B. PHARM. I YEAR
SEMESTER – I

I B. PHARM. SCHEME

SEMESTER - I

S. No.	Sub. Code	Subject	L	T	P	Th. Credit	Tu. Credit	Pr. Credit	Total Credit	Maximum Marks				
										TH	CW	SW	Pr.	Total
1.	PY1Y109	Human Anatomy & Physiology I	3	1	4	3	1	2	6	75	25	15	35	150
2.	PY1Y110	Pharmaceutical Analysis I	3	1	4	3	1	2	6	75	25	15	35	150
3.	PY1Y111	Pharmaceutics I	3	1	4	3	1	2	6	75	25	15	35	150
4.	PY1Y112	Pharmaceutical Inorganic Chemistry	3	1	4	3	1	2	6	75	25	15	35	150
5.	HU1Y005	Communication skills*	2	-	2	2	-	1	3	35	15	10	15	75
6.	PY1Y006/ MA1Y007	Remedial Biology/ Remedial Mathematics*	2	-	2/0	2	-	1/0	3/2	35	15	10/0	15/0	75/50
Total			**16**	**4**	**18$/20#**	**16**	**4**	**9$/10#**	**27/29$/30#**	**370**	**130**	**70$/80#**	**155$/170#**	**725$/750#**

#Applicable ONLY for the students who have studied Mathematics/Physics/Chemistry at HSC & appearing for Remedial Biology course.
$Applicable ONLY for the students who have studied Physics/Chemistry/Botany/Zoology at HSC & appearing for Remedial Mathematics course.
* Non University Examination (NUE)

PY 1Y 109: HUMAN ANATOMY & PHYSIOLOGY-I

L	T	P	Th. Cr.	Tu. Cr.	Pr. Cr.	Total Credit	Maximum marks				
							TH	CW	SW	Pr	Total
3	1	4	3	1	2	6	75	25	15	35	150

Scope:

This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives:

After completion of course, student should be able to:

- Understand general body organization, anatomical structure and terminology.
- Understand structure and normal components of various body systems on cellular and organ levels.
- Understand normal functions of the components of various body systems on cellular and organ levels.
- Interpret correlation of all body systems with each other and their contributions to homeostasis.
- Perform laboratory procedures used to examine anatomical structures and evaluate physiological functions of the integumentary, skeletal, muscular, haemopoietic, lymphatic/immune, peripheral nervous system and special senses, and cardiovascular system.

Course Outcomes:

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

CO-1: Recall, illustrate and explain general body organization, anatomical structure and terminology.

CO-2: Relate, and explain structure and normal components of various body systems on cellular and organ levels.

CO-3: Relate and explain normal functions of the components of various body systems on cellular and organ levels.

CO-4: Interpret correlation of all body systems with each other and their contributions to homeostasis.

CO-5: Demonstrate laboratory procedures used to examine anatomical structures and evaluate physiological functions of the integumentary, skeletal, muscular, haemopoietic, lymphatic/immune, peripheral nervous system and special senses, and cardiovascular system.

THEORY TOPICS **DURATION (LECTURES)**

UNIT I **10**

a. 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.

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

UNIT II **10**

a. Integumentary system: Structure and functions of skin.
b. 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.
c. Joints: Structural and functional classification, types of joints movements and its articulation.

UNIT III **10**

a. 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.
b. Lymphatic system: Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

UNIT IV

a. Peripheral nervous system: Classification of peripheral nervous system, Structure and functions of sympathetic and parasympathetic nervous system. **8**
b. Origin and functions of spinal and cranial nerves.
c. Special senses: Structure and functions of eye, ear, nose and tongue and their disorders.

UNIT V **7**

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.

PRACTICALS: Minimum 15 experiments based on the following:

1. To study compound microscope.
2. To perform microscopic study of epithelial and connective tissue
3. To perform microscopic study of muscular and nervous tissue
4. To identify axial bones and appendicular bones
5. To enumerate white blood cell (WBC) count
6. To enumerate total red blood corpuscles (RBC) count
7. To determine of bleeding time
8. To determine of clotting time
9. To estimate haemoglobin content
10. To determine of blood group.
11. To determine erythrocyte sedimentation rate (ESR).
12. To determine heart rate and pulse rate.
13. To record blood pressure.
14. To study and demonstrate the function of olfactory nerve, different types of taste, visual acuity.
15. To study integumentary system and special senses

BOOKS & REFERENCES RECOMMENDED

Text books:

1. K. J.W. Wilson, C. Livingstone. Anatomy and Physiology in Health and Illness.
2. Tortora Grabowski. Principles of Anatomy and Physiology.
3. I. Singh. Textbook of Human Histology by, Jaypee brother's medical publishers.
4. C.L. Ghai. Textbook of Practical Physiology, Jaypee brother's medical publishers.
5. K. Srinageswari and R Sharma. Practical workbook of Human Physiology, Jaypee brother M P.
6. C.C. Chatterrje, Human Physiology (vol 1 and 2),Academic Publishers Kolkata
7. K. Sembulingam and P. Sembulingam. Essentials of Medical Physiology. Jaypee brothers M P.

Reference books:

1. Best and Tailor. Physiological basis of Medical Practice. Williams & Wilkins Co, Riverview, USA
2. A. C. Guyton and J. E. Hall. Text book of Medical Physiology.

Internet References:

1. http://www.coursera.org.
2. http://www.getbodysmart.com

PY 1Y 110: PHARMACEUTICAL ANALYSIS -I

L	T	P	Th. Cr.	Tu. Cr.	Pr. Cr.	Total Credit	Maximum Marks				
							TH	CW	SW	Pr.	Total
3	1	4	3	1	2	6	75	25	15	35	150

Scope: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs.

