and understand the concept of different class of chemical compounds.

CO3. **Demonstrate** and **classify** organic compounds and understand their structures.

CO4. **Describe** synthesis, reactions and uses of different class of organic compounds.

CO5. **Describe** and understand the different name reactions which are important for various important class of organic compounds.

Course Content

45 Hours

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained. To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences.

UNIT-I

07 Hours

Classification, nomenclature and isomerism

Classification of Organic Compounds

Common and IUPAC systems of nomenclature of organic compounds
(up to 10 Carbons open chain and carbocyclic compounds)

Structural isomerisms in organic compounds

UNIT-II

10Hours



Alkanes*, Alkenes* and Conjugated dienes*

SP³ hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP² hybridization in alkenes E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeff's orientation and evidences. E1 versus E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti-Markownikoff's orientation. Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

UNIT-III

10 Hours

Alkyl halides*

SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions. Structure and uses of ethyl chloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform. Alcohols* - Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

UNIT-IV

10 Hours

Carbonyl compounds* (Aldehydes and ketones)

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

UNIT-V

08 Hours

Carboxylic acids*

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester. Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

Aliphatic amines* - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

Reference Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar, Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.



4. Organic Chemistry by P.L.Soni
5. Advanced Practical organic chemistry by N.K.Vishnoi.
6. Reaction and reaction mechanism by Ahluwalia/Chatwal.

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Demonstrate and understand the concept of nomenclature of organic compounds and isomerism.	P01, PO3, P04, PO12, PEO1, PEO2
CO2	Demonstrate and understand the concept of different class of chemical compounds.	P01, PO3, P04, PO12, PEO1, PEO2
CO3	Demonstrate and classify organic compounds and understand their structures.	P01, PO3, P04, PO12, PEO1, PEO2
CO4	Describe synthesis, reactions and uses of different class of organic compounds.	P01, PO3, P04, PO12, PEO1, PEO2
CO5	Describe and understand the different name reactions which are important for various important class of organic compounds.	P01, PO3, P04, PO12, PEO1, PEO2, PS03

Course Code	Course Title	Program Outcomes														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-202T	Pharmaceutical Organic Chemistry I – Theory	3	-	3	3	-	-	-	-	-	-	-	3	3	3	1



- 1=weakly mapped
2= moderately mapped
3=strongly mapped

Pharmaceutical Organic Chemistry I-Practical (TIU-UBP-208P)
Contact hours:4hrs/wk

Course Objectives

- 1.To know the systematic qualitative analysis of unknown organic compounds
- 2.To prepare solid derivatives of organic compounds.
- 3.To understand the molecular models.

Course Outcomes:

After successful completion of this course, students will be able to:

- CO1. **Demonstrate** the systematic qualitative analysis of unknown organic compounds
CO2.**Evaluate** the Functional group and melting point of organic compounds
CO3. **Understand** the suitable solid derivatives from organic compounds
CO4.**Demonstrate** the molecular models

Course Content
Hours/Week

4

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1. Systematic qualitative analysis of unknown organic compounds like
 1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
 2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
 3. Solubility test
 4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
 5. Melting point/Boiling point of organic compounds
 6. Identification of the unknown compound from the literature using melting point/boiling point.
 7. Preparation of the derivatives and confirmation of the unknown compound by melting point/boiling point.
 8. Minimum 5 unknown organic compounds to be analysed systematically.
 2. Preparation of suitable solid derivatives from organic compounds
 3. Construction of molecular models

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar, Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.



4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K. Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwalia/Chatwal.

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Demonstrate the systematic qualitative analysis of unknown organic compounds	PO1,PO3,PO12,PEO1
CO2	Evaluate the Functional group and melting point of organic compounds	PO1, PO3, PO12,PEO1,PEO2, PEO3
CO3	Understand the suitable solid derivatives from organic compounds	PO1,PO12
CO4	Demonstrate the molecular models	PO1,PO4,PO5,PO12, PEO1,PEO2, PEO3

Course Code	Course Title	Pharmaceutical Knowledge	Problem solving	Conduct, analyze and interpret data	Ability to design and formulating a process	Ability to understand mechanism	Demonstrate skills in problem solving	Professional and ethical responsibilities	Communication to present a technical report	Impact on society and responsibilities	Leadership qualities	Self educating and Life-long Learning	Preparation for competitive examinations	Building a theoretical knowledge base along with necessary practical skills	To build a strong foundation as per the requirements of pharmaceutical Industries, Community and Hospital	Training students to achieve expertise
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-208P	Pharmaceutical Organic Chemistry I-Practical	3	-	2	2	2	-	-	-	-	-	-	2	3	2	2

