



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

Subject Code	Name of Subject	No. of hours	Tutorial	Credit points
TIU-UBP-101T	Human Anatomy and Physiology I-Theory	3	1	4
TIU-UBP-102T	Pharmaceutical Analysis I -Theory	3	1	4
TIU-UBP-103T	Pharmaceutics I- Theory	3	1	4
TIU-UBP-104T	Pharmaceutical Inorganic Chemistry-Theory	3	1	4
TIU-UBP-105T	Communication Skills-Theory*	2	-	2
TIU-UBP-106RBT/ TIU-UBP-106RMT	Remedial Biology/Mathematics- Theory*	2	-	2
TIU-UBP-107P	Human Anatomy and Physiology - Practical	4	-	2
TIU-UBP-108P	Pharmaceutical Analysis I -Practical	4	-	2
TIU-UBP-109P	Pharmaceutics I-Practical	4	-	2
TIU-UBP-110P	Pharmaceutical Inorganic Chemistry- Practical	4	-	2
TIU-UBP-111P	Communication Skills-Practical*	2	-	1
TIU-UBP-112RBP	Remedial Biology-Practical*	2	-	1
<b>Total</b>		<b>32/34<sup>\$</sup>/36<sup>#</sup></b>	<b>4</b>	<b>27/29<sup>\$</sup>/30<sup>#</sup></b>

<sup>\$</sup>Applicable ONLY for the students who have studied Physics/Chemistry/Botany/Zoology at HSC and appearing for Remedial Mathematics (RM) course.

<sup>#</sup>Applicable ONLY for the students who have studied Mathematics/Physics/Chemistry at HSC and appearing for Remedial Biology (RB)course.

\*Non University Examination (NUE)



**B.PHARM SYLLABUS**

**SEMESTER – I**

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

**[Contact hours-45]**

**Course Objectives**

1. To know 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 various experiments related to special senses and nervous system.
5. To understand the coordinated working pattern of different organs of each system

**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.

CO2. **Identify** the various aspects of physiology and anatomy of integumentary and skeletal systems.

CO3. **Explain** the various parameters of body fluids.

CO4. **Summarize** the physiology of peripheral nervous system.

CO5. **Demonstrate** the physiology of cardiovascular system.

**Course Content**

**45 Hours**

**Unit I**

**10 hours**

**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**

**10 hours**

**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**

**10 hours**

### **Body fluids and blood**

Body fluids, composition and functions of blood, hemopoiesis, 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**

**08 hours**

### **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**

**07 hours**

### **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.

### **Reference Books** (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, NY
3. Physiological basis of Medical Practice-Best and Tailor. 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. Chatterrje, 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	<b>Demonstrate</b> anatomy and physiology terms and summarise the organization, life processes and homeostasis in human body.	PO1, PO5, PO11, PO12
CO2	<b>Identify</b> the various aspects of physiology and anatomy of integumentary and skeletal systems.	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3
CO3	<b>Explain</b> the various parameters of body fluids.	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3
CO4	<b>Summarize</b> the physiology of peripheral nervous system.	PO1, PO5, PO11, PO12, PEO1, PEO2, PEO3
CO5	<b>Demonstrate</b> the physiology of cardiovascular system.	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-101T	Human Anatomy and Physiology I- Theory	3	-	-	-	3	-	-	-	-	-	3	3	3	3	3

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

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

**Contact hours: 4 hr/week**



## Course Objectives

1. To know the microscopic characteristics of different tissues and organs of human body.
2. To know the physiology of different organs of human body.
3. To understand the various haematological parameters of blood.
4. To understand the physiology of heart.

## Course Outcomes:

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

- CO1. **Identify** the various types of tissues and bones.  
CO2. **Estimate** the various hematological parameters  
CO3. **Describe** the pulse rate and blood pressure

## Course Content

4 Hours/Week

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.