Objectives:
After completion of course, student shall be able to:

- Understand the principles of volumetric and electro chemical analysis.
- Carryout various volumetric and electrochemical titrations.
- Develop various analytical skills for qualitative and quantitative determination.
- Use Pharmacopoeial standards for quality control of drug products.
- Perform elementary analytical assay procedures.

Course Outcomes:
Upon completion of the course, student shall be able to:
CO-1: Learn and understand the principles of different qualitative and quantitative analytical tests.
CO-2: Identify different chemicals using various techniques such as acid-base, redox, volumetric and electrochemical analysis and titrations.
CO-3: Summarise theoretical concepts of pharmaceutical analysis for expressing their utility in pharmaceutical sciences.
CO-4: Interpret and compare the Pharmacopoeial standards for quality control of drug products.
CO-5: Plan and apply different analytical tests to be performed in laboratory.

THEORY **DURATION (LECTURES)**

UNIT-I **10**

Pharmaceutical analysis- Definition and scope

1. Different techniques of analysis
2. Methods of expressing concentration
3. Primary and secondary standards.
4. 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

(a) **Errors:** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

(b) Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.

UNIT-II **10**

(a) **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.

(b) **Non aqueous titration:** Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

UNIT-III **10**

(a) **Precipitation titrations:** Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.

(b) **Complexometric titration:** Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.

(c) **Gravimetry:** Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.

(d) **Diazotisation titration:** Basic Principles, methods and application of diazotisation titration.

UNIT-IV **08**

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

UNIT-V **07**

Electrochemical methods of analysis

(a) **Conductometry:** Introduction, Conductivity cell, Conductometric titrations, applications.

(b) **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.

(c) **Polarography:** Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications.

PRACTICALS: Minimum 15 experiments based on the following:

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

4. Ammonium chloride by acid base titration

5. Ferrous sulphate by Cerimetry
6. Copper sulphate by Iodometry
7. Calcium gluconate by complexometry
8. Hydrogen peroxide by Permanganometry
9. Sodium benzoate by non-aqueous titration
10. Sodium Chloride by precipitation titration

IV. Determination of Normality by electro-analytical methods

11. Conductometric titration of strong acid against strong base
12. Conductometric titration of strong acid and weak acid against strong base
13. Potentiometric titration of strong acid against strong base

BOOKS & REFERENCES RECOMMENDED

Text books:

1. Vogel's, Text book of Quantitative chemical Analysis, fifth edition, 1989, Longman Scientific & Technical UK.
2. David Harvey, Modern Analytical Chemistry, first edition, 2000, McGraw Hill Companies, New York.
3. Bentley and Driver's Textbook of Pharmaceutical Chemistry
4. John H. Kennedy, Analytical chemistry principles
5. Daniel C. Harris, Quantitative Chemical Analysis, Eighth edition, W. H. Freeman and Company, New York.
6. P. Gundu Rao, Inorganic Pharmaceutical Chemistry.

Reference books:

1. Pharmacopoeia of India, Govt. of India, Ministry of Health and Family Welfare, New Delhi.
2. Beckett, A.H. and Stenlake, J.B., Practical Pharmaceutical Chemistry, fourth edition, Vol. I and II, CBS Publishers and Distributors, New Delhi, India.

PY 1Y 111: PHARMACEUTICS – I

L	T	P	Th. Cr.	Tu. Cr.	Pr. Cr.	Total Credit	Maximum Marks				
							TH	CW	SW	Pr.	Total
3	1	4	3	1	2	6	75	25	15	35	150

Scope: This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

Objectives:

On completion of this subject, students should be able to:

- Know the history of pharmacy & its development and various official literature of pharmacy.
- Identify the appropriate dosage forms and its route of administration for particular therapy.
- Familiarize with basic requirements in preparation of different simple dosage forms.
- Formulate & package dosage forms and reduce & enlarge simple pharmaceutical formulations.

Course Outcomes:

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

CO-1: Provide an overview of pharmacy discipline, its development, and scope. Knowing the history of modern pharmacy and its development. Understanding various systems of medicine and official literature of pharmacy.

CO-2: Identify appropriate dosage forms and route of administration for particular therapy.

CO-3: Explain various dosage forms, systems of medicine, various routes of drug administration and their therapeutic importance.

CO-4: Familiarize with basic requirements in preparation of different simple dosage forms and provide fundamental knowledge of formulation methodologies and techniques.

CO-5: Illustrate the basic understanding and training of dose calculation. Formulation and packaging of dosage forms.

THEORY TOPICS **DURATION (LECTURE)**

UNIT I **10**

a) **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.

b) **Dosage forms:** Introduction to dosage forms, classification and definitions.

c) **Prescription & Posology:** Definition, Parts of prescription, handling of Prescription and Errors in prescription.

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

UNIT II **10**

a) **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.

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

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

UNIT III **10**

a) **Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.

b) Biphasic liquids:

Suspensions- Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.

Emulsions- Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

UNIT IV **8**

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

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

UNIT V **7**

a) **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.

PRACTICALS

Minimum 20 practicals covering following areas:

1. Syrups

a) Syrup IP'66
b) Compound syrup of Ferrous Phosphate BPC'68

2. Elixirs

a) Piperazine citrate elixir
b) Paracetamol pediatric elixir

3. Linctus

a) Terpin Hydrate Linctus IP'66
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) Divded powders

8. Suppositories

a) Glycero gelatin suppository
b) Cocoa butter suppository
c) Zinc Oxide suppository

8. Semisolids

a) Sulphur ointment
b) Non staining-iodine ointment with methyl salicylate
c) Carbopol gel

9. Gargles and Mouthwashes

a) Iodine gargle
b) Chlorhexidine mouthwash

BOOKS & REFERENCES RECOMMENDED

Text books:

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. Lachman, Theory and Practice of Industrial Pharmacy, Lea&Febiger Publisher, The University of Michigan.
4. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
5. Jain N.K. and Sharma S.N., Textbook of Professional Pharmacy, 2010, Vallabh Prakashan.

