TECHNO INDIA UNIVERSITY
WESTBENGAL

B.PHARM SYLLABUS

SEMESTER II

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

Credit points-4

Course Outcomes

Upon completion of the course, the student shall be able

CO1	**Describe** the anatomy and physiology of nervous system.	K2
CO2	**Summarize** the anatomy and physiology of digestive system.	K2
CO3	**Explain** the anatomy and physiology of respiratory and urinary system.	K2
CO4	**Demonstrate** the anatomy and physiology of endocrine system.	K2
CO5	**Discuss** the anatomy and physiology of reproductive system and Demonstrate genetics.	K2

Course Content

Unit I

Nervous system

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

Unit II

Digestive system

Anatomy of GI Tract with special reference to anatomy and functions of stomach,(Acid production in the stomach, regulation of acid production throughparasympathetic 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

Respiratory system

Anatomy of respiratory system with special reference to anatomy of lungs,mechanism of respiration, regulation of respirationLung 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 andnephrons, functions of kidney and urinary tract, physiology of urine formation,micturition reflex and role of kidneys in acid base balance, role of RAS in kidneyand disorders of kidney.

Unit IV
Endocrine system

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

Unit V
Reproductive system
Anatomy of male and female reproductive system, Functions of male and femalereproductive 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

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

Credit points-2

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

CO1	**Demonstrate** the various organ system and special senses.	K2
CO2	**Estimate** the different types of taste and lung capacity.	K4
CO3	**Describe** reflex activity, body temperature and feedback system.	K2
CO4	**Summarize** family planning devices and pregnancy diagnosis test	K2
CO5	**Discuss** the permanent slides of vital organs and gonads.	K2

Course Content
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.

Pharmaceutical Organic Chemistry I-Theory (TIU-UBP-202T)
Credit points-4

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.	K2
CO2	**Demonstrate** and understand the concept of organic compounds including structure, reactions and stability of alkanes, alkenes and conjugated dienes	K2
CO3	**Demonstrate** and **classify** organic compounds and understand the structures and reactions of alkyl halides and alcohol.	K2
CO4	**Describe** synthesis, reactions and uses of carbonyl compounds.	K2
CO5	**Describe** and understand the structure, uses and different name reactions of carboxylic acids and aliphatic amines	K2

Course Content

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

UNIT-I

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

Alkanes*, Alkenes* and Conjugated dienes*

SP3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins.Stabilities of alkenes, SP2 hybridization in alkenesE1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement ofcarbocations, Saytzeffs orientation and evidences. E1 verses E2 reactions, Factors affecting E1and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff'sorientation, free radical addition reactions of alkenes, AntiMarkownikoff's orientation.Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical additionreactions of conjugated dienes, allylic rearrangement

UNIT-III

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 ethylchloride, 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

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

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. Oxalicacid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate andAcetyl salicylic acid

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

Pharmaceutical Organic Chemistry I-Practical (TIU-UBP-208P)

Credit points-2

Course Outcomes:

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

CO1	**Demonstrate** the systematic qualitative analysis of unknown organic compounds	K2
CO2	**Evaluate** the Functional group and melting point of organic compounds	K4
CO3	**Understand** thesuitable solid derivatives from organic compounds	K2
CO4	**Demonstrate** the molecular models	K2
CO5	**Identify** unknown compounds	K3

Course Content

1. Systematic qualitative analysis of unknown organic compounds like

   i. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
   ii. Detection of elements like Nitrogen, Sulphur and Halogen byLassaigne's test
   iii. Solubility test
   iv. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
   v. Melting point/Boiling point of organic compounds
   vi. Identification of the unknown compound from the literature using melting point/ boiling point.
   vii. Preparation of the derivatives and confirmation of the unknown compound bymelting point/ boiling point.
   viii. Minimum 5 unknown organic compounds to be analysed systematically.
2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

Biochemistry–Theory (TIU-UBP-203T)

Credit points-4

Course Outcomes

Upon completion of the course, the student shall be able

CO1	**Classify** Biomolecules and their chemical nature and biological role.	K2
CO2	**Identify** the factors affecting Carbohydrate metabolism and biological oxidation.	K3
CO3	**Compare** different Lipid and Amino acid metabolism	K4
CO4	**Summarize** Nucleic acid metabolism and genetic information transfer.	K2
CO5	**Demonstrate** Enzymes and their therapeutic and diagnostic applications.	K2