## 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. Miami, 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	Identify the various types of tissues and bones.	PO1, PO11, PO12, PEO1, PEO2, PEO3
CO2	Estimate the various hematological parameters	PO1, PO2, PO3, PO5, PO6, PO11, PO12, PEO1, PEO2, PEO3
CO3	Describe the pulse rate and blood pressure	PO1, PO2, PO3, PO5, PO6, PO11, PO12, PEO1, PEO2, PEO3

Course Code	Course Title	Course Outcomes (COs)												Program Outcomes (POs)		
		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	PO1	PO2	PO3
TIU-UBP-107P	Human Anatomy and Physiology – Practical	3	3	3	-	3	2	-	-	-	-	3	3	3	3	3

1=weakly mapped

2= moderately mapped

3=strongly mapped

**Pharmaceutical Analysis I –Theory (TIU-UBP-102T)**

**Contact hours: 45 hr**

**Course Objectives**

1. To gain knowledge and understand the basics of volumetric analysis.
2. To gain knowledge and understand the basics of electro chemical analysis.
3. To know about the history of pharmacopoeia and common theories of analytical chemistry



4. To develop analytical skills

### 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.

CO2. **Identify** the impurities present in pharmaceuticals and also understand their identification

CO3. **Illustrate** the preparation and assay methods for different class of chemical substances.

CO4. **Classify** different titration techniques with principle, methods, procedures and applications.

CO5. **Classify** different volumetric and electrochemical techniques with principle, methods, procedures and applications.

CO6. **Summarise** the various techniques employed to analyse pharmaceutical substances.

### Course Content

45 Hours

#### UNIT-I

10 Hours

(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

10 Hours

**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

10 Hours

**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: coprecipitation and post precipitation, Estimation of barium sulphate.



Basic Principles, methods and application of diazotisation titration.

**UNIT-IV**

**08 Hours**

**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**

**07 Hours**

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

**Recommended Books: (Latest Editions)**

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Textbook of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

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

Mapping between COs and Pos		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	<b>Demonstrate</b> and <b>explain</b> the different pharmacopoeia available worldwide, the theories and basics of pharmaceutical analysis.	P01, P02, P03, P012, PEO1, PEO2
CO2	<b>Identify</b> the impurities present in pharmaceuticals and also understand their identification	P01, P02, P03, P012, PEO1, PEO2, PEO3
CO3	<b>Illustrate</b> the preparation and assay methods for different class of chemical substances.	P01, P02, P03, P011, PEO1, PEO2
CO4	<b>Classify</b> different titration techniques with principle, methods, procedures and applications.	P01, P02, P03, P012, PEO1, PEO2





<b>CO5</b>	<b>Classify</b> different volumetric and electrochemical techniques with principle, methods, procedures and applications.	P01, P02, P03, P011, P012, PEO1, PEO2, PEO3
<b>CO6</b>	<b>Summarise</b> the various techniques employed to analyses pharmaceutical substances.	P01, P02, P03, P012, PEO1, PEO3

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-102T	Pharmaceutical Analysis I - Theory	3	2	2	-	-	-	-	-	-	-	3	3	3	3	3

1=weakly mapped

2= moderately mapped

3=strongly mapped

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

**Contact hours: 4hrs/wk**

#### Course Objectives

1. To know and administer the laboratory techniques.
2. To understand the method of various titrations, assay procedure of different substances
3. To administer the knowledge and techniques required for method of preparation for different concentration of substances.



### Course Outcomes:

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

CO1. **Demonstrate** the laboratory techniques for volumetric titration

CO2. **Evaluate** or to determine the assay for a particular chemical substance

CO3. **Demonstrate** the laboratory techniques for electrochemical titration

CO4. **Describe** methods of preparation for organic substances with definite concentrations

### Course Content

4 Hours/Week

#### 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

#### Recommended Books: (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Textbook of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry



4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

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

Mapping between COs and Pos		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	<b>Demonstrate</b> the laboratory techniques for volumetric titration	P01, P02, P03, P04, P06, P012, PEO1, PEO3
CO2	<b>Evaluate</b> or to <b>determine</b> the assay for a particular chemical substance	P01, P02, P03, P04, P06, P012, PEO1, PEO2
CO3	<b>Demonstrate</b> the laboratory techniques for electrochemical titration	P01, P02, P03, P04, P06, P012, PEO1, PEO3
CO4	<b>Describe</b> methods of preparation for organic substances with definite concentrations	P01, P02, P03, P04, P06, P012, PEO1, PEO2

Course Code	Course Title	Course Outcomes												Program Outcomes		
		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	Training students to achieve expertise
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-108P	Pharmaceutical Analysis I - Practical	3	3	3	3	-	3	-	-	-	-	-	3	3	2	2

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

**Pharmaceutics I– Theory (TIU-UBP-103T)**



**Contact hours- 45 hr**

**Course Objectives**

1. To know the history of profession of pharmacy.
2. To understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations.
3. To know the professional way of handling the prescription.
4. To have an overall idea about the preparation techniques of various conventional dosage forms.