Reference books:

1. M.E. Aulton, Pharmaceutics, The Science & Dosage Form Design, Churchill Livingstone, Edinburgh.
2. Indian pharmacopoeia.
3. British pharmacopoeia.
4. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
5. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
6. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
7. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker,INC, New York.
8. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions

and Suspensions, Marcel Dekker, INC, New York.
9. Remington's, The Science and Practice of Pharmacy, 21st ed., 2005, Lippincott Williams & Wilkins.
10. Ansel H.C., Pharmaceutical calculations, 14th ed. 2015, Lippincott Williams & Wilkins India
11. Shrivastava G.P., History of Indian Pharmacy.

PY 1Y 112: PHARMACEUTICAL INORGANIC CHEMISTRY

L	T	P	Th. Credit	Tut. Credit	Pr. Credit	Total Credits	Maximum Marks				
							TH	CW	SW	Pr.	Total
3	1	4	3	1	2	6	75	25	15	35	150

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.

Objectives: Upon completion of course student shall be able to

- Know the sources of inorganic impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
- Uunderstand the medicinal and pharmaceutical importance of inorganic compounds

Course Outcomes:

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

CO-1: Learn and identify different inorganic compounds useful in the field of pharmaceuticals.

CO-2: Understand the pharmaceutical importance and uses of inorganic compounds.

CO-3: Explain the method of preparation and properties of different inorganic compounds in relation to pharmaceuticals.

CO-4: Estimate and identify different inorganic compounds by performing their assay & titrations.

CO-5: Relate the knowledge of inorganic compounds, radioactive compounds and other chemicals with respect to the human health.

THEORY **DURATION (LECTURE)**

UNIT-I **10**

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**

a) **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.

b) **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

c) **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**

Gastrointestinal agents

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

UNIT-IV **08**

Miscellaneous compounds

1. **Expectorants:** Potassium iodide, Ammonium chloride*.
2. **Emetics:** Copper sulphate*, Sodium potassium tartrate.
3. **Haematinics:** Ferrous sulphate*, Ferrous gluconate.
4. **Poison and Antidote:** Sodium thiosulphate*, Activated charcoal, Sodium nitrate.
5. **Astringents:** Zinc Sulphate, Potash Alum.

UNIT-V **07**

Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I121, Storage conditions, precautions & pharmaceutical application of radioactive substances.

PRACTICALS: Minimum 15 experiments based on the following:

1. Limit tests for following ions

i. Limit test for Chlorides and Sulphates
ii. Modified limit test for Chlorides and Sulphates
iii. Limit test for Iron
iv. Limit test for Heavy metals
v. Limit test for Lead
vi. Limit test for Arsenic

2. Identification test

vii. Magnesium hydroxide
viii. Ferrous sulphate
ix. Sodium bicarbonate
x. Calcium gluconate
xi. Copper sulphate

3. Following tests

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

4. Preparation of inorganic pharmaceuticals

xv. Boric acid
xvi. Potash alum
xvii. Ferrous sulphate

BOOKS & REFERENCES RECOMMENDED

Text Books:

1. Block J. H., Roche E. B., Soine T. O., Wilson C. O., "Inorganic Medicinal and Pharmaceutical Chemistry", 1986, Varghese Publication.
2. Backette A. H., Stenlake J. B., "Practical Pharmaceutical Chemistry-Vol. I & II" 4th Edition, 1988, A & C Black.
3. Vogel's Qualitative Inorganic Analysis, 7th edition, 2006, Pearson Publication.
4. Discher, C. A., Modern inorganic pharmaceutical chemistry, 2nd edition, 1985, Waveland Press Inc.
5. Lee, J. D., Concise Inorganic chemistry, 5th edition, 2014, Oxford University Press.
6. M.L Schroff, Inorganic Pharmaceutical Chemistry
7. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition.
8. Anand & Chatwal, Inorganic Pharmaceutical Chemistry

Reference Books:

1. Indian Pharmacopoeia, The Indian Pharmacopoeia Commission, Govt. of India. Ministry of Health and Family Welfare, Ghaziabad. 5th edition, 2007
2. The Science and Practice of Pharmacy by Remington, 21th edition, 2005, Lipincott, William and Wilkins.
3. Advanced Inorganic Chemistry; Cotton & Wilkinson; Delhi, 6th edition, 1999, Wiley Eastern Ltd.
4. Practical Pharmaceutical Chemistry Vol. I & II; A.H. Beckett & J.B. Stenlake, 4th edition, 2006, CBS Publishers; New Delhi.
5. Vogel, Macro and Semimicro Quanlitative Inorganic Analysis, 5th edition, 1979, Longman Publication.
6. Atherden L. M., Bentley and Drivers Text Book of Pharmaceutical Chemistry, 8th edition, 1998, Oxford University Press, New Delhi.

HU 1Y 005: COMMUNICATION SKILLS

L	T	P	Th. Cr.	Tu. Cr.	Pr. Cr.	Total Credits	Maximum Marks				
							TH	CW	SW	Pr.	Total
2	-	2	2	-	1	3	35	15	10	15	75

Scope:
This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Objectives:

- To understand the behavioral needs for a pharmacist to function effectively in the areas of pharmaceutical operation.
- To communicate effectively (verbal and non-verbal) which will enhance the self-confidence and employability
- To effectively manage the team as a team player.
- To develop the ability to speak, read, write, understand and effectively express in grammatically corrects English.
- To develop interview skills and listening comprehension.
- To develop leadership qualities and essentials.

Course Outcomes:
Upon completion of the course, student shall be able to:
CO-1: Understand the behavioural needs for a pharmacist to function effectively in the areas of pharmaceutical operation.
CO-2: Communicate effectively (verbal and non-verbal) which will enhance the self-confidence and employability
CO-3: Exhibit leadership and be able to manage the team effectively.
CO-4: Develop interview skills and listening comprehension.
CO-5: Apply the skills to speak and express effectively.

