TECHNO INDIA UNIVERSITY
WESTBENGAL

B.PHARM SYLLABUS

SEMESTER – I

Human Anatomy and Physiology I- Theory (TIU-UBP-101T)

Credit points-4

Course Outcomes
Upon completion of the course, the student shall be able

CO1	**Demonstrate** anatomy and physiology terms and summarise the organization, life processes and homeostasis in human body.	K1
CO2	**Identify** the various aspects of physiology and anatomy of integumentary and skeletal systems.	K1
CO3	**Explain** the various parameters of body fluids.	K1
CO4	**Summarize** the physiology of peripheral nervous system.	K2
CO5	**Demonstrate** the physiology of cardiovascular system.	K1

Unit I

Introduction to human body
Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

Cellular level of organization
Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine

Tissue level of organization
Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Unit II

Integumentary system
Structure and functions of skin

Skeletal system

Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction

Joints
Structural and functional classification, types of joints movements and its articulation

Unit III

Body fluids and blood
Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.

Lymphatic system
Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

Unit IV

Peripheral nervous system:

Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves.

Special senses
Structure and functions of eye, ear, nose and tongue and their disorders.

Unit V

Cardiovascular system
Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

Human Anatomy and Physiology –Practical (TIU-UBP-107P)

Credit points-2

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

CO1	**Identify** the various types of tissues and bones.	K1
CO2	**Estimate** the various hematological parameters	K3
CO3	**Describe** the pulse rate and blood pressure	K2
CO4	**Estimate** the blood groups	K3
CO5	**Demonstrate** the parts of compound microscope	K2

Course Content

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Pharmaceutical Analysis I –Theory (TIU-UBP-102T)
Credit points-4

Course Outcomes

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

CO1	**Demonstrate** and **explain** the different pharmacopoeia available worldwide, the theories and basics of pharmaceutical analysis.	K2
CO2	**Identify** pharmaceutical analysis through acid base titration and non-aqueous titration	K3
CO3	**Illustrate** the preparation and assay methods for different class of chemical substances through titration and gravimetry	K2
CO4	**Classify** different titration techniques like redox titrations with principle, methods, procedures and applications.	K2
CO5	**Classify** different volumetric and electrochemical techniques with principle, methods, procedures and applications.	K2

Course Content

UNIT-I

(a) **Pharmaceutical analysis-** Definition and scope
i) Different techniques of analysis
ii) Methods of expressing concentration
iii) Primary and secondary standards.
iv) Preparation and standardization of various molar and normal solutions-Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate
(b) **Errors:** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures
(c) **Pharmacopoeia**, Sources of impurities in medicinal agents, limit tests.

UNIT-II

Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves

Non aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

UNIT-III

Precipitation titrations: Mohr's method, Volhard's, Modified, Volhard's, Fajans method, estimation of sodium chloride.
Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.
Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.
Basic Principles, methods and application of diazotisation titration.

UNIT-IV

Redox titrations
(a) Concepts of oxidation and reduction
(b) Types of redox titrations (Principles and applications)
Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

UNIT-V

Electrochemical methods of analysis
Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications.
Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.
Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications

Pharmaceutical Analysis I -Practical (TIU-UBP-108P)

Credit points-2

Course Outcomes:

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

CO1	**Demonstrate** the laboratory techniques for volumetric titration	K2
CO2	**Evaluate** or to determine theassayfor a particular chemical substance	K5
CO3	**Demonstrate** the laboratory techniques for electrochemical titration	K2
CO4	**Describe** methods of preparation for organic substances with definite concentrations	K2
CO5	**Demonstrate** electro-analytical methods	K2

Course Content

I. Limit Test of the following

(1) Chloride
(2) Sulphate
(3) Iron
(4) Arsenic

II. Preparation and standardization of

(1) Sodium hydroxide
(2) Sulphuric acid
(3) Sodium thiosulfate
(4) Potassium permanganate
(5) Ceric ammonium sulphate

III. Assay of the following compounds along with Standardization of Titrant

(1) Ammonium chloride by acid base titration
(2) Ferrous sulphate by Cerimetry
(3) Copper sulphate by Iodometry
(4) Calcium gluconate by complexometry
(5) Hydrogen peroxide by Permanganometry
(6) Sodium benzoate by non-aqueous titration
(7) Sodium Chloride by precipitation titration

IV. Determination of Normality by electro-analytical methods

(1) Conductometric titration of strong acid against strong base
(2) Conductometric titration of strong acid and weak acid against strong base
(3) Potentiometric titration of strong acid against strong base