**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.

CO2.**Outline** the mathematical calculations and formulas related to pharmaceutical preparations, titration of dose.

CO3.**Describe** various routes of drug administration, concept of dosage forms, unit operations involved in preparation of these dosage forms.

CO4.**Explain** the factors which influence the design of pharmaceutical dosage forms.

CO5. **Summarize** the factors influencing formulation of various dosage forms like solution.

**Course Content**

**45Hours**

**UNIT-I**

**10 Hours**

**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**

**10 Hours**

**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

08

#### Hours

**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

08 Hours

**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

07 Hours

**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

#### Reference Books (Latest Editions)

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science & Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The



University of Michigan.

7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

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

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	<b>Discuss</b> 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.	PO1, PO12, PEO1
CO2	<b>Outline</b> the mathematical calculations and formulas related to pharmaceutical preparations, titration of dose.	PO1, PO2, PO11, PO12, PEO1, PEO2, PEO3
CO3	<b>Describe</b> various routes of drug administration, concept of dosage forms, unit operations involved in preparation of these dosage forms.	PO1, PO4, PO5, PO11, PO12, PEO2
CO4	<b>Explain</b> the factors which influence the design of pharmaceutical dosage forms.	PO1, PO4, PO5, PO11, PO12, PEO1, PEO2, PEO3
CO5	<b>Summarize</b> the factors influencing formulation of various dosage forms like solution.	PO1, PO2, PO4, 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-103T	Pharmaceutics I - Theory	3	2	-	2	2	-	-	-	-	-	3	3	2	3	2

1=weakly mapped

2= moderately mapped

3=strongly mapped

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

Contact hours: 4 hrs/wk

#### Course Objectives

1. To explain formulation, evaluation, packaging and labelling requirements of syrups, elixirs, suspensions, emulsions and powder formulations.
2. To describe use of ingredients in formulation and the category of the formulation.
3. To Describe pharmaceutical calculations to prepare dosage forms in desired quantity and strength.

#### Course Outcomes:

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

CO1. **Describe** pharmaceutical calculations according to working formula

CO2. **Prepare** the formulations following the official procedure

CO3. **Demonstrate** the evaluation techniques for the prepared dosage forms

CO4. **Describe** use of the ingredients required to prepare the dosage forms

Course Content  
Hours/Week

4



**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
- a) 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) Cocoa 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

**Reference Books** (Latest Editions)





1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science & Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Françoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

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

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Describe pharmaceutical calculations according to working formula	PO1, PO2, PEO1
CO2	Prepare the formulations following the official procedure	PO1, PO4, PO12, PEO1, PEO2, PEO3
CO3	Demonstrate the evaluation techniques for the prepared dosage forms	PO1, PO12, PEO1, PEO2, PEO3
CO4	Describe use of the ingredients required to prepare the dosage forms	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-109P	Pharmaceutics I- Practical	3	2	-	2	2	-	-	-	-	-	-	3	3	2	2

1=weakly mapped

2= moderately mapped

3=strongly mapped

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

Contact hours: 45 hr

#### Course Objectives

- 1.To gain knowledge and understand the basics of pharmaceutical inorganic chemistry, its aspects and categories.
- 2.To know about the history of pharmacopoeia.
- 3.To understand the medicinal and pharmaceutical importance of inorganic compounds.
- 3.To have an overall idea about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
- 4.To administer the knowledge and techniques required for general method of preparation and assay for the inorganic compounds.
- 5.To gain knowledge about the various inorganic compounds and their usage in different purposes.

#### Course Outcomes

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

- CO1. **Demonstrate** and explain the different pharmacopoeia available worldwide



- CO2. **Identify** the impurities present in pharmaceuticals and also understand their estimation  
CO3. **Illustrate** the preparation and assay methods for different class of inorganic compounds.  
CO4. **Classify** inorganic compounds according to their usage.  
CO5. **Differentiate** between the different categories of inorganic substances.  
CO6. **Summarise** the medicinal and pharmaceutical importance of inorganic compounds.