Course Content

UNIT I

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

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 levelphosphorylation

Inhibitors ETC and oxidative phosphorylation/Uncouplers

UNIT III

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 intobile 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 (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia)

Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline
Catabolism of heme; hyperbilirubinemia and jaundice

UNIT IV
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
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

Biochemistry-Practical (TIU-UBP-209P)
Credit points-2

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

CO1	**Demonstrate** chemical tests for macromolecules such as carbohydrate, protein.	K2
CO2	**Evaluate** the abnormal level of different constituents present in urine.	K4
CO3	**Evaluate** the level of different constituents present in blood.	K4
CO4	**Describe** the measurement of pH and preparation of buffer solution.	K2
CO5	**Evaluate** the effect of temperature and substrate concentration on different enzyme.	K4

Course Content

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.

Pathophysiology-Theory (TIU-UBP-204T)
Credit points-4

Course Outcomes

Upon completion of the course, the student shall be able

CO1	**Classify** different principles of cell injury and adaptation, and understand the mechanism in the process of inflammation and repair.	K2
CO2	**Identify** diseases related to cardiovascular, renal and respiratory systems.	K3
CO3	**Demonstrate** the mechanism involved in disorders of endocrine, nervous and gastrointestinal system and haematological diseases.	K2
CO4	**Classify and illustrate** diseases related to bones, joints, cancer, liver, inflammatory bowel diseases, etc.	K3
CO5	**Illustrate** the principles of sexually transmitted and infectious diseases.	K2

Course Content

Unit I

- **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,Ribosomedamage,Nuclear damage),Morphology of cell injury – Adaptive changes(Atrophy, Hypertrophy,hyperplasia, Metaplasia, Dysplasia),Cell swelling, Intra cellularaccumulation, Calcification,Enzyme leakage and Cell Death Acidosis&Alkalosis, Electrolyte imbalance64
- **Basic mechanism involved in the process of inflammation and repair:**
- Introduction, Clinical signs of inflammation, Different types of Inflammation, MechanismofInflammation – Alteration in vascular permeability and blood flow, migration ofWBC's, Mediatorsof inflammation, Basic principles of wound healing in theskin, Pathophysiology of Atherosclerosis

Unit II

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

Unit III

- **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

- **Inflammatory bowel diseases,** jaundice, hepatitis (A, B, C, D, E, F) alcoholic liverdisease.
- **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

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

Computer Applications in Pharmacy– Theory (TIU-UBP-205T)
Credit points-3

Course Outcomes

Upon completion of the course, the student shall be able

CO1	**Classify** Binary number system, Decimal number system, Octal number system, information system and software.	K2
CO2	**Demonstrate** Web technologies concept in web page design	K2
CO3	S**ummarize** application of computers in pharmacy	K2
CO4	**Illustrate** the concept of bioinformatics	K2
CO5	**Describe** the scope of computer use for data analysis in preclinical development	K2

Course Content

UNIT-1

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 Sl1-P 1-Q , Z o[1]s IMP Sl1-P 1-INP 1-thod, binary multiplication, binary division

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

UNIT-2

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-3

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-4

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

UNIT-5

Computers as data analysis in Preclinical development:

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

Computer Applications in Pharmacy – Practical (TIU-UBP-210P)
Credit points-1

Course Outcomes:

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

CO1	**Demonstrate** HTML table.	K2
CO2	**Evaluate** the drugs database table in SQL.	K4
CO3	**Describe** view, add, delete and modify the patient record in MS access.	K2
CO4	**Evaluate** Creating invoice table using – MS Access	K4
CO5	**Evaluate** creating database	K4

Course Content

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 requiredfields 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
12. Exporting Tables, Queries, Forms and Reports to XML pages

Environmental Sciences–Theory (TIU-UBP-206T)
Credit points-3

Course Outcomes

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

CO 1	**Classify** variousnatural resources	K2
CO2	Describe applications and uses of natural resources	K2
CO3	**Summarize** concept of ecosystem with their structure and function and classify various ecosystems	K2
CO4	**Illustrate** the presence of various pollutants, their significance, and impacts	K3
CO5	Develop the underlying concepts involved in prevention and mitigation measures of air, water and soil pollution.	K3

Course content

Unit-I

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

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

Environmental Pollution: Air pollution; Water pollution; Soil pollution