Pharmaceutics I– Theory (TIU-UBP-103T)
Credit points-4

Course Outcomes
Upon completion of the course, the student shall be able

CO1	**Discuss** the historical background of pharmacy and worldwide evolution of rules and regulations related to the profession of pharmacy as well as manufacturing, sale and distribution of drugs.	K2
CO2	**Outline** the mathematical calculations and formulas related to pharmaceutical preparations, titration of dose.	K2
CO3	**Describe** various routes of drug administration, concept of dosage forms, formulation and evaluation of monophasic and biphasic liquid dosage forms	K2
CO4	**Classify** pharmaceutical incompatibilities and e**xplain** formulation and evaluation of suppositories.	K2
CO5	**Summarize** the factors influencing formulation and evaluation of semisolids.	K2

Course Content

UNIT-I

Historical background and development of profession of pharmacy: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.

Dosage forms: Introduction to dosage forms, classification and definitions

Prescription: Definition, Parts of prescription, handling of Prescription and Errors in prescription.

Posology: Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

UNIT-II

Pharmaceutical calculations: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.

Powders: Definition, classification, advantages and disadvantages, Simple &compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

Liquid dosage forms: Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

UNIT-III

Monophasic liquids: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions, Formulation and manufacturing consideration of syrups and elixirs. Filling and packaging; evaluation of liquid orals official in pharmacopoeia.

Biphasic liquids:

Suspensions: Definition, advantages and disadvantages, classifications, Formulation and manufacturing consideration of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome. Evaluation of suspensions.

Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation, Formulation and manufacturing consideration &stability problems and methods to overcome. Evaluation of emulsions

UNIT IV

Suppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.

Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

UNIT V

Semisolid dosage forms: Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms

Pharmaceutics I-Practical (TIU-UBP-109P)

Credit points-2

Course Outcomes:

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

CO1	**Describe** pharmaceutical calculations according to working formula	**K2**
CO2	**Develop** the formulations following the official procedure	**K3**
CO3	**Demonstrate** the evaluation techniques for the prepared dosage forms	**K2**
CO4	**Describe** use of the ingredients required to prepare the dosage forms	**K2**
CO5	**Demonstrate** the preparation techniques of formulations	**K2**

Course Content

1. Syrups

a) Simple Syrup

b) Syrup of ferrous phosphate

2. Elixirs

a) Piperazine citrate elixir

b) Paracetamol pediatric elixir

3. Linctus

a) Terpin- Hydrate Linctus

b) Iodine Throat Paint (Mandles Paint)

4. Solutions

a) Strong solution of ammonium acetate

b) Cresol with soap solution

c) Lugol's solution

5. Suspensions

a) Calamine lotion

b) Magnesium Hydroxide mixture

c) Aluminium Hydroxide gel

6. Emulsions

a) Turpentine Liniment

b) Liquid paraffin emulsion

7. Powders and Granules

a) ORS powder (WHO)

b) Effervescent granules

c) Dusting powder

d) Divided powders

8. Suppositories
a) Glycero gelatin suppository
b) Coca butter suppository
c) Zinc oxide suppository

9. Semisolids
a) Sulphur ointment
b) Non staining iodine ointment with methyl salicylate
c) Carbopol gel

10. Gargles and Mouthwashes
a) Iodine gargle
b) Chlorhexidine mouth wash

Pharmaceutical Inorganic Chemistry- Theory (TIU-UBP-104T)

Credit points-4

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

CO1	**Demonstrate** and explain the different pharmacopoeia available worldwide, **Identify** the impurities present in pharmaceuticals and also understand their estimation	K2
CO2	**Illustrate** the preparation and assay methods for different class of inorganic compounds including buffers and electrolytes, dental products etc.	K3
CO3	**Classify** inorganic compounds according to their usage like gastrointestinal agents, antimicrobials and cathartics.	K2
CO4	**Differentiate** between the different categories of inorganic substances like emetics, astringents, etc.	K4
CO5	**Summarise** the medicinal and pharmaceutical importance of radiopharmaceuticals	K2

Course Content

UNITI

Impurities in pharmaceutical substances: History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate.
General methods of preparation, assay for the compounds superscripted with asterisk(*), properties and medicinal uses of inorganic compounds belonging to the following classes

UNITII

Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.
Major extra and intracellular electrolytes: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*,Potassium chloride, Calcium gluconate*and Oral Rehydration Salt(ORS), Physiological acid base balance.