**Course Content**

**45 Hours**

**UNIT I**

**10 Hours**

**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

**UNIT II**

**10 Hours**

**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 dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

**UNIT III**

**10 Hours**

**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

**UNIT IV**

**08 Hours**

**Miscellaneous compounds Expectorants:** Potassium iodide, 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

**UNIT V**

**07 Hours**



**Radiopharmaceuticals:** Radio activity, Measurement of radioactivity, Properties of  $\alpha, \beta, \gamma$  radiations, Half life, radio isotopes and study of radioisotopes - Sodium iodide  $I_{131}$ , Storage conditions, precautions & pharmaceutical application of radio active substances.

**Reference Books** (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4<sup>th</sup> edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3<sup>rd</sup> Edition 4.
4. M.L. Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia

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

Mapping between COs and Pos		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	<b>Demonstrate</b> and <b>explain</b> the different pharmacopoeia available worldwide	PO1, PO11, PO12, PEO1
CO2	<b>Identify</b> the impurities present in pharmaceuticals and also understand their estimation	PO1, PO2, PO3, PO6, PO11, PO12, PEO1, PEO2, PEO3
CO3	<b>Illustrate</b> the preparation and assay methods for different class of inorganic compounds.	PO1, PO2, PO3, PO4, PO11, PO12, PEO1, PEO2, PEO3
CO4	<b>Classify</b> inorganic compounds according to their usage.	PO1, PO3, PO11, PO12, PEO1, PEO3
CO5	<b>Differentiate</b> between the different categories of inorganic substances.	PO1, PO3, PO11, PO12, PEO1
CO6	<b>Summarise</b> the medicinal and pharmaceutical importance of inorganic compounds.	PO1, PO2, PO3, PO11, PO12, PEO1



Course Code	Course Title	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO 1	PEO2	PEO 3
TIU-UBP-104T	Pharmaceutical Inorganic Chemistry– Theory	3	2	2	2	-	2	-	-	-	-	3	3	3	2	2

1=weakly mapped

2= moderately mapped

3=strongly mapped

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

Contact hours: 4 hrs/wk

#### Course Objectives

1. To know about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
2. To administer the knowledge and techniques required for general method of preparation for the inorganic compounds.
3. To understand the test of purity and test of identification for different inorganic chemicals.

#### 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

CO2. **Evaluate** the purity of inorganic substances

CO3. **Describe** methods of preparation for inorganic substances



C04. **Identify** the inorganic chemicals as per their specific identification test

**Course Content**

**4 Hours/Week**

**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

**Reference Books** (Latest Editions)

8. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4<sup>th</sup> edition.
9. A.I. Vogel, Text Book of Quantitative Inorganic analysis
10. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3<sup>rd</sup> Edition 4.
11. M.L. Schroff, Inorganic Pharmaceutical Chemistry
12. Bentley and Driver's Textbook of Pharmaceutical Chemistry
13. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
14. Indian Pharmacopoeia

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



Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	<b>Demonstrate</b> impurity tests and evaluate presence of impurities for inorganic compounds	PO1, PO2, PO3, PO8, PO11, PO12, PEO1, PEO2, PEO3
CO2	<b>Evaluate</b> the purity of inorganic substances	PO1, PO2, PO3, PO8, PO11, PO12, PEO1, PEO2, PEO3
CO3	<b>Describe</b> methods of preparation for inorganic substances	PO1, PO3, PO4, PO11, PO12, PEO1, PEO2
CO4	<b>Identify</b> the inorganic chemicals as per their specific identification test	PO1, PO2, PO3, 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	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-110P	Pharmaceutical Inorganic Chemistry – Practical	3	2	2	2	-	-	-	3	-	-	3	3	3	3	2
--------------	--	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

1=weakly mapped

2= moderately mapped

3=strongly mapped

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

Contact hours: 30 hr

#### Course Objectives

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and Non Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

#### Course Outcomes

Upon completion of the course, the student shall be able

CO1 **Explain** and **express** the behavioural needs for a Pharmacist to function effectively in the areas of pharmaceutical operation

CO2 **Describe** Communication skills effectively (Verbal and Non-Verbal), Develop interview skills

