

With effect from 02/08/2016

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. PHARMACY COURSE STRUCTURE (2016-17)**

**I YEAR I SEMESTER**

S. No	Course Code	Subject	L	T	P	Credits
1	BS101/ BS102	Remedial Mathematics / Remedial Biology - I	4/ 2	1/ 1	0	4/ 2
2	PS103	Dispensing and General Pharmacy	4	1	0	4
3	PS104	Anatomy, Physiology and Health Education – I	3	1	0	3
4	BS105	Pharmaceutical Organic Chemistry – I	4	1	0	4
5	HS106	Professional Communication in English	3	0	0	3
6	PS107	Dispensing and General Pharmacy Lab	0	0	3	2
7	PS108	Anatomy, Physiology and Health Education – I Lab	0	0	3	2
8	BS109	Pharmaceutical Organic Chemistry – I Lab	0	0	3	2
9	BS110	Remedial Biology - I Lab	0	0	3	2
10	*MC111	NSS	0	0	0	0
		<b>Total Credits</b>	<b>18/16</b>	<b>4/4</b>	<b>12</b>	<b>24/24</b>

**I YEAR II SEMESTER**

S. No	Course Code	Subject	L	T	P	Credits
1	BS201	Pharmaceutical Inorganic Chemistry	3	1	0	3
2	BS202	Pharmaceutical Organic Chemistry – II	4	1	0	4
3	PS203	Physical Pharmacy - I	4	1	0	4
4	BS204	Statistical Methods and Computer Applications	3	1	0	3
5	PS205	Anatomy, Physiology and Health Education – II	4	1	0	4
6	BS206	Pharmaceutical Inorganic Chemistry Lab	0	0	3	2
7	BS207	Statistical Methods and Computer applications Lab	0	0	3	2
8	PS208	Physical Pharmacy – I Lab	0	0	3	2
9	*MC209	Physical Education	0	0	0	0
		<b>Total Credits</b>	<b>18</b>	<b>5</b>	<b>9</b>	<b>24</b>

**Note: For Bi.P.C Students to choose Remedial Mathematics (Theory).**

**For M.P.C Students to choose Remedial Biology (Theory: 2-1-0-2, Lab: 0-0-3-2)**

**\*Mandatory Course**

## REMEDIAL MATHEMATICS

**B.Pharm. I Year I Sem.**

**L T/P/D C**

Course Code: BS101

**4 1/0/0 4**

**Course Objectives:** This is an introductory course in mathematics, the subject deals with introduction to algebra, trigonometry, differential calculus, integral calculus etc.

**Course Outcome:** The student will learn the basics of mathematics which will be helpful in pharmaceutical calculation in the higher classes

### UNIT I

**Algebra:** Permutations and combinations - Binomial theorem –Partial fractions (addition, subtraction and multiplication) –Matrices –Determinants –Application of determinants to solve simultaneous equations (Cramer's Rule).

### UNIT II

**Trigonometry:** measurement of angles, trigonometry functions, compound angles, trigonometry ratios of multiple angles ( $\sin 2\theta$ ,  $\cos 2\theta$ ,  $\tan 2\theta$ ), Heights and distances (All simple problems only).

**Co-ordinate Geometry:** Distances between two points, Area of a triangle, division of line segment, locus.

### UNIT III

**Differential Calculus:** Continuity and limit: Differentiation, derivative of product, derivative of function, derivation of a fraction of functions

Derivatives of trigonometric functions (excluding inverse trigonometric and hyperbolic functions).  
Derivatives of Logarithmic and exponential functional, partial dedifferentiation, maxima and minima (all simple problems)

### UNIT IV

**Integral Calculus:** integration of algebraic and exponential functions, Integration of trigonometric functions, integration by parts, integration by the method of substitution, definite integrals, areas and curves (all simple problems)

### UNIT V

**Differential Equations:** Formation of a differential equation, equation of 1<sup>st</sup> order and 1<sup>st</sup> degree, Homogenous, exact differential equation

### Text Books

- 1) Intermediate first Year mathematics and Intermediate Second year mathematics, printed and published by Telugu Academy, Himayath nagar, Hyderabad
- 2) Remedial Mathematics by Shahnaz Bathul
- 3) Text book of Pharmaceutical Mathematics with Application to Pharmacy-Panchaksharappa Gowda. D. H.