Dental products: Dentifrices, role of fluoride in the treatment of dentalcaries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

UNITIII

Gastrointestinal agents: Acidifiers: Ammonium chloride*and Dil. HCl
Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture
Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite
Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*,Iodine and its preparations

UNITIV

Miscellaneous compounds Expectorants: Potassiumiodide, Ammonium chloride*.
Emetics: Copper sulphate*,Sodium potassium tartarate
Haematinics: Ferrous sulphate*, Ferrous gluconate
Poison and Antidote: Sodium thiosulphate*, Activated charcoal,Sodium nitrite
Astringents: Zinc Sulphate, Potash Alum

UNITV

Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of a,ß,γ radiations, Half life, radio isotopes and study of radioisotopes - Sodium iodide I_{131}, Storage conditions, precautions &pharmaceutical application of radio active substances.

Pharmaceutical Inorganic Chemistry-Practical (TIU-UBP-110P)

Credit points-2

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

CO1	**Demonstrate** impurity tests and evaluate presence of impurities for inorganic compounds	K2
CO2	**Evaluate** the purity of inorganic substances	K4
CO3	**Describe** methods of preparation for inorganic substances	K2

CO4	**Identify** the inorganic chemicals as per their specific identification test	K3
CO5	**Demonstrate** preparation of inorganic compounds	K2

Course Content

I. **Limit tests for following ions**

Limit test for Chlorides and Sulphates
Modified limit test for Chlorides and Sulphates
Limit test for Iron
Limit test for Heavy metals
Limit test for Lead
Limit test for Arsenic

II. **Identification test**

Magnesium hydroxide
Ferrous sulphate
Sodium bicarbonate
Calcium gluconate
Copper sulphate

III. **Test for purity**

Swelling power of Bentonite
Neutralizing capacity of aluminum hydroxide gel
Determination of potassium iodate and iodine in potassium Iodide

IV. **Preparation of inorganic pharmaceuticals**

Boric acid
Potash alum
Ferrous sulphate

Communication Skills–Theory (TIU-UBP-105T)

Credit points-2

Course Outcomes

Upon completion of the course, the student shall be able

CO1	**Explain** the importance to develop effective communication skills, overcome barriers and understand the perspectives in communication.	K2
CO2	**Describe** elements ofcommunication and understand communication styles	K2
CO3	**Demonstrate** basic listening and writing skills	K3
CO4	**Develop** interview skills	K3
CO5	**Develop** group discussion skills	K3

Course Content

Unit 1

Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context

Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers

Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

Unit 2

Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication

Communication Styles: Introduction, The Communication Styles Matrix with example for each - Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

Unit 3

Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations

Effective Written Communication: Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication

Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

Unit 4

Interview Skills: Purpose of an interview, Do's and Dont's of an interview

Giving Presentations: Dealing with Fears, planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

Unit 5

Group Discussion: Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

Communication Skills–Practical (TIU-UBP-111P)
Credit points-1

Course Outcomes

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

CO1	**Understand** the behavioural needs for a Pharmacist to function effectively in the areas of pharmaceutical operation	K1
CO2	**Describe** effectively (Verbal and Non-Verbal), Develop interview skills	K2
CO3	**Illustrate** effectively to manage the team as a team player, Develop Leadership qualities and essentials	K2
CO4	**Develop** Leadership qualities and essentials	K3
CO5	**Identify** figures of speech	K3

Course Content

Module I

Meeting People, Asking Questions, Making
Friends - What did you do? - Do's and Dont's

Module II

Pronunciations covering the following topics

Pronunciation (Consonant Sounds)

Pronunciation and Nouns Pronunciation (Vowel Sounds)

Advanced Learning Listening Comprehension

Direct and Indirect Speech

Module III

Figures of Speech

Module IV

Effective Communication:
Writing Skills: Effective Writing, Interview Handling Skills, E-Mail Etiquette, Presentation Skills.