CO3 Effectively **organize** the team as a team player, Develop Leadership qualities and Essentials

#### Course Content

**30 Hours**

##### Unit 1

**3 Hours**

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

##### Unit 2

**3 Hours**





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

**Unit 3**

**3 Hours**

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

**Unit 4**

**3 Hours**

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

**Unit 5**

**3 Hours**

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

**Unit 6**

**3 Hours**

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

**Unit 7**

**3 Hours**

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

**Unit 8**

**3 Hours**

Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message Interview Skills: Purpose of an interview, Do's and Dont's of an interview

**Unit 9**

**3 Hours**

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

**Unit 10**

**3 Hours**

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

**Reference Books**

- Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
- Communication skills, Sanjay Kumar, Pushpalata, 1<sup>st</sup>Edition, Oxford Press, 2011
- Organizational Behaviour, Stephen .P. Robbins, 1<sup>st</sup>Edition, Pearson, 2013
- Brilliant- Communication skills, Gill Hasson, 1<sup>st</sup>Edition, Pearson Life, 2011





Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-105T	Communication Skills –Theory	-	2	-	-	-	-	-	3	-	3	-	-	-	-	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

### Communication Skills–Practical (TIU-UBP-111P)

Contact hours: 2 hrs/wk

#### Course Objectives

1. To learn and understand the components, structure of the English Language .
2. To learn effective communication which will enrich the students so that they can be competent enough to give their best in the competitive market.
3. To facilitate rigorous exercises on effective communication, self-expression, listening, reading, speaking, and writing skills.

#### 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
- CO2. **Describe** effectively (Verbal and Non-Verbal), Develop interview skills
- CO3. Effectively **manage** the team as a team player, Develop Leadership qualities and essentials

#### Course Content

2 Hours / week

##### Module I

10 Hours

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

##### Module II:

10 Hours

##### Pronunciations covering the following topics

Pronunciation (Consonant Sounds)

Pronunciation and Nouns Pronunciation (Vowel Sounds)

Advanced Learning Listening Comprehension

Direct and Indirect Speech

##### Module III

5 Hours

Figures of Speech

##### Module IV

5 Hours

Effective Communication:



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

**Text and Reference Books:**

**Text Books:**

1. Wordsworth® English language lab software

**Reference Books:**

2. Communication skills for professionals, Konarnira, 2ndEdition, New arrivals – PHI, 2011
3. Personality development and soft skills, Barun K Mitra, 1 stEdition , Oxford Press, 2011
4. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india [pvt.ltd](http://pvt.ltd), 2011
5. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011 11. Effective communication, John Adair, 4thEdition , Pan Mac Millan,2012
6. Bringing out the best in people, Aubrey Daniels, 2<sup>nd</sup> Edition, Mc Graw Hill, 1999

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

Mapping between COs and Pos		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	<b>Understand</b> the behavioural needs for a Pharmacist to function effectively in the areas of pharmaceutical operation	PO2, PO3, PO6, PO7, PO8, PO9, PO10, PEO1, PEO2, PEO3
CO2	<b>Communicate</b> effectively (Verbal and Non-Verbal), Develop interview skills	PO2, PO3, PO6, PO7, PO8, PO9, PO10, PEO1, PEO2, PEO3
CO3	Effectively <b>manage</b> the team as a team player, Develop Leadership qualities and essentials	PO2, PO10, PEO3



Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO 1	PEO2	PEO3
TIU-UBP-111P	Communication Skills- Practical	-	1	1	-	-	2	2	3	3	2	2	2	3	2	2

1=weakly mapped

2= moderately mapped

3=strongly mapped

### Remedial Biology Theory (TIU-UBP-106RBT)

Contact hours: 30 hr

#### Course Objectives

1. To know the classification and salient features of five kingdoms of life
2. To understand the basic components of anatomy & physiology of plant
3. To gain knowledge on- the basic components of anatomy & physiology animal with special reference to human

#### Course Outcomes

Upon completion of the course, the student shall be able

**CO1: Classify** Five kingdoms of life and basis of classification, types of tissues, cell organelles, endocrine glands, nervous system, modes of excretion

**CO2: Identify** Morphology of different parts of flowering plants, salient features of Monera, Protista, Fungi, animalia and plantae, virus, parts of human excretory system, digestive system, reproductive system, circulatory system, nervous system, endocrine system