THEORY **DURATION (LECTURE)**

UNIT-I **07**

a) **Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context.
b) **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers.
c) **Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.

UNIT-II **07**

a) **Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication.
b) **Communication Styles:** Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style.

UNIT-III **07**

a) **Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations.
b) **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.
c) **Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message.

UNIT-IV **05**

a) Interview Skills: Purpose of an interview, Do's and Dont's of an interview.
b) Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery.

UNIT V **04**

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

PRACTICALS:

The following learning modules are to be conducted using **wordsworth®** English language lab software:

1. **Basic communication covering the following topics**
   Meeting People
   Asking Questions
   Making Friends
   What did you do?
   Do's and Dont's
2. **Pronunciations covering the following topics**
   Pronunciation (Consonant Sounds)
   Pronunciation and Nouns
   Pronunciation (Vowel Sounds)
3. **Advanced Learning**
   Listening Comprehension / Direct and Indirect Speech
   Figures of Speech
   Effective Communication
   Writing Skills
   Effective Writing
   Interview Handling Skills
   E-Mail etiquette
   Presentation Skills

BOOKS & REFERENCES RECOMMENDED (LATEST EDITIONS):

Text books:

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011.
2. Communication skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011
3. Communication skills for professionals, Konar nira, 2nd Edition, New arrivals – PHI, 2011.
4. Soft skills and professional communication, Francis Peters SJ, 1st Edition, Mc Graw Hill Education, 2011

Reference books:

1. Organizational Behaviour, Stephen .P. Robbins, 1st Edition, Pearson, 2013
2. Brilliant- Communication skills, Gill Hasson, 1st Edition, Pearson Life, 2011
3. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5th Edition, Pearson, 2013
4. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
5. Personality development and soft skills, Barun K Mitra, 1st Edition, Oxford Press, 2011
6. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
7. Effective communication, John Adair, 4th Edition, Pan Mac Millan,2009
8. Bringing out the best in people, Aubrey Daniels, 2nd Edition, Mc Graw Hill, 1999

PY 1Y 006: REMEDIAL BIOLOGY

L	T	P	Th. Credit	Tut. Credit	Pr. Credit	Total Credits	Maximum Marks				
							TH	CW	SW	Pr.	Total
2	-	2	2	-	1	3	35	15	10	15	75

Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

Objectives:

After completion of course, student shall be able to:

- Know the classification and salient features of five kingdoms of life.
- Understand the basic component of anatomy and physiology of plant.
- Understand the basic component of anatomy and physiology of animal with special reference to human.
- Understand system of the human body covered in this course: circulatory, digestive, respiratory, excretory, nervous, endocrine and reproductive.
- Understand the normal functions of the components of these systems on cellular and organ levels

Course Outcomes:

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

CO-1: Classify and discuss the salient features of five kingdoms of life and morphology of flowering plants.

CO-2: Describe the basic component of anatomy and physiology of organ systems of human body.

CO-3: Describe the types of mineral nutrition and role of photosynthesis in plants.

CO-4: Discuss the essential components and their functions for plant growth and development.

CO-5: Demonstrate the structural components of cell and tissues.

THEORY **DURATION (LECTURE)**

UNIT I **6**

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, Potista, Fungi, Animalia and Plantae, Virus.

Morphology of Flowering plants

Morphology of different parts of flowering plants- Root, stem, inflorescence, flower, leaf, fruit, seed. General Anatomy of Root, stem, leaf of monocotyledons & dicotylidones.

UNIT II **6**

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 **6**

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 **6**

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 **6**

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.

PRACTICALS: Minimum 15 experiments based on the following:

1. Study of Microscope.
2. Section cutting techniques.
3. Mounting and staining.
4. Permanent slide preparation.
5. Study of cell and its inclusions.
6. Study of Stem and its modifications.
7. Study of Root and its modifications.
8. Study of Leaf and its modifications
9. Detailed study of frog by using computer models
10. Microscopic study and identification of
11. Identification of bones
12. Determination of blood group
13. Determination of blood pressure
14. Determination of tidal volume

BOOKS & REFERENCES RECOMMENDED

Text books:

1. Vidyarthi R.D., Pandey P. N., "A Text Book of Zoology", 1st edition, S Chand & Co. Pvt. Ltd. Publisher, 2006.
2. John E. Hall, Guyton & Hall: "Textbook of Medical Physiology", 13th edition, WB Saunders Company, 2015.
3. Gokhale S.B., Kokate C.K., A manual for pharmaceutical biology practical.
4. Gokhale S.B., Text book of Biology.
5. Thulajappa and Seetaram. A Text book of Biology.
6. Sreenivasa Naidu B.V., A Text book of Biology.
7. Naidu and Murthy, A Text book of Biology.

Reference books:

1. Dutta A.C., "Botany for Degree students", 20th edition, Oxford university press publisher, 2006.
2. Bhatia K.N., "Truemans: Elementary Biology", Vol. II, 27th edition, Trueman book company-New Delhi, 2014.
3. Evans W. C., "Trease and Evans Pharmacognosy", 16th edition, Saunders Ltd, 2009.
4. Nalini Chandar, Cell and Molecular Biology (Lippincott's Illustrated Reviews Series), Lippincott Williams & Wilkins publisher, 2012.
5. Kale S.R, Kale R.R., .Practical human anatomy and physiology.
6. Gokhale S.B., Shriwastava.S.P., A Manual of pharmaceutical biology practical.
7. Shafi. M.J.H., Biology practical manual according to National core curriculum, Biology forum of Karnataka.
8. Kambaranatha M. E and Ananthakrishnan T. N., Outlines of Zoology.