1=weakly mapped



2= moderately mapped

3=strongly mapped

Biochemistry–Theory (TIU-UBP-203T)

Contact hours: 45 hr

Course Objectives

1. To understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. To know the metabolism of nutrient molecules in physiological and pathological conditions.
3. To gain knowledge the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Course Outcomes

Upon completion of the course, the student shall be able

CO1. **Classify** Biomolecules and their chemical nature and biological role.

CO2. **Identify** the factors affecting Carbohydrate metabolism and biological oxidation.

CO3. **Compare** different Lipid and Amino acid metabolism

CO4. **Summarize** Nucleic acid metabolism and genetic information transfer.

CO5. **Demonstrate** Enzymes and their therapeutic and diagnostic applications.

Course Content

45 Hours

UNIT I

08 Hours

Biomolecules

Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

Bioenergetics

Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential. Energy rich compounds; classification; biological significances of ATP and cyclic AMP

UNIT II

10 Hours

Carbohydrate metabolism

Glycolysis – Pathway, energetics and significance

Citric acid cycle- Pathway, energetics and significance

HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency

Glycogen metabolism Pathways and glycogen storage diseases (GSD)

Gluconeogenesis- Pathway and its significance

Hormonal regulation of blood glucose level and Diabetes mellitus



Biological oxidation

Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate level phosphorylation

Inhibitors ETC and oxidative phosphorylation/Uncouplers

UNIT III

10 Hours

Lipid metabolism

β -Oxidation of saturated fatty acid (Palmitic acid) Formation and utilization of ketone bodies; ketoacidosis

De novo synthesis of fatty acids (Palmitic acid)

Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

Amino acid metabolism

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders

Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, alcaptonuria, tyrosinemia)

Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline

Catabolism of heme; hyperbilirubinemia and jaundice

UNIT IV

10 Hours

Nucleic acid metabolism and genetic information transfer

Biosynthesis of purine and pyrimidine nucleotides

Catabolism of purine nucleotides and Hyperuricemia and Gout disease

Organization of mammalian genome

Structure of DNA and RNA and their functions

DNA replication (semi conservative model)

Transcription or RNA synthesis

Genetic code, Translation or Protein synthesis and inhibitors

UNIT V

07 Hours

Enzymes

Introduction, properties, nomenclature and IUB classification of enzymes

Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)

Enzyme inhibitors with examples

Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation

Therapeutic and diagnostic applications of enzymes and isoenzymes

Coenzymes –Structure and biochemical functions



Reference Books(Latest Editions)

1. Principles of Biochemistry by Lehninger.
2. Harper’s Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Classify Biomolecules and their chemical nature and biological role.	PO1, PO12, PS01
CO2	Identify the factors affecting Carbohydrate metabolism and biological oxidation.	PO1, PO5, PEO1 ,PEO3
CO3	Compare different Lipid and Amino acid metabolism	PO1,PO5,PO3,PO11, PO12, PEO1,PEO2
CO4	Summarize Nucleic acid metabolism and genetic information transfer.	PO1,PO11,PO12,PEO1
CO5	Demonstrate Enzymes and their therapeutic and diagnostic applications.	PO1,PO5,PO11, PO12,PEO1,PEO2

		Pharmaceutical Knowledge	Problem solving	Conduct, analyze and interpret data	Ability to design and formulating a process	Ability to understand mechanism	Demonstrate skills in problem solving	Professional and ethical responsibilities	Communication to present a technical report	Impact on society and responsibilities	Leadership qualities	Self educating and Life-long Learning	Preparation for competitive examinations	Building a theoretical knowledge base along with necessary practical skills	To build a strong foundation as per the requirements of pharmaceutical Industries, Community and Hospital	Training students to achieve expertise					



Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-203T	Biochemistry - Theory	3	-	2	-	3	-	-	-	-	-	3	3	3	3	2

1=weakly mapped

2= moderately mapped

3=strongly mapped

Biochemistry-Practical (TIU-UBP-209P)

Contact hours: 4hrs/wk

Course Objectives

- 1.To know the qualitative analysis of biomolecules.
- 2.To evaluate abnormal constituents present in blood and urine.
- 3.To understand the function of enzyme and different constituents present in human blood.