**CO3: Recognize** Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus, menstrual cycle, functions of hormones, Renin angiotensin system



**CO4:Compare** parts of female and male reproductive system, macro and micronutrients, Spermatogenesis and Oogenesis, blood vessels, Composition of blood and lymph

**CO5:Demonstrate** respiration, glycolysis, fermentation, cell, tissue, digestion, absorption and assimilation nervous system, cardiac output

---

**Course Content** **30Hours**

---

**UNIT I** **07 Hours**

**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, Animalia and 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** **07 Hours**

**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** **07 Hours**

**Excretory products and their elimination**

- Modes of excretion
- Human excretory system- structure and function
- Urine formation
- Renin 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

05 Hours

#### 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

04 Hours

#### Plant respiration:

- Respiration, glycolysis, fermentation (anaerobic).

#### Plant growth and development

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

#### Cell - The unit of life

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

#### Tissues

- Definition, types of tissues, location and functions.

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

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	<b>Classify</b> Five kingdoms of life and basis of classification, types of tissues, cell organelles, endocrine glands, nervous system, modes of excretion	PO5, PO11, PO12, PEO1, PEO2
CO2	<b>Identify</b> Morphology of different parts of flowering plants, salient features of Monera, Protista, Fungi, animalia and plantae, virus, parts of human excretory system, digestive system, reproductive system, circulatory system, nervous system, endocrine system	PO5, PO11, PO12, PEO1
CO3	<b>Recognize</b> Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus, menstrual cycle, functions of hormones, Rennin angiotensin system	PO5, PO11, PO12, PEO1



<b>CO4</b>	<b>Compare</b> parts of female and male reproductive system, macro and micronutrients, Spermatogenesis and Oogenesis, blood vessels, Composition of blood and lymph	PO5, PO12, PEO1, PO9, PO10
<b>CO5</b>	<b>Demonstrate</b> respiration, glycolysis, fermentation, cell, tissue, digestion, absorption and assimilation nervous system, cardiac output	PO5, PO9, PEO1, PO12, PO11.

		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 Pharmacy	Training students to achieve expertise
<b>Course Code</b>	<b>Course Title</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PEO1</b>	<b>PEO2</b>	<b>PEO3</b>
TIU-UBP-106RBT	Remedial Biology Theory	-	-	-	-	3	-	-	-	2	2	3	3	3	2	-

1=weakly mapped

2= moderately mapped

3=strongly mapped

### **Remedial Biology-Practical (TIU-UBP-112RBP)**

**Contact hours: 2 hrs/wk**

#### **Course Objectives**

1. To know the fundamentals of morphological structure of plants, human skeleton system
2. To administer the knowledge and techniques of common laboratory tests, to handle a microscope and slide preparation.
3. To understand different cell and cell inclusions

#### **Course Outcomes:**





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

**CO1.Describe** about the parts, handling and use of microscope, and **demonstrate** fundamentals of morphological structures of plants

**CO2.Compare** the human skeletal system deformities

**CO3.Demonstrate** the basic procedure to Describe common laboratory blood tests

**CO4.Predict** technical errors and clinical implications of laboratory tests

### Course Content

2 Hours/week

- **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

### Reference Books

1. Practical human anatomy and physiology. by S.R. Kale and R.R. Kale.
2. A Manual of pharmaceutical biology practical by S.B. Gokhale, C.K. Kokate and S.P. Shrivastava.
3. Biology practical manual according to National core curriculum. Biology forum of Karnataka. Prof.M.J.H. Shafi

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	<b>Describe</b> about the parts, handling and use of microscope Demonstrate fundamentals of morphological structures of plants	PO5, PO11, PO12,
CO2	<b>Compare</b> the human skeletal system deformities	PO5, PO11, PO12
CO3	<b>Demonstrate</b> common laboratory blood tests	PO1, PO5, PO11, PO12, PEO2, PEO3
CO4	<b>Predict</b> technical errors and clinical implications of laboratory tests	PO1, PO5, PO11, PO12, PEO2, PEO3



Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-112RBP	Remedial Biology-Practical	2	-	-	-	3	-	-	-	-	-	3	3	-	2	2