### References

- 1) Pharmaceutical Arithmetic's by Mohd. Ali CBS publishers and distributor, New Delhi.
- 2) Higher Engineering Mathematics by Grewal.

## REMEDIAL BIOLOGY - I

**B.Pharm. I Year I Sem.**  
Course Code: BS102

**L T/P/D C**  
**2 1/0/0 2**

**Course Objectives:** This is an introductory course in biology which gives detailed study on natural sources such as plant and animal origin. This subject deals with the plant cell, animal cell classifications plant kingdom and study of animal issues and study about frogs and some animals.

**Course Outcome:** The student will learn details about plant and animal cells plant taxonomy classification and some aspects of physiology of frogs and animals.

### UNIT I

**Plant cell and tissues:** ultra structure of plant cell and its inclusions. Cell division-mitosis and meiosis. Types of tissues and their functions, tissue systems.

### UNIT II

**Morphology and histology** of root, stem, bark, wood, leaf, flower, fruit and seed. Modifications of root and stem.

### UNIT III

**Taxonomy:** Systemic position and classification of following families: umbelliferae, apocyanaceae and liliaceae.

### UNIT IV

**Animal cells and tissues:** ultra structure of animal cell, cell division, types of cells and tissues and their functions

**Study of anatomy of frog:** Basic study of digestive system, CVS, nervous system, genito-urinary system, musculoskeletal system.

### UNIT V

Structure and life history of parasites illustrated by Amoeba, Entamoeba, Trypanosome, Plasmodium, Taenia, Ascaris,

### Suggested Text Books

- 1) Intermediate First Year and Second Year Botany / Zoology Text Books printed and published by Telugu Academy, Himayath nagar and Hyderabad.
- 2) A.C. Dutta, Text Book of Botany
- 3) Botany for Degree students Vol I and II by B. P. Pandey
- 4) Enger- Concepts biology

## DISPENSING AND GENERAL PHARMACY

B.Pharm. I Year I Sem.  
Course Code: PS103

L T/P/D C  
4 1/0/0 4

**Course Objectives:** The student shall be given orientations to know the origin of pharmacopoeias on dispensing procedure of medicines, pharmaceutical calculation, and interpretations of incompatibilities.

**Course Outcome:** Student will be familiar with the Hospital pharmacy organization, drug distribution procedures, dispensing, storage, incompatibilities and patient related factors.

### UNIT I

**a. Genesis and Evolution of Pharmacy:** History of Pharmacy, origin and development of the Pharmacopoeias, History of Ayurveda, salient features of IP, USP and BP.

Pharmacy Education – D. Pharm, B Pharm, M.Pharm, Pharma-D, Qualification for getting license.

**b. Dispensing Pharmacy:** Principles of dispensing, form of prescription, handling of prescription, source of errors in prescription, care required in dispensing procedures including labelling of dispensed products.

### UNIT II

#### Calculations:

Weights and Measures, introduction to Latin terms, Percentage calculations, alligation method, proof spirit calculations, displacement value and calculations of isotonicity adjustment. General dispensing procedure- posology-calculations of doses.

### UNIT III

**Principles involved and procedures adopted in dispensing of the following classes of preparations.**

- (i) Mixtures                      (ii) Solutions              (iii) Emulsions              (iv) Powders  
(v) Lotions and liniments      (vi) Ointments              (vii) Suspensions              (viii) Syrups  
(ix) Suppositories.

**Definition of the following preparations like creams, capsules, pastes, jellies, suppositories, ophthalmics, lozenges, pills, inhalations, paints, sprays and tablet triturates .**

### UNIT IV

#### Pharmaceutical ethics

Introduction to Pharmaceutical ethics, ethical guidelines for retail pharmacist / community Pharmacist, manufacturing Pharmacist and pharmaceutical researcher

### UNIT V

**a. Fundamental operations:** Weighing, measurement of liquids, procedure of dispensing solution.

**b. Colours:** Reasons for colouring pharmaceutical preparations, colouring of tablets, capsules and non-injectable fluids, Desirable properties of colouring agent, different types of colouring agents.