Remedial Biology Theory (TIU-UBP-106RBT)

Credit points-2

Course Outcomes

Upon completion of the course, the student shall be able

CO1	**Classify** living organisms and **Identify** Morphology of different parts of flowering plants	K2
CO2	**Illustrate** human body systems like digestive system, circulatory system and	K2

	respiratory system	
CO3	**Explain** the features of reproductive system, circulatory system, nervous system, endocrine system	K2
CO4	**Recognize** the process of nutrition for plants.	K2
CO5	**Demonstrate** phases of plant growth, respiration, identify the structure and functions of cells and tissues.	K2

Course Content

UNIT I

Living world:

- Definition and characters of living organisms
- Diversity in the living world
- Binomial nomenclature
- Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi,
- Animaliaand Plantae, Virus

Morphology of different parts of flowering plants –

- Root, stem, inflorescence, flower, leaf, fruits seed.
- General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledons.

UNIT II

Body fluids and circulation

Composition of blood, blood groups, coagulation of blood

- Composition and functions of lymph
- Human circulatory system
- Structure of human heart and blood vessels
- Cardiac cycle, cardiac output and ECG

Digestion and Absorption

- Human alimentary canal and digestive glands
- Role of digestive enzymes
- Digestion, absorption and assimilation of digested food

Breathing and respiration

- Human respiratory system
- Mechanism of breathing and its regulation
- Exchange of gases, transport of gases and regulation of respiration
- Respiratory volumes

UNIT III

Excretory products and their elimination

- Modes of excretion

- Human excretory system- structure and function
- Urine formation
- Rennin angiotensin system

Neural control and coordination

- Definition and classification of nervous system
- Structure of a neuron
- Generation and conduction of nerve impulse
- Structure of brain and spinal cord
- Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata

Chemical coordination and regulation

- Endocrine glands and their secretions
- Functions of hormones secreted by endocrine glands

Human reproduction

- Parts of female reproductive system
- Parts of male reproductive system
- Spermatogenesis and Oogenesis
- Menstrual cycle

UNIT IV

Plants and mineral nutrition:

- Essential mineral, macro and micronutrients
- Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

Photosynthesis

- Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

UNIT V

Plant respiration:

- Respiration, glycolysis, fermentation (anaerobic).

Plant growth and development

- Phases and rate of plant growth, Condition of growth, Introduction to plant growthregulators

Cell - The unit of life

- Structure and functions of cell and cell organelles. Cell division

Tissues

- Definition, types of tissues, location and functions.

Remedial Biology-Practical (TIU-UBP-112RBP)
Credit points-1

Course Outcomes:

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

CO1	**Describe** about the parts, handling and use of microscope	**K2**
CO2	**Compare** the human skeletal system deformities	**K4**
CO3	**Demonstrate** the basic procedure to describe common laboratory blood tests	**K2**
CO4	**Predict** technical errors and clinical implications of laboratory tests	**K3**
CO5	**Demonstrate** fundamentals of morphological structures of plants	**K2**

Course Content

- **Introduction to experiments in biology**
  Study of Microscope
  Section cutting techniques
  Mounting and staining
  Permanent slide preparation
- Study of cell and its inclusions
- Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
- Detailed study of frog by using computer models
- Microscopic study and identification of tissues pertinent to Stem, Root, Leaf, seed, fruit and flower
- Identification of bones
- Determination of blood group
- Determination of blood pressure
- Determination of tidal volume

Remedial Mathematics Theory (TIU-UBP-106RMT)
Credit points-2

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

CO1	**Demonstrate** function and deal with problems related to partial fractions and logarithms, limit, continuity	K2
CO2	**Demonstrate** concept of Matrices and Determinant	K2
CO3	**Illustrate** calculus differentiation, integration	K2
CO4	**Understand** concepts of analytical geometry and straight lines.	K2
CO5	**Solve** differential equations related to Chemical kinetics and Pharmacokinetics equations	K3

Course Content

Unit I:

Partial fraction

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics

Logarithms

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

Function*:* Real Valued function, Classification of real valued functions

Limits and continuity

Introduction, Limit of a function, Definition of limit of a function ($\in -\delta$ definition)

$\frac{x^n - a^n}{x-a} = na^{n-1}, \frac{sin\theta}{\theta} = 1.$

Unit II:

Matrices and Determinant

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants , Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix , Cayley-Hamilton theorem, Application of Matrices in solvingPharmacokinetic equations.

Unit III:

Calculus Differentiation

Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) Without Proof, Derivative of x^n *w.r.t* x, where *n* is any rational number, Derivative of e^x, Derivative of $\log_e x$, Derivative of a^x ,Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application

Unit IV:

Analytical Geometry:

Introduction

Signs of the Coordinates, Distance formula

Straight Line

Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line

Integration

Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

Unit V:

Differential Equations:

Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations,

Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations

Laplace Transform:

Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations.