



TECHNO INDIA UNIVERSITY

W E S T B E N G A L

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 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

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

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

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

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

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 be explained. To emphasize on definition, types, classification, principles/mechanisms, applications, examples and 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 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

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. 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

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
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CO2	Evaluate the Functional group and melting point of organic compounds	K4
CO3	Understand the suitable 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 by Lassaigne'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 by melting 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 level phosphorylation

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 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

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, 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 imbalance⁶⁴
- **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

- **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 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 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

- **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	Summarize 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 Q1-¹VERP 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

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 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
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 various natural 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