**c. Excipients:** Types of flavouring agents, preservatives and stabilisers

#### **Text Books**

- 1) Cooper and Gunns Dispensing Pharmacy, CBS, Publ. and Distributors New Delhi.
- 2) R.M Metha, Dispensing Pharmacy.
- 3) JS Quadry, Hospital Pharmacy.

#### **References**

- 1) Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
- 2) William Hassan, Hospital Pharmacy.

## ANATOMY PHYSIOLOGY AND HEALTH EDUCATION - I

B.Pharm. I Year I Sem.

L T/P/D C

Course Code: PS104

3 1/0/0 3

**Course Objectives:** This course is designed to impart a fundamental knowledge on the structure and functions of the human body. The overall anatomy and physiology of organ systems and their coordination are being dealt.

**Course Outcome:** Describes the structure and functions of various organs of the human body and mechanisms in the maintenance of normal functioning and disease state are known.

### UNIT I

**Scope of Anatomy and Physiology and basic terminology used in these subjects.** Structure of cell, its components and their function. Elementary tissues of the human body: epithelial, connective, muscular and nervous tissues, their sub-types and characteristics. Body fluids, Homeostasis

**Skeletal system:** Structure, composition and functions of skeleton, classification of joints, types of movements at joints,

**Skeletal muscles:** Gross anatomy, physiology of muscle contraction, physiological properties of skeletal muscles and their disorders. Rheumatoid arthritis, Gout.

### UNIT II

**Haemopoietic system and Lymphatic System:** Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, Anemias and its types, lymph organs.

### UNIT III

**Cardiovascular system:** Basic anatomy, physiology and conduction system of heart, blood vessels and circulation. Basic pulmonary, coronary, hepatic, system, understanding of cardiac cycle, heart sounds and electrocardiogram. blood pressure and its regulation. Brief outline of cardiovascular disorders like hypertension, myocardial infarction, congestive heart failure and cardiac arrhythmias.

### UNIT IV

**Digestive System:** Gross anatomy of the gastro-intestinal tract, functions of its different parts, various gastrointestinal secretions and their role in the absorption and digestion of food, peptic ulcer, ulcerative colitis, hepatic disorder.

### UNIT V

**Demography and Family Planning:** population problem, family planning and various contraceptive methods. Medical termination of pregnancy.

**Brief outline of communicable diseases,** causative agents, modes of transmission and prevention (chicken pox, influenza, diphtheria, whooping cough, tuberculosis, poliomyelitis, hepatitis, cholera, typhoid, malaria, rabies, tetanus, leprosy, syphilis and Aids).

**Text Books**

- 1) Tortora, G.J and Anagnostokas, Principles of Anatomy and Physiology, N.P Harper and Row Publishers N.Y
- 2) Ross and Willson, Text Book of Human Anatomy, M.J.Mycek S.B Gerther and MMPER
- 3) Human Antomy and Physiology with health education by Padma B Sanghani

**References**

- 1) Guyton, Textbook of Medical Physiology, AC Guyton WB Sannders Company, 1995.
- 2) K. Sembulingam and Prema Sembulingam, Essentials of Medical Physiology, 3rd Edition, Jaypee Bros., New Delhi.

## PHARMACEUTICAL ORGANIC CHEMISTRY - I

B.Pharm. I Year I Sem.  
Course Code: BS105

L T/P/D C  
4 1/0/0 4

**Course Objectives:** The organic compounds are classified based on their functional groups and character. The basic principles and mechanisms of different types of organic reactions are explained in an elaborative manner.

**Course Outcome:** The detailed study on the mechanisms involved in various reactions would help the students to understand the synthesis of higher organic compounds which would be dealt in future classes.

### UNIT I

**a. Structure and Activity of Organic Molecules:** Shapes of organic molecules, bond lengths, bond angles and bond dissociation energies. Electronic effects in organic molecules: inductive effect, electromeric or mesomeric effect, hyperconjugation, concept of resonance; types of organic reagents and reactions.