Course Outcomes:

After successful completion of this course, students will be able to:

- CO1. **Demonstrate** chemical tests for macromolecules such as carbohydrate, protein.
- CO2. **Evaluate** the abnormal level of different constituents present in urine.
- CO3. **Evaluate** the level of different constituents present in blood.
- CO4. **Describe** the measurement of pH and preparation of buffer solution.
- CO5. **Evaluate** the effect of temperature and substrate concentration on different enzyme.

Course Content

4 hrs/week

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



Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-209P	Biochemistry – Practical	3	2	2	-	2	2	-	-	-	-	-	3	3	2	2

1=weakly mapped

2= moderately mapped

3=strongly mapped

Pathophysiology-Theory (TIU-UBP-204T)

Contact hours: 45 hr

Course Objectives

To know the etiology and pathogenesis of the selected disease Describes.

To administer the knowledge of common pathophysiology on the complications of diseases.

To gain knowledge about the signs and symptoms of the diseases

Course Outcomes

Upon completion of the course, the student shall be able

CO1. Classify different pathophysiological Describes in human body like cancer, infectious diseases, STDs, haematological disorders.

CO2. Identify different sign and symptoms of many pathological conditions on the basis of their sign and symptoms

CO3. Describe Basic principles of Cell injury and Adaptation, Basic mechanism involved in the process of inflammation and repair.

CO4. Compare sign and symptoms of various diseases.

CO5. Demonstrate Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia

Course Content

45 Hours

Unit I

10Hours

- **Basic principles of Cell injury and Adaptation:**
- Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance
- **Basic mechanism involved in the process of inflammation and repair:**
- Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis

Unit II

10Hours



- **Cardiovascular System:**
- Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)
- **Respiratory system:** Asthma, Chronic obstructive airways diseases.
- **Renal system:** Acute and chronic renal failure.

Unit II

10Hours

- **Hematological Diseases:** Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia
- **Endocrine system:** Diabetes, thyroid diseases, disorders of sex hormones
- **Nervous system:** Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.
- **Gastrointestinal system:** Peptic Ulcer

Unit IV

8 Hours

- **Inflammatory bowel diseases,** jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease.
- **Disease of bones and joints:** Rheumatoid arthritis, osteoporosis and gout
- **Principles of cancer:** classification, etiology and pathogenesis of cancer
- **Diseases of bones and joints:** Rheumatoid Arthritis, Osteoporosis, Gout
- **Principles of Cancer:** Classification, etiology and pathogenesis of Cancer

Unit V

7 Hours

- **Infectious diseases:** Meningitis, Typhoid, Leprosy, Tuberculosis
- **Urinary tract infections**
- **Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhoea

Recommended Books (Latest Editions)

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united Describes;
5. William and Wilkins, Baltimore; 1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.



9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia;WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition;London;Churchill Livingstone publication; 2003.

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Classify different pathophysiological Describes in human body like cancer, infectious diseases, STDs, haematological disorders.	PO9, PO5, PO11, PO12, PEO2
CO2	Identify different sign and symptoms of many pathological conditions on the basis of their sign and symptoms	PO11, PO12, PEO2, PO5, PO9, PO10
CO3	Describe Basic principles of Cell injury and Adaptation, Basic mechanism involved in the process of inflammation and repair.	PO5, PO11, PO12, PEO2
CO4	Compare sign and symptoms of various diseases.	PO5, PO9, PO11, PO12, PEO2
CO5	Demonstrate Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia	PO5, PO12, P011

Course Code	Course Title	Pharmaceutical Knowledge	Problem solving	Conduct, analyze and interpret data	Ability to design and formulating a process	Ability to understand mechanism	Demonstrate skills in problem solving	Professional and ethical responsibilities	Communication to present a technical report	Impact on society and responsibilities	Leadership qualities	Self educating and Life-long Learning	Preparation for competitive examinations	Building a theoretical knowledge base along with necessary practical skills	To build a strong foundation as per the requirements of pharmaceutical Industries, <small>Communication and Leadership Development</small>	Training students to achieve expertise
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-204T	Pathophysiology - Theory	-	-	-	-	3	-	-	-	2	2	3	3	-	2	-