MA 1Y 007: REMEDIAL MATHEMATICS

L	T	P	Th. Credit	Tut. Credit	Pr. Credit	Total Credits	Maximum Marks				
							TH	CW	SW	Pr.	Total
2	-	-	2	-	-	2	35	15	-	-	**50**

Scope: This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

Objectives:

- To impart understanding of fundamental aspects of mathematics having applications in mathematical expressions encountered in various subjects of B. Pharm. degree course.
- To provide basic knowledge of Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.
- To develop the ability to solve different types of numerical problems

Course Outcomes:

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

CO-1: Impart fundamental aspects of mathematics in various subjects of B. Pharm. degree course.

CO-2: Develop basic knowledge of Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

CO-3: Develop the ability to solve differential equations and its applications.

CO-4: Calculate the different ways of analytical geometry.

CO-5: Summarize basic knowledge of laplace transform and its pharmaceutical applications.

THEORY **DURATION (LECTURE)**

UNIT-I **06**

a) 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.

b) Logarithms:

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

c) Function:

Real Valued function, Classification of real valued functions.

d) **Limits and continuity** :

Introduction, Limit of a function, Definition of limit of a function ($\in$ – δ definition)

$$\lim_{x\to a}\left(\frac{x^n-a^n}{x-a}\right) = na^{n-1}, \lim_{\theta\to 0}\left(\frac{sin\theta}{\theta}\right) = 1$$

UNIT-II **06**

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 method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley – Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations.

UNIT-III **06**

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. Applications.

UNIT-IV **06**

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. Applications.

UNIT-V **06**

a) **Differential Equations** : Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations, **Application in solving Pharmacokinetic equations.**
b) **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.**

BOOKS & REFERENCES RECOMMENDED (LATEST EDITIONS):

Text books:

1. Kachot, K.R., Advanced Mathematics for Pharmacy, Maharja Publishing House, Ahemdabad.
2. Bale, N.P., A textbook of Pharmaceutical Mathematics (Advanced Mathematics Volume-I).
3. Remedial Mathematics (Advanced Mathematics Volume-I).

Reference books:

1. M. Ray, Algebra.
2. K.P. Basu, Intermediate Algebra.
3. Paria G., Differential Calculus, Scholar's Publications, Indore.
4. Paria G., Integral Calculus, Scholar's Publications , Indore.
5. Paria G., Coordinate Geometry of Three Dimensions, Scholar's Publications, Indore.
6. Dr. B. S. Grewal, Higher Engineering Mathematics.
7. Panchaksharappa Gowda D.H., Pharmaceutical Mathematics with application to Pharmacy.
8. Differential Calculus by Shanthinarayan.
9. Integral Calculus by Shanthinarayan.

B. PHARM. I YEAR
SEMESTER - II

I B.PHARM. SCHEME

SEMESTER - II

S. No.	Sub. Code	Subject	L	T	P	Th. Credit	Tu. Credit	Pr. Credit	Total Credit	Maximum Marks				
										TH	CW	SW	Pr.	Total
1.	PY1Y610	Human Anatomy and Physiology II	3	1	4	3	1	2	6	75	25	15	35	150
2.	PY1Y611	Pharmaceutical Organic Chemistry I	3	1	4	3	1	2	6	75	25	15	35	150
3.	PY1Y613	Biochemistry	3	1	4	3	1	2	6	75	25	15	35	150
4.	PY1Y612	Pathophysiology	3	1	-	3	1	-	4	75	25	-	-	100
5.	CT1Y503	Computer Applications in Pharmacy*	3	-	2	3	-	1	4	50	25	10	15	100
6.	PY1Y504	Environmental Sciences*	3	-	-	3	-	-	3	50	25	-	-	75
Total			**18**	**4**	**14**	**18**	**4**	**7**	**29**	**400**	**150**	**55**	**120**	**725**

*Non University Examination (NUE)

PY 1Y 610: HUMAN ANATOMY & PHYSIOLOGY-II

L	T	P	Th. Cr.	Tu. Cr.	Pr. Cr.	Total Credit	Maximum marks				
							TH	CW	SW	Pr	Total
3	1	4	3	1	2	6	75	25	15	35	150

Scope:

- This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives:

After completion of course, student should be able to:

- Explain the gross morphology, structure and functions of various organs of the human body taught under this course.
- Understand the relevance and significance of human anatomy and physiology to understand pharmaceutical sciences.
- Identify the various tissues and organs of different systems of human body.
- Understand components of respective body systems and their coordinated functions.
- Perform laboratory procedures to examine urinary, respiratory and endocrine system.
- Understand about basic principles of genetics.

Course Outcomes:

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

CO-1: Explain the gross morphology, structure and functions of various organs of the human body.

CO-2: Extend and relate significance of human anatomy and physiology to understand pharmaceutical sciences.

CO-3: Identify the various tissues and organs of different systems of human body.

CO-4: Explain and summarize components of respective body systems, their coordinated functions and principles of genetics.

CO-5: Perform experiment related to urinary, respiratory and endocrine system.

THEORY TOPICS **DURATION (LECTURES)**

UNIT I **10**

a. Nervous system: Organization of nervous system, neuron, neuroglia, classification and properties of nerve fiber, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

b. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)

UNIT II **6**

a. 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.
b. Energetics: Formation and role of ATP, Creatinine Phosphate and BMR.

UNIT III **10**

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

UNIT IV **10**

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 **9**

a. 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.
b. Introduction to genetics: Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.

PRACTICALS: Minimum 15 experiments based on the following:

1. To study the nervous system using specimen, models.
2. To study the endocrine system using specimen, models
3. To demonstrate the general neurological examination
4. To demonstrate the reflex activity.
5. Recording of body temperature.
6. To demonstrate positive and negative feedback mechanism.
7. To determine tidal volume and vital capacity.
8. To study digestive, respiratory, endocrine, urinary and reproductive systems with the help of models, charts and specimens.
9. To record body mass index.
10. To study family planning devices and pregnancy diagnosis test.
11. Study of physiology of menstruation and pregnancy with the help of charts, models, microscopic slides.
12. Analysis of normal and abnormal constituents of urine.
13. To study about the structure of the DNA and RNA.
14. To study about the structure of the Gene and Chromosomes.
15. Understanding EEG and their significance.