**b. Aliphatic/Alicyclic Hydrocarbons:** Nomenclature, isomerism (chain, conformational and geometrical) relative stabilities (heats of combustion and hydrogenation), ring stabilities of cyclohexane, chair-boat conformation, Bayer's strain theory and sachse-mohr theory. Free radical substitution reactions (halogenation) of alkanes.

### UNIT II

**a. Alkenes:** Electrophilic addition reactions of alkenes, Markovnikov's rule, Kharasch effect, Bayer's oxidation (cis-hydroxylation, polymerisation).

**b. Alkadienes:** Stability and 1,4 addition reactions of conjugated alkadienes.

**c. Alkynes:** Acidity of 1-alkynes, formation of metal acetylides. Stereo specific reduction of alkynes. Addition of hydrogen halide (HCl) addition of water and keto-enol tautomerism.

### UNIT III

**Aromatic Hydrocarbons:** Kekule's structure of benzene, bond lengths, heats of hydrogenation and stability, molecular orbital picture of benzene, aromaticity, Huckel's rule, nomenclature of benzene derivatives, characteristic reactions of benzene, theory of reactivity and orientation in mono substituted benzenes.

### UNIT IV

**a. Halogen Compounds-Aromatic:** Nomenclature, low reactivity of halo benzenes towards nucleophilic substitution, arenes.

**b. Halogen Compounds-Aliphatic:** Nomenclature, general methods of preparation, characteristic nucleophilic substitution reactions, factors that play role in  $SN^1$  and  $SN^2$ , Walden inversion, elimination reaction and Saytzeff's rule.

### UNIT V

**Alcohols:** Nomenclature, classification, general methods of preparation, physical properties, hydrogen bonding, characteristic nucleophilic substitution reactions (replacement of -OH by -



Cl), elimination reactions, and relative reactivities of 1°, 2° and 3° alcohols, Meerwein Ponderoff Verley reduction.

**Text Books**

- 1) T. R. Morrison and R. N. Boyd, Organic chemistry, prentice hall of India private Limited, New Delhi.
- 2) I.L. Finar Vol. I and Vol. II, the Fundamentals Principles of Organic Chemistry, ELBS/Longman.
- 3) Ball and Ball Advanced pharmaceutical organic chemistry.

**References**

- 1) Jerry March, Reactions and Mechanism 4<sup>th</sup> ed.
- 2) Jerry March, Advanced Organic Chemistry

**PROFESSIONAL COMMUNICATION IN ENGLISH**

**B.Pharm. I Year I Sem.**  
**Course Code: HS106**

**L T/P/D C**  
**3 0/0/0 3**

**WILL BE UPLOADED TOMORROW**

## DISPENSING AND GENERAL PHARMACY LAB

**B.Pharm. I Year I Sem.**

Course Code: PS107

**L T/P/D C**

**0 0/3/0 2**

- 1) Dispensing of prescriptions falling under the categories; Mixtures, solutions, emulsions, creams, ointments, powders, pastes, lotions, liniments, inhalations, paints, syrups, Suppositories etc.
- 2) Dispensing procedures involving pharmaceutical calculations, pricing of prescriptions and dosage calculations for paediatric and geriatric patients.
- 3) Dispensing of prescriptions involving adjustment of tonicity.
- 4) Categorization and storage of pharmaceutical products based on legal requirements of labelling and storage.
- 5) Project report on visit to the community pharmacy for Counseling on the rational use of drugs and aspects of health care.