- 1=weakly mapped
2= moderately mapped
3=strongly mapped

Computer Applications in Pharmacy– Theory (TIU-UBP-205T)

Contact hours: 30 hr

Course Objectives

1. To know the fundamentals about Information gathering, requirement and feasibility analysis.
2. To administer the knowledge and techniques required for Binary number system, Decimal number system, Octal number system
3. To understand the concept of HTML, XML, CSS and Programming.
4. To have an overall idea about the MYSQL, MS ACCESS, Pharmacy Drug database.
5. To gain knowledge about the various Lab-diagnostic System, Patient Monitoring System, Pharma Information System

Course Outcomes

Upon completion of the course, the student shall be able

CO1. **Classify** Binary number system, Decimal number system, Octal number system.

CO2. **Identify** Concept of Information Systems and Software

CO3. **Summarize** computer process specifications, input/output design, process.

CO4. **Compare** Computers as data analysis in Preclinical development.

CO5. **Demonstrate** Web technologies concept in web page design.

Course Content

30 Hours

UNIT-1

10Hr

Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction ± 2 Q1-1-VERP S11-P 1-Q, Z o¹s IMP S11-P 1-INP 1-thod, binary multiplication, binary division

Concept of Information Systems and Software: Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database.

UNIT-2

10Hr



Application of computers in Pharmacy ± Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring

Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

UNIT-3

10Hr

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

Computers as data analysis in Preclinical development:

Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMs)

Text Books

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – CaryN.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi – 110002

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Classify Binary number system, Decimal number system, Octal number system.	PO1, PO12
CO2	Identify Concept of Information Systems and Software.	PO1, PO2, PEO2
CO3	Summarize computer process specifications, input/output design, process.	PO1,PO2,PO3,PO11, PO12,PEO1,PEO2, PEO3
CO4	Compare Computers as data analysis in Preclinical development.	PO1,PO11,PO12,PEO1
CO5	Demonstrate Web technologies concept in web page design.	PO1,PO3,PO11, PO12,PEO1,PEO2,PEO3



Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-205T	Computer Applications in Pharmacy Theory	3	2	2	-	-	-	-	-	-	-	3	3	3	3	2

1=weakly mapped

2= moderately mapped

3=strongly mapped

Computer Applications in Pharmacy – Practical (TIU-UBP-210P)

Contact hours: 2hrs/wk

Course Objectives

1. To know the practical concept about Information gathering, requirement and feasibility analysis.
2. To administer the knowledge and techniques required for Binary number system, Decimal number system, Octal number system
3. To understand the practical concept of HTML, XML, CSS and Programming.
4. To have an overall Real time idea about the MYSQL, MS ACCESS, Pharmacy Drug database.
5. To gain knowledge about the various Lab-diagnostic System, Patient Monitoring System, Pharma Information System in real-world application.

Course Outcomes:

After successful completion of this course, students will be able to:

CO1. **Demonstrate** HTML table

CO2. **Evaluate** the drugs database table in SQL

CO3. **Describe** view, adds, delete and modify the patient record in MS access



C04.Evaluate Creating invoice table using – MS Access

Course Content

4

Hours/Week

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

Reference Books (Latest Editions)

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – CaryN.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Demonstrate HTML table.	PO1,PO3,PO6,PEO1
CO2	Evaluate the drugs database table in SQL.	PO1,PO12,PEO1,PEO2, PEO3
CO3	Describe view, add, delete and modify the patient record in MS access.	PO1,PO2,PO3,PO6,PO12
CO4	Evaluate Creating invoice table using – MS Access	PO1,PO4,PO5,PO12, PEO1,PEO2, PEO3



Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-210P	Computer Applications in Pharmacy - Practical	3	1	2	1	1	2	-	-	-	-	-	2	3	2	2

1=weakly mapped

2= moderately mapped

3=strongly mapped

Environmental Sciences–Theory (TIU-UBP-206T)

Contact hours: 30 hr

Course Objectives

1. To understand the intrinsic relation between humans and environment, our position in the ecosystem around us
2. To comprehend the significance of the biodiversity surrounding us.
3. To figure out the importance and need for energy resources, various sources of energy, renewable and non-renewable sources, conventional and unconventional sources.
4. To have basic concepts about sustainability, our dependence on nature and the consequences of overexploitation.
5. To enable students to appreciate the importance and how much we owe to the earth systems for our survival.
6. To have a basic concept about the types of pollution and mitigation procedures.
7. To have an overall idea about the environmental legal framework in our country and about the EIA and environmental audit procedures.