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

**Remedial Mathematics Theory (TIU-UBP-106RMT )**  
**Contact hours: 30 hr**

**Course Objectives:**

Upon completion of the course the student shall be able to

1. **To know** the theory and their application in Pharmacy
2. **To solve** the different types of problems by applying theory
3. **To appreciate** the important application of mathematics in Pharmacy

**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  
**CO2. Demonstrate** limit, continuity and concept of differentiation, integration and differential equations  
**CO3. Solve** differential equations related to Chemical kinetics and Pharmacokinetics equations using Laplace Transform method  
**CO4. Illustrate** the concept of matrix, determinant and their properties with examples  
**CO5. Demonstrate** coordinate system and study the properties of Straight lines

**Course Content**

**30 Hours**

**Unit I:**

**6 Hours**



### 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

### Unit II:

10 Hours

#### Limits and continuity

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

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

### 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

#### Integration

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

#### 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.

### Unit III:

8 Hours

#### 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 solving Pharmacokinetic equations.

### Unit IV:

6 Hours

#### 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

### Recommended Books (Latest Edition)

1. Differential Calculus by Shanthi narayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthi narayan
4. Higher Engineering Mathematics by Dr.B.S.Grewal

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

Mapping between COs and Pos		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	<b>Demonstrate</b> function and deal with problems related to partial fractions and logarithms	PO1, PO2, PO11. PO12, PEO1
CO2	<b>Demonstrate</b> limit, continuity and concept of differentiation, integration and differential equations	PO1, PO11. PO12. PEO1
CO3	<b>Solve</b> differential equations related to Chemical kinetics and Pharmacokinetics equations using Laplace Transform method	PO1, PO2, PO11. PO12, PEO1
CO4	<b>Illustrate</b> the concept of matrix, determinant and their properties with examples	PO1, PO2, PO11. PO12, PEO1
CO5	<b>Demonstrate</b> coordinate system and study the properties of Straight lines	PO1, PO11. PO12, PEO1



		Pharmaceutical Knowledge: Graduates will demonstrate knowledge of pharmaceutical science & basic science.	Problem solving: Graduates will demonstrate an ability to identify, formulate and solve the problems associated with Pharmaceutical Industry, Community & Hospital Pharmacy.	Conduct, analyze and interpret data. Graduate will demonstrate an ability to conduct, analyze and interpret data arising out of research experience into production, Quality control & Quality assurance.	Design and formulating a process: Graduates will demonstrate an ability to design formulation & Synthetic process as per needs and specifications in Pharmaceutical Industries & Marketing	Ability to understand mechanism: Graduates will demonstrate an ability to understand mechanism of drug action, its dynamics and kinetics, visualize and work on laboratory techniques and improvements	Demonstrate skills in problem solving: Graduate will demonstrate skills to use modern Pharmaceutical tools, software and equipment to analyze & solve problems	Professional and ethical responsibilities: Graduates will demonstrate knowledge of professional and ethical responsibilities as per Pharmaceutical jurisprudence and global regulations	Communication skills: Graduate will be able to communicate effectively, both verbal and written form, to present a technical report	Impact on society and responsibilities: Graduate will show the understanding of impact of Pharmaceutical sciences on the society and also will be aware of modern issues related to health care.	Leadership qualities: An ability to function effectively as a leader and member of multidisciplinary teams	Self educating and Life-long Learning: Graduate will develop confidence for self education and ability for life-long learning	Preparation for competitive examinations: Graduate can participate and succeed in competitive examinations	To build a strong theoretical knowledge base along with necessary practical skill and able to use these experiences in pharmaceutical industry, research & development.	To provide students with a strong foundation in Pharmaceutics, Pharmaceutical Chemistry, Pharmacology and Pharmacognosy fundamentals as per the present requirement of pharmaceutical Industries, Community and Hospital Pharmacy	To train students with good knowledge along with practical efficiency in Pharmacodynamics, pharmacokinetics, Drug properties, synthesis, molecular modelling, formulation & development, analytical aspects in research and design. Extend this knowledge to create novel Herbal & Synthetic Pharmaceutical products for the benefit of life
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-106RMT	Remedial Mathematics - Theory	3	3	-	-	-	-	-	-	-	-	3	3	3	-	-

1=weakly mapped

2= moderately mapped

3=strongly mapped