### **References:**

1. Pharmaceutics –I, Practical manual by N.K.Jain, Vijay Mishra
2. Dispensing pharmacy practical manual by B.S.Sanmethi, K.Mehta and Anshu Gupta

## ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION - I LAB

B.Pharm. I Year I Sem.  
Course Code: PS108

L T/P/D C  
0 0/3/0 2

(21 Experiments)

1. Study of human skeleton
2. Study of different systems with the help of charts and models
3. Microscopic study of different tissues
4. Estimation of Haemoglobin in blood, Determination of bleeding time, clotting time – 3 Experiments.
5. Estimation of R.B.C. count – 2 Experiments.
6. Estimation of W.B.C count – 2 Experiments.
7. Estimation of D.L.C.
8. Recording of body temperature, pulse rate and blood pressure, basic understanding of Electrocardiogram-PQRST waves and their significance
9. Determination of vital capacity, experiments on spirometry
10. Study of reproductive system with the help of charts and models
11. Various devices used in Family planning like Copper T, Lippers loop, Pills, Diaphragm and Condom.
12. Microscopic studies of abnormal tissue sections
13. Simple experiments involved in the analysis of normal and abnormal urine; collection of specimen, appearance, determination of pH, sugars, proteins, urea and creatinine
14. Study of special senses with the help of charts and models

### References

1. Plummer, Practical Biochemistry
2. Chatterjee, Human Physiology
3. C. L. Ghai, Practical Physiology
4. Elaine N. Marieb, Human Anatomy and Physiology.

## PHARMACEUTICAL ORGANIC CHEMISTRY-I LAB

B.Pharm. I Year I Sem.  
Course Code: BS109

L T/P/D C  
0 0/3/0 2

### I. Introduction to Equipment and Glassware

1. Determination of melting point/boiling point by Thiels method.
2. Determination of Mixed melting point for organic compounds.
3. Recrystallization (Purification including decolourization) of two organic compounds.
4. Purification and drying of organic solvents.

### II. Preparation of organic compounds (each involving a specific organic reaction covered in theory)

- |                                    |   |   |
|------------------------------------|---|---|
| 1. N-Acetylation                   | : | Preparation of Acetanilide from Aniline   |
| 2. O-Acetylation                   | : | Preparation of Aspirin from Salicylic acid  |
| 3. Nuclear Bromination             | : | Preparation of p-Bromoacetanilide from Acetanilide                                  |
| 4. Hydrolysis                      | : | Preparation of p-Bromoaniline from p-Bromoacetanilide                               |
| 5. Nuclear Nitration               | : | Preparation of m-Dinitrobenzene from nitrobenzene                                   |
| 6. Oxidation                       | : | Preparation of Benzoic acid from Benzyl chloride                                    |
| 7. Esterification                  | : | Preparation of n-Butylacetate from n-Butylalcohol                                   |
| 8. Etherification                  | : | Preparation of $\beta$ -Naphthyl methyl ether from $\beta$ -Naphthol                |
| 9. $\alpha$ -Halogenation          | : | Preparation of Iodoform from Oxidation of Acetone                                   |
| 10. Extensive Nuclear Substitution | : | Preparation of Tribromophenol or Bromination Tribromoaniline from Phenol or Aniline |

### III. Systematic qualitative Analysis (Identification) of Monofunctional Organic Compounds:

Avoid water-soluble compounds, and compounds containing more than one functional group; at least six individual compounds to be analyzed.

### References

1. Vogel's Text Book of Practical Organic Chemistry, 5<sup>th</sup> Edition.
2. R. K. Bansal, Laboratory Manual of Organic Chemistry.
3. O. P. Agarwal, Advanced Practical Organic Chemistry.
4. F. G. Mann and B.C. Saunders, Practical Organic Chemistry.
5. Organic Chemistry a lab manual, Cengage learning India Pvt. Ltd. By Pavia
6. Advanced Practical Organic Chemistry, Vishoi-Vikas Publications.

## REMEDIAL BIOLOGY LAB

**B.Pharm. I Year I Sem.**

**Course Code: BS110**

**L T/P/D C**

**0 0/3/0 2**

- 1) Introduction to simple and compound microscope and their handling
- 2) Morphological study of various plant parts
- 3) Study of histology of monocot root, stem, leaf and dicot root, stem and leaf
- 4) Systemic study of representatives of following families: apocyanaceae, solanaceae, three sub families of leguminaceae and liliaceae
- 5) Demonstration of various systems of frog
- 6) Study of structure of human parasites and insects mentioned in theory with the help of specimen.
- 7) Microscopic examination of specimens slides related to plant and animal tissues.