BOOKS & REFERENCES RECOMMENDED

Text books:

1. K. J.W. Wilson, C. Livingstone. Anatomy and Physiology in Health and Illness.
2. Tortora Grabowski. Principles of Anatomy and Physiology.
3. I. Singh. Textbook of Human Histology by, Jaypee brother's medical publishers.
4. C.L. Ghai. Textbook of Practical Physiology, Jaypee brother's medical publishers.
5. K. Srinageswari and R Sharma. Practical workbook of Human Physiology, Jaypee brother M P.
6. C.C. Chatterrje, Human Physiology (vol 1 and 2),Academic Publishers Kolkata
7. K. Sembulingam and P. Sembulingam. Essentials of Medical Physiology. Jaypee brothers M P.

Reference books

1. Best and Tailor. Physiological basis of Medical Practice. Williams & Wilkins Co, Riverview, USA
2. A. C. Guyton and J. E. Hall. Text book of Medical Physiology.

Internet references:

1. http://www.coursera.org.
2. http://www.getbodysmart.com

PY 1Y 611: PHARMACEUTICAL ORGANIC CHEMISTRY- I

L	T	P	Th. Credit	Tut. Credit	Pr. Credit	Total Credits	Maximum Marks				
							TH	CW	SW	Pr.	Total
3	1	4	3	1	2	6	75	25	15	35	**150**

Scope: This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

Objectives: Upon completion of the course the student shall be able to

a. Write the structure, name and the type of isomerism of the organic compound
b. Write the reaction, name the reaction and orientation of reactions
c. Account for reactivity/stability of compounds,
d. Identify/confirm the identification of organic compound

Course Outcomes:

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

CO-1: Learn the structures, their IUPAC names and the type of reactions of organic compounds.
CO-2: Outline the methods of preparation, uses and reaction of different functional groups.
CO-3: Explain the qualitative and quantitative tests for identification of organic compounds.
CO-4: Perform & interpret qualitative and quantitative analysis of unknown organic compounds.
CO-5: Summarize and apply information of organic compounds in relation to pharmaceuticals

THEORY **DURATION (LECTURE)**

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

UNIT-I **07**

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 isomerism in organic compounds.

UNIT-II **10**

Alkanes*, Alkenes* and Conjugated dienes*

SP^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP^2 hybridization in alkenes E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E1 verses E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation. Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement.

UNIT-III **10**

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, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

UNIT-IV **10**

Carbonyl compounds* (Aldehydes and ketones)

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

UNIT-V **08**

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, EthylenediamineAmphetamine.

PRACTICALS: Minimum 15 experiments based on following:

I. Systematic qualitative analysis of unknown organic compound/s for preliminary tests
II. Systematic qualitative analysis of unknown organic compound/s for preliminary and Lassaigns tests.
III. Systematic qualitative analysis of unknown organic compound/s for functional group (for preliminary / Lassaigns / solubility / functional group tests)
IV. Following classes of compounds may be analyzed
V. Phenols, amide/ urea, carbohydrate, amine, carboxylic acid, aldehyde, ketone, alcohol, carboxylic acid ester, hydrocarbon, halohydrocarbon, nitro compound and anilide
VI. Determination of melting and boiling points of organic compounds
VII. Systematic qualitative analysis of unknown organic compound for functional group and identification of the organic compound
VIII. Preparation of suitable solid derivatives from organic compounds
IX. Systematic qualitative analysis of unknown organic compound for Functional group, its identification and confirmation of identification
X. Construction of molecular models

BOOKS & REFERENCES RECOMMENDED

Text books:

1. Carey A. F., and Giuliano M. R., Organic Chemistry (2011): 8th Edition. McGraw-Hill Companies, Inc.
2. Finar I. L., Organic Chemistry (2011) vol. 1,Organic Chemistry: 6th Edition. Longman.
3. Finar I. L., Organic Chemistry (2011) vol.2, Organic Chemistry: 6th Edition. Longman.
4. Robert T. Morrison and Robert N. Boyd (2008) Organic Chemistry: 7th Edition. Printice Hall

Reference books:

1. Bahl B. S., Bahl A., " Text Book of Organic Chemistry" 22nd edition (2016) S. Chand publication
2. Soni P. L., "Text Book of Organic Chemistry: A modern Approach" 18th edition (1985) S. Chand publication.
3. Pavia D. L., Lampman G. M., Kriz G. S., Vyvyan J. A., " Introduction to spectroscopy" 5th edition, 2015, cengage learning, USA
4. Visnoi N. K., " Advanced Practical Organic Chemistry" 3rd edition (2009) Vikas Publishing House
5. Ahluwalia V. K., Parashar R. K., "Organic Reaction Mechanism" 4th edition (2010), Narosa Publishing House.
6. Cleyden J., Greeves N., Warren S., and Wothers P., (2001) organic chemistry: 1st Edition. Oxford university press.
7. Mann, G. F., and Saunders, C. B., (1960) Practical Organic Chemistry: 4th Edition. Longman
8. Vogel, I. A., (1956) A Text Book of Practical Organic Chemistry Including Qualitative Organic Analysis: 3rd Edition. Longman

Internet references:

1. http://www.internetchemistry.com/chemistry/organic chemistry.htm

PY 1Y 613: BIOCHEMISTRY

L	T	P	Th. Credit	Tut. Credit	Pr. Credit	Total Credits	Maximum Marks				
							TH	CW	SW	Pr.	Total
3	1	4	3	1	2	6	75	25	15	35	**150**

Scope: Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Objectives: Upon completion of course student shell able to

- Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
- Understand the metabolism of nutrient molecules in physiological and pathological conditions.
- Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

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

CO-1: Identify the catalytic role of enzymes, importance of enzyme inhibition, therapeutic and diagnostic applications of enzymes.

CO-2: Illustrate the structure of various biomolecules and their role in physiological and pathological conditions.

CO-3: Define and summarize the importance of biomolecules and genetic material in the synthesis of enzyme, RNAs and DNAs.

CO-4: Explain various biological process and relate their significance in biological context.

CO-5: Perform qualitative and quantitative analysis of different biomolecules in relation to normal physiology.

THEORY TOPICS **DURATION (LECTURE)**

UNIT-I **08**

(a) Biomolecules

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

(b) Bioenergetics

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

UNIT-II **10**

(a) 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.

(b) Biological oxidation

Electron transport chain (ETC) and its mechanism.
Oxidative phosphorylation & its mechanism and substrate level phosphorylation
Inhibitors ETC and oxidative phosphorylation/Uncouplers

UNIT-III **10**

(a) 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.

(b) Amino acid metabolism

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders
Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, Alkeptonuria, Tyrosinemia)
Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline
Catabolism of heme; Hyperbilirubinemia and Jaundice

UNIT-IV **10**

Nucleic acid metabolism and genetic information transfer

Biosynthesis of purine and pyrimidine nucleotides
Catabolism of purine nucleotides and Hyperuricemia and Gout disease
Organization of mammalian genome
Structure of DNA and RNA and their functions
DNA replication (semi conservative model)
Transcription or RNA synthesis
Genetic code, Translation or Protein synthesis and inhibitors

UNIT-V **07**

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

PRACTICALS: Minimum 15 experiments based on following:

1. Qualitative analysis of Monosaccharides (Glucose, Fructose).
2. Qualitative analysis of Disaccharides (Lactose, Maltose).
3. Qualitative analysis of Polysaccharides (Sucrose and starch)
4. Identification tests for Proteins (albumin and Casein)

5. Quantitative analysis of reducing sugars (DNSA method)
6. Quantitative analysis of Proteins (Biuret method)
7. Qualitative analysis of urine for abnormal constituents
8. Determination of blood creatinine
9. Determination of blood sugar
10. Determination of serum total cholesterol
11. Preparation of buffer solution and measurement of pH
12. Study of enzymatic hydrolysis of starch
13. Determination of Salivary amylase activity
14. Study the effect of Temperature on Salivary amylase activity.
15. Study the effect of substrate concentration on salivary amylase activity.
16. Study the effect of pH on salivary amylase activity.
17. Determination of isoelectric point/pH of casein.
18. DNA electrophoresis.
19. Protein electrophoresis.

BOOKS & REFERENCES RECOMMENDED:

Text books:

1. Conn E.E., Stumpf P. K., Bruening G., Doi R.H., "Outlines of Biochemistry", 5th edition, 2009, John Wiley & Sons, India.
2. Davidson V. L., Sittman D. B., "The National Medical Series for independent study-BIOCHEMISTRY", 4th edition, Lippincott Williams & Wilkins- a Wolters Kluwer Company.

References books:

1. Mathews C. K., van Holde K. E., Ahern K. G., "Biochemistry", 4th edition, 2012, Prentice Hall.
2. Rodwell V., Bender D., Botham K. M., Kennelly P. J., Weil P. A., "Harper's Illustrated Biochemistry"30th edition, 2015,McGraw Hill Medical Publishing Division.
3. Nelson D. L., Cox M. M., "Lehninger Prinicples Of Biochemistry", 6th edition, 2102, W. H. Freeman and Company, New York.
4. Berg J. M., Tymoczko J. L., Gatto G. J., Stryer L., "Biochemistry", 7th edition, 2015, W. H. Freeman and Company, New York.
5. Hawk P. B., "PRACTICAL PHYSIOLOGICAL CHEMISTRY", 6th edition, revised and enlarged, P. Blakiston's Son & Co., Philadelphia (Out of print – available in Department library).
6. Rama Rao A.V.S.S., "Text book of Biochemistry" 4th edition 2008, UBS publisher and distributors. New Delhi.
7. Dev A. C., "Fundamental of Biochemistry" 7th edition 2001, New central book agency Kolkatta.
8. Gupta R. C, Bhargava S., "Practical Biochemistry", 5th edition, CBS publisher and distributors, New Delhi.
9. Plummer D. T., "Introduction of Practical Biochemistry" 3rd edition, Tata McGraw Hills Pvt. Ltd., New Delhi.
10. Varley H., "Practical Clinical Biochemistry" 4th edition, 2005, CBS publisher and distributors, New Delhi.

PY 1Y 612: PATHOPHYSIOLOGY

L	T	P	Th. Cr.	Tu Cr.	Pr. Cr.	Total Credit	Maximum marks				
							TH	CW	SW	Pr	Total
3	1	-	3	1	-	4	75	25	-	-	100

Scope:
Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Objectives:
After completion of course, student should be able to:

- Develop understanding of molecular basis of modulation in normal anatomy and physiology during initiation and progression of diseases.
- Connect this phenomenon while studying pharmacology of drug molecule.
- Understand the mechanism of tissue repair process.
- Understand causes, symptoms and contributing factor in occurrence and progression of given diseases.
- Sort the pathways that required modulating in disease treatment.
- Apply understanding of pathology during designing and testing of drug molecules and dosage forms.

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

CO-1: Develop understanding of molecular basis of modulation in normal anatomy and physiology during initiation and progression of diseases.

CO-2: Extend and utilize pathophysiological phenomenon while studying pharmacology of drug molecule.

CO-3: Explain the mechanism of tissue repair process and relate with treatment of various disease.

CO-4: Discover, classify causes, symptoms and contributing factor in occurrence and progression of given diseases along-with the identification of pathways that require modulation in disease treatment

CO-5: Apply the understanding of pathophysiology during designing and testing of drug molecules and dosage forms.

THEORY TOPICS **DURATION (LECTURES)**

UNIT I **10**

a. Basic principles of Cell injury and Adaptation: Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage),Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance

b. 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 **10**

a. Cardiovascular System: Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)

b. Respiratory system: Asthma, Chronic obstructive airways diseases.

c. Renal system: Acute and chronic renal failure.

UNIT III **10**

a. Haematological Diseases: Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia
b. Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones
c. Nervous system: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: Depression, schizophrenia and Alzheimer's disease.
d. Gastrointestinal system: Peptic Ulcer.

UNIT IV **8**

a. Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease.
b. Disease of bones and joints: Rheumatoid arthritis, osteoporosis and gout.
c. Principles of cancer: Classification, etiology and pathogenesis of cancer.

UNIT V **7**

a. Infectious diseases: Meningitis, Typhoid, Leprosy, Tuberculosis, Urinary tract infections
b. Sexually transmitted diseases: AIDS, Syphilis, Gonorrhea

BOOKS & REFERENCES RECOMMENDED

Text books:

1. Mohan, H. Textbook of Pathology, 7th Revised edition 2014, Jaypee Brothers Medical Publishers.
2. Mandal, A.K., Choudhary, S. Textbook of Pathology for MBBS - General Pathology and Haematology / Systemic Pathology (Volume 1 and 2) 1st Edition 2014 Avichal Publishing Company.
3. Sharma S.C., Pathophysiology of Common Disease 1st edition

Reference books:

1. Kumar, V., Abbas, A.K., Fausto, N., Aster, J.C., Robbins and Cotran Pathologic Basis of Disease, 8th Edition, Elsevier Publication.
2. DiPiro, J., Talbert, R.L., Yee, G., Wells, B., Posey, L.M. Pharmacotherapy A Pathophysiologic Approach, 9th edition 2014, McGraw-Hill Education.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states;

5. William and Wilkins, Baltimore;1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
8. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003

WEBSITE:

1. http://library.med.utah.edu/WebPath/GENERAL.html

Journals:

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

CT 1Y 503: COMPUTER APPLICATIONS IN PHARMACY

L	T	P	Th. Cr.	Tut. Cr.	Pr. Cr.	Total Credits	Maximum Marks				
							TH	CW	SW	Pr.	Total
3	-	2	3	-	1	4	50	25	10	15	100

Scope:
This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

Objectives:
- To provide understanding about various applications of computer in pharmacy.
- To provide understanding about various types of databases.
- To know the various applications of databases in pharmacy

Course Outcomes:
Upon completion of the course, student shall be able to:
CO-1: Understand various applications of computer in pharmacy.
CO-2: Impart knowledge about various types and applications of databases.
CO-3: Develop skills related to different software and web technologies.
CO-4: Outline the basic concepts of bioinformatics and its applications.
CO-5: Define the importance of computers in preclinical data analysis.

THEORY **DURATION (LECTURE)**

UNIT-I **06**

a) 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 – One's complement, Two's complement method, binaryy multiplication, binary division.

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

UNIT-II **06**

a) Web technologies: Introduction to HTML, XML, CSS and Programming languag introduction to web servers and Server Products.

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

UNIT-III **06**

a) 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.

b) Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System.

UNIT-IV **06**

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

UNIT-V **06**

Computers as data analysis in Preclinical development: Chromatographic data analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS).

PRACTICALS:

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.

BOOKS & REFERENCES RECOMMENDED:

Text books:

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Intescience, A John Willey and Sons, INC., Publication, USA.
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributiors , 4596/1- A, 11 Darya Ganj, New Delhi – 110 002 (India).

Reference books:

1. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi – 110002.
2. Peter Weverka, “Microsoft office 2007 plain and simple”, Microsoft Press, NJ.
3. Rajaraman, “Fundamentals of Computers” East Economy Edition, NJ.
4. P.S. Thakur and R. Manchanda, “Computers in Pharmacy”, Birla Publications, New Delhi.
5. Abhay Jain and M. Chandwani, “Introduction to Computers”, Jain Brothers, New Delhi.

PY 1Y 504: ENVIRONMENTAL SCIENCES

L	T	P	Th. Cr.	Tu. Cr.	Pr. Cr.	Total Credit	Maximum Marks				
							TH	CW	SW	Pr.	Total
3	-	-	3	-	-	3	50	25	-	-	75

Scope:

Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Objectives:

After completion of course, student shall be able to:

- Create the awareness about environmental problems among learners.
- Impart basic knowledge about the environment and its allied problems.
- Develop an attitude of concern for the environment.
- Motivate learner to participate in environment protection and environment improvement.
- Acquire skills to help the concerned individuals in identifying and solving environmental problems.
- Strive to attain harmony with Nature.

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

CO-1: Create the awareness about environmental problems among learners.

CO-2: Impart basic knowledge about the environment and its allied problems.

CO-3: Develop an attitude of concern for the environment and strive to attain harmony with Nature.

CO-4: Motivate learner to participate in environment protection and environment improvement.

CO-5: Build skills to help the concerned individuals in identifying and solving environmental problems.

THEORY **DURATION (LECTURES)**

UNIT-I **06**

The Multidisciplinary nature of environmental studies.

Natural Resources, Renewable and non-renewable resources.

UNIT-II **06**

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-III **06**

Concept of an ecosystem.

Introduction, types, characteristic features, Structure and function of forest ecosystem.

UNIT-IV **06**

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

UNIT-V **06**

Environmental Pollution: Air pollution; Water pollution; Soil pollution.

BOOKS & REFERENCES RECOMMENDED

Text books:

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd. , Ahmedabad
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

Reference books:

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Clark R.S., Marine Pollution, Clanderson Press Oxford.
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T., Environmental Encyclopedia, Jaico Publ. House, Mumbai.

Magazine:

1. Down of Earth, Centre for Science and Environment.