Course Outcomes

On completion of this course, the students will be able to



CO 1: **Relate** to multidimensional complex nature of environmental problems, various types of ecosystems, ecosystem dynamics, perceive and appreciate the surrounding nature.

CO 2: **Perceive** with the intrinsic relation between humans and environment, our position in the ecosystem around us, and importance of biodiversity.

CO 3: **Classify** the presence of various pollutants, their significance, and impacts, and develop the underlying concepts involved in various air pollution prevention and mitigation measures.

CO 4: **Summarise** the routes of generation, classification, management, and environmental significance of solid waste.

CO 5: **Illustrate** water chemistry, deduce the relationship between various water pollutants, and understand the principles of various water and wastewater treatment procedures.

CO 6: **Create** awareness and concern about importance of environmental resources and their damage and protection.

CO 7: **Compare** the different approaches and practices of biodiversity conservation and management.

CO 8: **Explain** the legal framework in our country for safeguarding the environment including pollution prevention, control, management, and wildlife management.

CO 9: **Defend** as responsible citizens for various global environmental issues and motivate others for active participation in minimizing the environmental damage already caused.

Course content

45 Hours

Unit-I

15hours

The Multidisciplinary nature of environmental studies

Natural Resources

Renewable and non-renewable resources:

Natural resources and associated problems

a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

Unit-II

15hours

Ecosystems

§ Concept of an ecosystem.

§ Structure and function of an ecosystem.

§ Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit- III

15hours

Environmental Pollution: Air pollution; Water pollution; Soil pollution

Text Books:

1. Principles of Environmental Science, 4th edition by Cunningham, W.P. and Cunningham, M.A. (2002), Tata McGraw-Hill Publishing Company, New Delhi

2. Basic Environmental Engineering & Elementary Biology by Monidranath Patra and Rahul Kumar Singha, Aryan Publishing house



3. Introduction to Environmental Engineering and Science, by Masters, G.M., Prentice Hall of India, Second Indian Reprint.

Reference Books:

- 1 Wastewater Engineering: Treatment and Reuse, 4th Edition, Metcalf and Eddy, Inc. McGraw-Hill, Inc., New York, 2002
- 2 Environmental Engineering”, Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, McGraw-Hill Education (India) Private Limited, New Delhi
- 3 Introduction to Environmental Engineering, 2nd Ed. by Davis, M. L. and Cornwell D. A. McGraw Hill, Singapore.
- 4 Environmental Sciences: The Environment and Human Impact by Jackson, A.R.W. and Jackson, J.M., , Longman Publishers

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Relate to multidimensional complex nature of environmental problems, various types of ecosystems, ecosystem dynamics, perceive and appreciate the surrounding nature.	PO7, PO9, PO12
CO2	Perceive the intrinsic relation between humans and environment, our position in the ecosystem around us, and importance of biodiversity.	PO7, PO9, PO11, PO12
CO3	Classify the presence of various air pollutants, their significance, and impacts, and develop the underlying concepts involved in various air pollution prevention and mitigation measures.	PO7, PO9, PO12
CO4	Summarise the routes of generation, classification, management, and environmental significance of solid waste.	PO7, PO9, PO12
CO5	Illustrate water chemistry, deduce the relationship between various water pollutants, and understand the principles of various water and wastewater treatment procedures.	PO7, PO9, PO12
CO6	Create awareness and concern about importance of environmental resources and their damage and protection.	PO9, PEO1, PEO3, PO11
CO7	Compare the different approaches and practices of biodiversity conservation and management.	PO7, PO9, PO12
CO8	Explain the legal framework in our country for safeguarding the environment including pollution prevention, control, management, and wildlife management.	PO7, PO9, PO12
CO9	Defend as responsible citizens for various global environmental issues and motivate others for active participation in minimizing the environmental damage already caused.	PO7, PO9, PO12



Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-206T	Environmental Sciences-Theory	-	-	-	-	-	-	3	-	3	-	2	3	1	-	1

1=weakly mapped

2= moderately mapped

3=strongly mapped