JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

B. PHARMACY
COURSE STRUCTURE

I YEAR

Code	Subject	T	C	P	C
R7101	Remedial Mathematics/ Remedial Biology (R7107)	4+1/2+1	8/4	0/3 (R7108)	0/4
R7102	Physical Pharmacy – I	3+1	6	3 (R7109)	4
R7103	Pharm. Inorganic Chemistry	4+1	8	3 (R7110)	4
R7104	Pharmaceutical Organic Chemistry-I	3+1	6	3 (R7111)	4
R7105	Anatomy and Physiology	3+1	6	3 (R7112)	4
R7106	English Language Communication Skills	3+1	6	-	-
	Total	26/24	40/36	12/15	16/20

II YEAER I Semester

Code	Subject	T	C	P	C
R7201	Pharmaceutical Unit Operations –I	4+1	4	-	-
R7202	Pharmaceutical Organic Chemistry – II	4+1	4	3 (R7206)	2
R7203	Statistical Methods & Computer Applications	4+1	4	3 (R7207)	2
R7204	Physical Pharmacy – II	4+1	4	3 (R7208)	2
R7205	Health Education & Pathophysiology	4+1	4	3 (R7209)	2
	Total	25	20	20	8

II YEAR II Semester

Code	Subject	T	C	P	C
R7301	Pharmaceutical Unit Operations- II	4+1	4	3 (R7306)	2
R7302	Pharmaceutical Analysis I	4+1	4	3 (R7307)	2
R7303	Pharmacognosy – I	4+1	4	3 (R7308)	2
R7304	Dispensing and Hospital Pharmacy	4+1	4	3 (R7309)	2
R7305	Environmental Science	4+1	4	-	-
	Total	25	20	20	8

III YEAR I Semester

Code	Subject	T	C	P	C
R7401	Pharmaceutical Biochemistry	4+1	4	3 (R7406)	2
R7402	Pharmaceutical Microbiology	4+1	4	3 (R7407)	2
R7403	Pharmacognosy –II	4+1	4	3 (R7408)	2
R7404	Pharmaceutical Technology –I	4+1	4	3 (R7409)	2
R7405	Pharmacology -I	4+1	4	-	-
	Total	25	20	12	8

III YEAR II Semester

Code	Subject	T	C	P	C
R7501	Medicinal Chemistry – I	3+1	3	3 (R7507)	2
R7502	Pharmaceutical Technology-II	3+1	3	3 (R7508)	2
R7503	Pharmacology II	4+1	4	3 (R7509)	2
R7504	Chemistry of Natural Drugs	4+1	4	3 (R7510)	2
R7505	Pharmaceutical Jurisprudence	4+1	4	-	-
R7506	Advanced Communication Skills Lab	-	-	3	2
	Total	23	18	15	10

IV YEAR I Semester

Code	Subject	T	C	P	C
R7601	Pharmaceutical Analysis – II	3+1	3	3 (R7307)	2
R7602	Biopharmaceuticsand Pharmacokinetics	3+1	3	3 (R7308)	2
R7603	Pharmacology III	4+1	4	3 (R7309)	2
R7604	Medicinal Chemistry II	4+1	4	3 (R7310)	2
R7605	Pharmacy Administration	4+1	4	-	-
R7606	Industrial Training and Seminar	-	-	-	2
	Total	23	18	12	10

IV YEAR II Semester

Code	Subject	T	C	P	C
R7701	Novel Drug Delivery Systems and Regulatory Affairs	3+1	3	3 (R7707)	2
R7702	Pharmaceutical Biotechnology	3+1	3	3 (R7708)	2
R7703	Medicinal Chemistry-III	3+1	3	3 (R7709)	2
R7704	Pharmacognosy III	3+1	3	3 (R7710)	2
R7705	Clinical Pharmacy & Therapeutics	4+1	4	-	-
R7706	Project work* & Comprehensive Viva	-	-	-	4
	Total	21	16	12	12

* Suggested areas for project work.

1. Industrial Pharmacy
2. Clinical Pharmacy/ Pharmacology
3. Pharmacognosy /Medical Chemistry
4. Pharmaceutical Analysis / Quality Assurance
5. Pharmaceutical Marketing

The candidates have to undergo Industrial Training for One month (200 Hours Minimum) during 3rd year summer vacation

T – Theory periods per week
P – Practical Periods per week
C – Credits

End examinations in theory subjects shall be for a duration of 3 Hours with 5 questions to be answered out of 8 questions.
End examinations in practical subjects shall be for 3 Hours

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I Year B. Pharmacy	**T**	**P**	**C**
	4+1*	**0**	**8**

(R7101) REMEDIAL MATHEMATICS

UNIT I

Algebra:

Arithmetic Progression-Geometric Progression- Permutations & combinations-Binomial theorem-partialfractions-Matrices-Determinants-Application of determinants to solve simultaneous equations (Cramer's Rule).

UNIT II

Trigonometry: Trigonometric ratios and the relations between them Sin (A+B), Cos (A+B), Tan (A+B) formulae only. Trigonometric ratios of multiple angles-Heights and distances (simple 000 problems there on).

UNIT III

Co-ordinate Geometry: Distances between points-Area of a triangle, Co-ordinates of a point dividing a given segment in a given ratio-locus-equation to a straight line in different forms-Angle between straight lines-point of intersection.

UNIT IV

Differential Calculus: Continuity and limit: Differentiation, derivability and derivative, R.H. derivatives and L.H. derivatives, Differentiation, General theorems of derivation.

UNIT V

Derivatives of trigonometric functions (excluding inverse trigonometric and hyperbolic functions). Logarithmic differentiation. Partial differentiation maxima and minima (elementary).

UNIT VI

Integral Calculus: Integration as on inverse process of differntiation, definite integrals, integration by substitution, integration by parts, integration of algebraic function of E^x evolution of area in simple cases.

UNIT VII

Differential equations: Formation of a differential equation, order and degree, solution of first order differential equations.

UNIT VIII

Introduction to Laplace transforms and their use.

TEXT BOOKS

1. Intermediate first Year mathematics and
2. Intermediate Second year mathematics., printed and published by Telugu Academy, Himayatnagar,
3. Pharmaceutical Arithmetic's by Mohd. Ali CBS publishers and distributor, New Delhi.
4. Higher Engineering Mathematics by Grewal.

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I Year B. Pharmacy	**T**	**P**	**C**
	2+1*	**0**	**4**

(R7107) REMEDIAL BIOLOGY

UNIT I
Methods of classification of plants.
Plant cell: It's detailed structure, mitosis, meiosis different types of plant tissues and their functions.

UNIT II
Simple and compound microscopes used in biology; section cutting; staining and mounting of sections.
Morphology and histology of root, stem, bark, wood, leaf, flower, fruit and seed. Modifications of root and stem.

UNIT III
General survey of animal kingdom: structure and life history of parasites illustrated by Amoeba, Entamoeba, Trypanosoma, Plasmodium, Taenia, Ascaris, Schistosoma, Oxyuris and Ancylostoma.

UNIT IV
General structure and life history of insects like Cockroach, Mosquito, Housefly, Mite and Silkworm. Relationship of insects with medicinal crops.

SUGGESTED TEXT BOOKS

1. Intermediate First Year and Second Year Botany / Zoology Text Books printed and published by Telugu Academy, Himayatnagar, .
2. A.C. Dutta, Text Book of Botany
3. Botnay for Degree students Vol I & II by B.P. Pandey

I Year B. Pharmacy

T	P	C
3+1*	0	6

(R7102) PHYSICAL PHARMACY – I

UNIT I

Intermolecular forces and states of matter: Binding forces between molecules, the states of matter, the gaseous state, the liquid state, solids and the crystalline state. Phase equilibria and the phase rule.

UNIT II

Thermodynamics: The first law of thermodynamics. Thermochemistry. The second law of thermodynamics. The third law of thermodynamics, Free energy functions and applications.

UNIT III

Physical properties of Drug Molecules: Dielectric constant induced polarization, dipole moment, refractive index and molar refraction, optical rotatory dispersion.

UNIT IV

Solutions of Non electrolytes: Concentration expressions, ideal and real solutions, colligative properties, molecular weight determinations.

UNIT V

Solutions of Electrolytes: Properties of solutions of electrolytes. The Arrhenius theory of electrolyte dissociation. The modern theory of strong electrolytes and other coefficients for expressing colligative properties.

UNIT VI

Ionic equilibria: Modern theories of acids, bases and salts, Sorensen's pH scale, specific concentration as a function of pH, calculation of pH, graphical solution to pH problems, acidity constants.

UNIT VII

Buffers and buffered isotonic systems: The buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions, methods of adjusting tonicity and pH (relevant numerical problems).

UNIT VIII

Electromotive force and oxidation-Reduction systems: Electrochemical cells. Electrometric determination of pH and redox.

TEXT BOOKS

1. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences Fifth Edition.
2. C.V.S.Subramanyam, Essentials of Physical Pharmacy, Vallabh Prakashan.
3. B.S Bahl, Arun Bahl and G.D Tuli, Essentials of Physical Chemistry.
4. Derle D.V., Essentials of Physical Pharmacy

REFERENCES

1. Pharmacopoeia, (I.P., B.P., U.S.P. and European.)
2. Martindale, The Extra Pharmacopoeia; latest edition, the Royal Pharmaceutical Society.
3. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
4. Robin. J. Haiwan, Hand Book of Pharmacy & Health Care ED, The Pharma Press UK.

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I Year B. Pharmacy	**T**	**P**	**C**
	4+1*	**0**	**8**

(R7103) PHARMACEUTICAL INORGANIC CHEMISTRY

UNIT- I

1. Classification of Inorganic Pharmaceuticals based on their applications and therapeutic uses.
2. Sources of impurities, quality control and test for purity
3. Qualitative tests for anion and cations
4. Limit tests for Arsenic, heavy metals, lead, iron, chloride and sulphate and Pharmacopoeial standards.

Notes: Definition, Preparation, Assay principle, Limits tests and Uses for the following classes of compoundsfrom Unit II to Unit VII

UNIT - II

1. **Electrolytes**: Sodium, potassium and calcium replenishers.
2. **Sodium and potassium replenishers**: Sodium chloride, compound sodium chloride solution (Ringer solution), potassium chloride, ORS.
3. **Calcium replenishers**: Calcium chloride, calcium gluconate, dibasic calcium phosphate.
4. **Acid base regulators:** Sodium bicarbonate, sodium lactate, sodium citrate/potassium citrate, sodium acetate, and ammonium chloride
5. **Dialysis fluids:** Haemodialysis fluids, intraperitoneal dialysis fluids and gastro-intestinal agents.

UNIT III

1. **Acidifiers and Antacids: IP monographs:** Dilute hydrochloric acid, sodium acid phosphate, sodium bicarbonate, sodium citrate, potassium citrate, aluminium hydroxide gel, dried aluminium hydroxide gel, magnesium oxide (Magnesia), magnesium hydroxide mixture, magnesium carbonate, magnesium trisilicate, calcium carbonate.
2. **Adsorbents and related drugs**: Light kaolin, heavy kaolin, and activated charcoal.
3. **Laxatives:** Magnesium sulphate, sodium phosphate.

UNIT -IV

1) **Mineral Nutrients/Supplements**
   (a) **Haematinics** – Ferrous sulphate, ferrous fumarate, ferrous gluconate, ferric ammonium citrate, iron and dextrose injection.
   (b) **Halogens:** Iodine, Iodides and fluorides.

2) **Pharmaceutical aids:**
   (a) **Excipients**: Dicalcium phosphate, tricalcium phosphate, magnesium stearate, talc and calcium carbonate (Precipitated chalk).
   (b) **Suspending agents**: Bentonite, colloidal silica, aluminium stearate.
   (c) **Colorants:** Titanium oxide, Ferric oxide

UNIT- V

(a) **Expectorants**: Ammonium chloride, potassium iodide.
(b) **Emetics**: Potassium antimony tartarate, copper sulphate, zinc sulphate.
(c) **Antidotes:** Sodium thiosulphate, sodium nitrite.

UNIT -VI

***Topical agents*:**

1) **Astringents:** Zinc sulphate, zinc oxide, calcium hydroxide, copper sulphate, Bismuth sub carbonate.
2) **Topical protectants:** Zinc oxide, calamine, zinc stearate, talc, titanium-dioxide, heavy kaolin and light kaolin (only uses).
3) **Silicone polymers:** Activated dimethicone.
4) **Anti-Infectives:** Hydrogen peroxide solution, potassium permanganate, silver nitrate (silver protein), iodine, (solutions of iodine, povidone iodine), boric acid, zinc undecylenate, mercury compounds (yellow mercuric chloride)

UNIT- VII

***Dental products*:**

1) **Fluorides**: Sodium fluoride, sodium monofluorophosphate and stannous fluoride.
2) **Oral antiseptics and Astringents**: Hydrogen peroxide, sodium peroxide (bp), magnesium peroxide, zinc peroxide and mouth washes.
3) **Dentifrices**: Calcium carbonate, dibasic calcium phosphate, calcium phosphate, sodium metaphosphate and strontium chloride.

4) **Cements & fillers** : Zinc oxide (only uses).

UNIT-VIII
Miscellaneous Medicinal Agents

a)	Antineoplastics	:	Cisplatin
b)	Antidepressants	:	Lithium carbonate
c)	Diagnostic agents	:	Barium sulphate
d)	Surgical Aids	:	Plaster of Paris
e)	Antirheumatic agents	:	Sodium aurothiomalate
f)	Internal parasiticid	:	Sodium antimony gluconate
g)	Anti thyroid agents	:	Potassium perchlorate

TEXT BOOKS

1. J.H Block, E.Roche, T.O Soine and C.O. Wilson, Inorganic Medical and Pharmaceutical Chemistry Lea & Febiger Philadelphia PA.
2. A.H.Beckett and J.B.Stenlake, Practical pharmaceutical chemistry, Part-I. The Athtone press, University of London, London.
3. P. Gundu Rao, Inorganic pharmaceutical chemistry; Vallabh Prakashan, Delhi.
4. Advanced Inorganic Chemistry by Satya prakash, G.D.Tuli

REFERENCES

1. L.M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry Oxford University Press, London.
2. Indian Pharmacopoeia 1996.

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I Year B. Pharmacy	**T**	**P**	**C**
	3+1*	**0**	**6**

(R7104) PHARMACEUTICAL ORGANIC CHEMISTRY-I

UNIT – I

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.

UNIT – II

A Study of Hydrocarbons:

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, selectivity of halogen.

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

Alkadienes: Stability & 1,4 addition reactions of conjugated alkadienes.

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 monosubstituted benzenes, Birch reduction

Polynuclear aromatic hydrocarbons: Nomenclature, structure and aromatic character of naphthalene, anthracene, phenanthrene and naphthacene resonance structures, electron density and reactivity. Electrophilic substitution, oxidation and reduction reactions.

UNIT – IV

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.

Halogen Compounds-Aromatic: Nomenclature, low reactivity of halo benzenes towards nucleophilic substitution, benzyne concept.

UNIT – V

Alcohols: Nomenclature, classification, general methods of preparation, physical properties, hydrogen bonding, characteristic nucleophilic substitution reactions (replacement of -OH by -Cl), elimination reactions, Reimer Tiemann reaction and relative reactivities of 1^o, 2^o and 3^o alcohols, Meerwein Pondorff Verley reduction

Ethers: Nomenclature, Williamson's synthesis, action of hydro iodic acid on ethers (Ziesel's method).

Phenols: Nomenclature, general methods of preparation, physical properties, acidity of phenols, stability of phenoxide ion, reactions of phenols, Kolbe-schmidt reaction stability of conjugated dienes, and Fries rearrangement.

UNIT – VI

Carbonyl Compounds: Nomenclature, two important methods of preparation, polarity of carbonyl group, relative reactivities of carbonyl compounds, nucleophilic addition and addition-elimination reactions, oxidation-reduction reactions, aldol condensation, Cannizzaro reaction, benzoin condensation, Perkins reactions, Reformatsky reaction, Oppenauer oxidation.

UNIT – VII

Carboxylic acids and their derivatives:

Carboxylic acids: Nomenclature, intermolecular association, stability of carboxylate anion, two important methods of preparation, decarboxylation, functional groups reactions, reduction of carboxylic acids. a note on dicarboxylic acids.

Acid derivatives: (acid chlorides, anhydrides, esters and amides). Nomenclature, reactions like hydrolysis, reduction of esters and amides, Hofmann's degradation of amides. Brief account of malonic and acetoacetic esters, their importance in synthesis.

UNIT – VIII

Nitrogen Compounds:

Nitro compounds: Nomenclature, acidity of nitro compounds containing α- hydrogens, reductive reactions of aromatic nitro compounds.

Amines: Nomenclature, basicity of amines, classification, relative reactivity, hinsberg method of separation, acylation reactions. Diazotisation and reactions of diazonium salts.

Nitriles and isonitriles: Nomenclature, two methods of synthesis, reactivity and functional reactions.

TEXT BOOKS

1. T.R.Morrison and R.N.Boyd, Organic chemistry, pentice hall of India private limited, New Delhi.
2. Ball & Ball, Advanced pharmaceutical organic chemistry.
3. Bruce, Organic chemistry.
4. Jerry March, Advanced Organic Chemistry.

REFERENCES

1. Jerry March, Reactions and Mechanism 4th ed.
2. I.L. Finar Vol.I. & Vol. II., The Fundamentals Principles of Organic Chemistry, ELBS/Longman.

I Year B. Pharmacy

T	P	C
3+1*	0	6

(R7105) ANATOMY AND PHYSIOLOGY

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.

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

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

UNIT-II

Haemopoietic system: Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, disorders of platelets and coagulation.

Lymph and Lymphatic System: Composition, formation and ciruculation of lymph; disorders of lymph and lymphatic system. Basic physiology and functions of spleen.

UNIT-III

Cardiovascular system: Basic anatomy of the heart. Physiology of heart, blood vessels and circulation. Basic understanding of cardiac cycle, heart sounds and electrocardiogram. blood pressure and its regulation. Brief outline of cardiovascular disorders like hypertension, hypotension, atherosclerosis, angina, myocardial infarction, congestive heart failure and cardiac arrhythmias.

UNIT-IV

Digestive System: Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food.

UNIT-V

Respiratory System: Anatomy of respiratory organs. Functions of respiration, mechanism and regulation of respiration, respiratory volumes and vital capacity.

UNIT-VI

Central Nervous System: Functions of different parts of brain and spinal cord. Neurochemical transmission in the central nervous system, reflex action, electroencephalogram, specialized functions of the brain, cranial nerves and their functions.

Autonomic Nervous System: Physiology and functions of autonomic nervous system. Mechanism of neurohumoral transmission in the A.N.S.

UNIT-VII

Urinary System: Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid base balance, diseases of the urinary system.

UNIT - VIII

Endocrine System: Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals, pancreas, testes and ovary, their hormones and functions.

TEXT BOOKS

1. Tortora, G.J and Anagnodokas, Principles of Anatomy and Physiology, N.P Harper & Row Publishers N.Y
2. Ross & Willson, Text Book of Human Anatomy, M.J.Mycek S.B Gerther and MMPER
3. C.C.Chatterjee, Human Physiology.
4. Donald.C Rizzo, Fundamental of Anatomy and Physiology.
5. T.S. Ranganathan, A Text book of Human Anatomy.
6. Subrhamanyam and Others, A textbook of Physiology
7. Dr.H.D.Singh, Basic Human Physiology.

REFERENCES

1. Elaine N. Marieb, Essential of Human Anatomy & Physiology
2. Guyton, Textbook of Medical Physiology, AC Guyton WB Sannders Company, 1995.
3. K. Sembulingam and Prema Sembulingam, Essentials of Medical Physiology, 3rd Edition, Jaypee Bros., New Delhi.
4. M.N.Gosh, Human Physiology
5. Julia F. Gui, Learning Human Anatomy: A Laboratory Text

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I Year B. Pharmacy	**T**	**P**	**C**
		3+1*	**0**	**6**

(R7106) ENGLISH LANGUAGE COMMUNICATION SKILLS

UNIT – I

Humour from **LEARNING ENGLISH:** ***A Communicative Approach, Orient*** Longman, 2005

1. The Sounds of English – Vowels and Diphthongs, oral presentations (prepared), Just A Minute (JAM) Sessions.

UNIT - II

2. Healths **and Medicine** from **LEARNING ENGLISH:** ***A Communicative Approach,*** Orient Longman, 2005

3. The Sounds of English – Consonants, oral presentations (prepared), Just A Minute sessions).

UNIT - III

4. Environment from **LEARNING ENGLISH:** ***A Communicative Approach,*** Orient Longman, 2005.

5. Stress in English – Oral presentations (extempore), Just A Minute sessions

UNIT - IV

6. Inspiration from **LEARNING ENGLISH:** ***A Communicative Approach,*** Orient Longman, 2005.

7. Intonation - Oral presentations (extempore), Just A Minute sessions

UNIT -V

8. Human Interest from **LEARNING ENGLISH:** ***A Communicative Approach,*** Orient Longman, 2005.

9. Role Play and Situational Dialogues – Informal, Semi- formal and Formal.

UNIT – VI

10. Media from **LEARNING ENGLISH:** ***A Communicative Approach****,* Orient Longman, 2005.

11. Role Play and Situational Dialogues – Informal, Semi-formal and Formal.

**** Exercises from the lessons not prescribed for detailed study shall also be used for classroom tasks.***

UNIT – VII

Exercises on

Reading and Writing Skills
Reading Comprehension
Situational dialogues
Interview Skills
Group Discussion
Letter writing
e - mail writing and e – mail etiquette
Report writing – Preparing a rough draft, editing and preparing the final report.

UNIT – VIII

Remedial Grammar to be dealt with through practice exercises and activities covering

Common errors in English, Subject-Verb agreement, Use of Articles and Prepositions,
Tense and aspect

Vocabulary development covering

Synonyms & Antonyms, one-word substitutes, prefixes & suffixes, Idioms &
phrases, words often confused.

TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into **Eight Units**, are prescribed:

For Detailed study

- **LEARNING ENGLISH:** ***A Communicative Approach***, : Orient Longman, 2006. (Six Selected Lessons and exercises from all the nine units)

For Practice in Listening and Speaking skills

- **A Practical Course in English Pronunciation**, (with two audio cassettes) by J. Sethi, Kamlesh Sadanand and D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.

REFERENCES

1. **Strengthen Your English,** Bhaskaran & Horsburgh, Oxford University Press
2. **Basic Communication Skills for Technology**, Andrea J Rutherfoord, Pearson Education Asia.
3. **Murphy's English Grammar with CD,** Murphy, Cambridge University Press.
4, **English Skills for Technical Students,** WBSCTE with British Council, Orient Longman
5. **Everyday Dialogues in English** by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
6. **English For Technical Communication**, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications.
7. **A Handbook of English for Engineers & Technologists** by Dr. P. Eliah, B. S. Publications.
8. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.
9. **English Pronouncing Dictionary** by Daniel Jones, Current Edition with CD.
10. **Spoken English**- R. K. Bansal and J. B. Harrison, Orient Longman 2006 Edn.
11. **A textbook of English Phonetics** for Indian Students by T.Balasubramanian (Macmillan)

I Year B. Pharmacy	T	P	C
	0	3	4

(R7108) REMEDIAL BIOLOGY LAB

1 Care and uses of microscope
2 Gross identification of slides of structure and life cycle of plants/animals mentioned in theory.
3 Morphology of plant parts indicated in theory.
4 Preparation, Microscopic Examination of stem, root and leaf of mono and dicot leaves.
5 Structure of human parasites and insects mentioned in the theory with the help of specimens.

I Year B. Pharmacy	T	P	C
	0	3	4

(R7109) PHYSICAL PHARMACY – I LAB

1. Percent composition – Capillary Flow method
2. Percent composition – polarimeter & refractometer
3. Molecular weight – Landsberger method.
4. Molecular weight – Rast camphor method.
5. Calibration of pH Meter
6. pH Estimation – pH meter
7. pH Estimation – colourimetric method.
8. pH Estimation by Half Neturalization Method
9. Refractive index of liquids.
10. Phenol water system – CST
11. Lower consolute temperature – Tea and Water
12. Heat of neutralization
13. Phase diagram - Phenol – Water, Effect of Impurities.
14. Ternary phase diagram.
15. Preparation of Buffers and Buffer Capacity Determination.

I Year B. Pharmacy	T	P	C
	0	3	4

(R7110) PHARMACEUTICAL INORGANIC CHEMISTRY LAB

List of experiments:

A) Limit tests for the following as per the procedure given in Indian Pharmacopoeia (1996 – including the latest addenda)

1) Chlorides
2) Sulphates
3) Heavy metals
4) Iron
5) Arsenic (demonstration)

B)

6) Balances and Weighing; Calibration of weights, Pipette and Burette.
7) Preparation and standardization of Hydrochloric acid solution (0.1N).
8) Preparation and standardization of Potassium permanganate solution (0.1N & 0.1M).
9) Preparation of a primary standard solution of 0.1N Potassium hydrogen-phthalate.
10) Preparation and standardization of 0.1N EDTA solution.
11) Preparation and purification of Boric acid.
12) Preparation and purification of Sodium citrate.
13) Preparation and purification of Potash alum.
14) Preparation and purification of Magnesium stearate.
15) Assay of sodium bicarbonate and assay of Boric acid (Neutralization).
16) Assay of Calcium gluconate (or) any calcium compounds (Complexometry).
17) Assay of Copper sulphate (Redox titration).
18) Assay of Sodium acetate (Non-aqueous titration).
19) Assay of Ferrous sulphate (Oxidation-reduction / Redox titration).
20) Exercises related to assay by Gravimetric method.

REFERENCES

1. Indian Pharmacopoeia - 1996.
2. Vogel's Qualitative Analysis

I Year B. Pharmacy	T	P	C
	0	3	4

(R7111) PHARMACEUTICAL ORGANIC CHEMISTRY-I LAB

Introduction to Equipment & Glassware, Recrystallization method, details of M.P, B.P and distillation

I. **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 β-Naphthyl methyl ether from β-Naphthol
9. α-Halogenation : Preparation of Iodoform from Oxidation of Acetone
10. Extensive Nuclear Substitution: Preparation of Tribromophenol or BrominationTribromoaniline from Phenol or Aniline

II. **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, 5th Edition.
2. R.K. Bansal, Laboratory Manual of Organic Chemistry.
3. O.P. Agarwal, Advanced Practical Organic Chemistry.
4. F.G.Mann & B.C. Saunders, Practical Organic Chemistry.

I Year B. Pharmacy	T	P	C
	0	3	4

(R7112) ANATOMY AND PHYSIOLOGY LAB
(21 Experiments)

1. Study of human skeleton – 2 Experiments
2. Study of different systems with the help of charts and models – 2 Experiments.
3. Microscopic study of different tissues – 3 Experiments.
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. – 2 Experiments.
8. Recording of body temperature, pulse rate and blood pressure, basic understanding of electrocardiogram-PQRST waves and their significance – 3 Experiments.
9. Determination of vital capacity, experiments on spirometry – 2 Experiments.

REFERENCES

1. Plummer, Practical Biochemistry
2. Elaine N. Marieb, Human Anatomy & Physiology.
3. A.K. Chartterjee, Human Physiology

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II Year B. Pharmacy I Semester

T	P	C
4+1*	0	4

(R7201) PHARMACEUTICAL UNIT OPERATIONS- I

UNIT-I

Stoichiometry: Unit processes material and energy balance, molecular units, mole fractions, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups, different types of graphic representation, mathematical problems

UNIT –II

Fluid Flow: Types of flow, Reynold's number, viscosity, concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure.

UNIT-III

Material handling systems:

a. Liquid handling - different types of pumps.
b. Gas handling - various types of fans, blowers and compressors.
c. Solid handling - conveyors

UNIT-IV

Filtration and Centrifugation: Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, etc. Factors affecting filtration, mathematical problems on filtration, optimum-cleaning cycle in batch filters.

Principles of centrifugation, industrial centrifugal filters, centrifugal filters, and centrifugal sedimeters.

UNIT-V

Crystalization: Characteristics of crystals like; purity, size, shape, geometry, habit, forms, size and factors affecting it. Solubility curves and calculation of yields. Material and heat balances around Swenson Walker Crystallizer. Supersaturation theory and its limitations. Nucleation mechanisms, crystal growth. Study of various types of crystallizers, tanks, agitated batch, single vacuum, circulating magma and crystal crystallizers. Caking of crystals and its prevention. Numerical problems on yields.

UNIT-VI

Dehumidification and Humidity control

Basic concepts and definition, wet bulb and adiabatic saturation temperature. Psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipments for dehumidification operations.

Refrigeration and Air Conditioning:

Principles and applications of refrigeration and air conditioning.

UNIT-VII

Materials of Construction: General study of composition, corrosion, resistance, properties and applications of the materials of construction with special reference to stainless steel and glass.

UNIT-VIII

Industrial hazards and safety precautions: Mechanical, Chemical, Electrical, fire and dust hazards. Industrial dermatities, accident records etc.

TEXT BOOKS

1. S.J. Carter, Cooper and Gunn's Tutorial Pharmacy 6th ed CBS publisher, Delhi.
2. C.V.S. Subramanayam, Pharmaceutial Unit Operation, Vallabh Prakashan
3. Prof. K. Samba Murthy, Pharmaceutical Engineering.
4. Badzer & Banchero, Introduction to Chemical Engineering.

REFERENCES

1. Perry's Handbook of Chemical Engineering.
2. Unit Operations by Mc Cabe & Smith.
3. Mc Cabe & Smith, Elements of Chemical Engineering.
4. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences.
5. EA Rawlins, Bently's Text Book of Pharmaceutics, 8th edition, ELBS

II Year B. Pharmacy I-Semester

T	P	C
4+1*	0	4

(R7202) PHARMACEUTICAL ORGANIC CHEMISTRY - II

Note: Definition, nomenclature, structure, aromaticity, reactivity, acidity-basicity and characteristic reactions of the following heterocyclic compounds.of Unit I and II

UNIT – I

Five membered and six membered ring systems with one hetero atom: Furan, pyrrole, thiophene and pyridine.

Fused ring systems with one hetero atom indole: Quinoline, iso-quinoline, and acridine.

UNIT – II

Five membered and six membered ring systems with two heteroatoms: Pyrazole, imidazole, oxazole, isoxazole, thiazole, pyrazine, pyrimidine and pyridazine.

Fused ring systems with two heteroatoms: Benzimidazole and phenothiazine.

UNIT - III

Stereochemistry of Carbon compounds: Optical rotation, plane polarized light, optical activity, chirality, notations (assignment of configuration), relative configuration (Fischer DL configuration), absolute configuration, sequence rules (with examples), enantiomers, meso compounds, racemic mixture, resolution, and asymmetric synthesis.

Stereochemistry of alkenes*:* Concept of E & Z configurations.Elements of symmetry.

UNIT - IV

Carbohydrates: Definition, classification, nomenclature, relative configuration of some important monosaccharides, study of glucose structure, mutarotation, ring structure, oxidation-reduction reactions, osazone formation, action of barium hydroxide, epimerization, Lobry De Bruyn – Van Ekenstein reaction, structure of the disaccharide sucrose, glycosidic linkage, non-reducing nature; structural components of starch and cellulose. A brief account on pharmaceutical importance of various carbohydrates.

UNIT - V

a) **Amino acids**: Definition, classification, essential amino acids, configuration, three important methods of preparation of amino acids, physical properties. Zwitter ionic nature, isoelectric point, peptide synthesis and important reactions of amino acids.

b) **Polypeptides and proteins:** Definition, classification of proteins, denaturation, isoelectric point, C-terminal and N-terminal concept. Brief account of primary, secondary and tertiary structure. A brief account of the pharmaceutical importance of amino acids, polypeptides and proteins.

UNIT – VI

a. **Glycosides**: Definition and α, β – glycosidic linkages, enzymatic hydrolysis, physiological importance.
b. **Lipids (oils and fats):** Definition, fatty acids, characterization of lipids (Saponification value, acid value and Iodine value), hydrogenation and rancidity of oils and fats.

UNIT - VII

a) **Purine derivatives (xanthine bases**): Chemical structures of uric acid and methylated xanthines (caffeine, theophylline and theobromine) of physiological/ pharmaceutical significance.
b) Definitions of nucleic Acids, nucleotides, nucleosides, A brief account on structure of DNA & RNA.

UNIT – VIII

A study of the mechanism and application in synthesis of the following named reactions:

A. Beckmann rearrangement
B. Phillips condensation reaction
C. Mannich reaction
D. Michael addition reaction
E. Wittig reaction
F. Hoffmann rearrangement
G. Curtius rearrangement
H. Schmidt reaction

TEXT BOOKS

1. R Morrison and R. Boyd, organic chemistry, Pub by Printice Hall of India, New Delhi.
2. I L Finar, Organic Chemistry, Vol. I. & II, 6th Pearson education
3. O.P Agarwal, A Textbook of Organic Chemistry
4. Eliel, Stereochemistry of Organic compounds.
5. Arun Bahl & S.S Bahl, Advanced Organic Chemistry

REFERENCES

1. Jerry March, Advanced Organic Chemistry 4th Ed.
2 Cram & Hammond.Organic Chemistry.
3. A.I. Vogal, A textbook of practical organic chemistry
4. Solomons, Organic Chemistry

II Year B. Pharmacy I-Semester | **T** | **P** | **C**
| **4+1*** | **0** | **4**

(R7203) STATISTICAL METHODS AND COMPUTER APPLICATIONS

Section - A: Bio-statistics

UNIT-I

Data collection and treatment: Significant digits and rounding of numbers, data collection, random and non-random sampling methods, sample size, data organization, diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams, standard deviation and standard error of means, co-efficient of variation, confidence (fiducial) limits, probability and events.

Probability and Distributions: Bayer's theorem, probability theorem, probability distribution, elements of binomial and poison distribution, normal distribution curve and properties, kurtosis and skewness**.**

UNIT - II

Regression: Correlation and regression analysis, method of least squares and non-linear regression.

UNIT.III

Statistical inference: Common parametric and non-parametric tests employed in testing of significance in biological/pharmaceutical experiments and elements of ANOVA (One way and two way).

UNIT.IV

Design of experiments: Basic concepts of CRD, RBD and Latin square designs.

Sampling and Quality Control: Concept of random sampling, statistical QC charts. Applications of statistical concepts in pharmaceutical sciences.

Section - B: Computer Applications

UNIT.V

Concept: History of computers, simple model of computer and its working parts of the computer, CPU, memory, input/output devices, computer languages and their hierarchal machine language, assembly language, high level language comparision of high level and low level languages especially C, C++, PASCAL etc.,

Introduction to microcomputers and concepts of operating systems: Elements of DOS, UNIX, etc., introduction of computer networks.

UNIT.VI

Database management: Spread sheets (like MS-EXCEL, ACCESS), concepts and objectives of database and database management system, advantages and disadvantages of the database management system and examples of DBMS packages (like DBASE III).

Flow chart and algorithm development: Definition and properties of the algorithm, Flow chart symbols and their uses, Examples of efficient algorithm and flow-chart, conversion of algorithm/flow-chart to high-level languages.

UNIT.VII

Introduction to computer programming: C language: Constant and string variables, expressions, functions, structures, repetition statements (loops), nested loop, definite and indefinite loop and arrays. Concepts of files. Sequential files and random access files, Simple program writing for bio-statistical methods.

UNIT.VIII

Computer applications in pharmaceutical and clinical studies. Computer validation – Introduction.

TEXT BOOKS

1. Pranab Kumar Benarjee, Introduction to Biostatistics
2. Khan and Khanum, Fundamentals of Biostatistics
3. Yashvanth Kanetkar, Let Us C++, BPB Publications New Delhi.
4. Ron Mansfiled, Working In Microsoft Office.
5. Ivan Bayross, SQL, PL/SQL The Programming Language of oracle.

REFERENCE

1. Dona E. Knath, The Art Of Computer Programming by Pearson Education (Singapore) Pvt. Ltd Delhi, 110 092.
2. Remez Elmasi, Shankar. B. Navathe, Fundamentals Of Database System, Pearson Education (Singapore) Pvt. Ltd Delhi, 110 092.
3. Collins, Dictionary Of Computers and IT by Ian Sinclair, Harper Collins Publishers Glasgow, UK.
4. Y. Raja Raman, Computer Programming in C.

II Year B. Pharmacy I-Semester

T	P	C
4+1*	0	4

(R7204) PHYSICAL PHARMACY - II

UNIT-I
Solubility and Distribution Phenomena: Solvent-solute interaction, solubility of gases in liquids, liquids in liquids, solids in liquids, distribution of solutes in immiscible solvents.
Introduction to phenomena of diffusion: Ficks first law and second law.

UNIT-II
Complexation: Metal complexes, organic molecular complexes in inclusion complex, and methods of analysis, complexation and drug action.

UNIT-III
Kinetics: Rates and orders of the reaction. Influence of temperature and other factors on reaction rates. Decomposition and stabilization of medicinal agents, kinetics in the solid state and accelerated stability analysis (relevant numerical problems).

UNIT-IV
Interfacial Phenomena: Liquid interfaces, measurement of surface and interfacial tensions, adsorption at liquid interfaces. Surface-active agents and systems of hydrophilic lipophillic classification. Adsorption at solid interfaces. Electrical properties of interfaces.

UNIT-V
Micromeritics: Particle size and size distribution, methods for determining surface area, methods for determining practicle size, pore size, particle shape and surface area, derived properties of powders.

UNIT-VI
Rheology: Newtonian system, non-Newtonian system, thixotropy, measurement and applications in formulations. Determination of viscosity and its applications.

UNIT - VII
Colloids: Introduction, types of colloidal systems, solubilization, Stability of colloids, optical properties, kinetic properties, electrical properties and Donnan Membran equilibraium.

UNIT-VIII
Coarse Dispersions: Suspensions, emulsions: suspensions, interfacial properties of suspended particles. Settling in suspensions. Formulation of suspensions: emulsions- theories of emulsification, physical stability of emulsions, preservation of emulsions, rheological properties of emulsions and suspensions.

TEXT BOOKS

1. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences 5th Edition.
2. CVS Subhramanyam, Physical Pharmacy, Vallabh prakashan.
3. L. Lachman, H. Lieberman The Theory And Practice Of Industrial Pharmacy J. L Kaniz Lee & Febiger Philadelphia, USA

REFERENCE

1. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
2. M.E. Aulton, Pharmaceutics – The science of dosage form design, 2nd edition
3. Derle D.V., Essentials of Physical Pharmacy.

II Year B. Pharmacy I-Semester	T	P	C
	4+1*	0	4

(R7205) HEALTH EDUCATION AND PATHOPHYSIOLOGY

UNIT-I

Concepts of health & disease, disease causing agents and prevention of disease. Classification of food requirements, balanced diet, nutritional deficiency disorders, their treatment and prevention, specifications for drinking water.

UNIT-II

Demography and family planning:

Demography cycle, family planning and various contraceptive methods. Medical termination of pregnancy.

UNIT-III

Brief outline of communicable diseases, their causative agents, modes of transmission and prevention (chicken pox, measles, influenza, diptheria whooping cough, tuberculosis, poliomyelitis, hepatitis, cholera, typhoid, food poisoning, helmenthiasis, malaria, filariasis, rabies, trachoma, tetanus, leprosy, syphilis, gonnorrhoea, and Aids).

UNIT-IV

First Aid: Emergency treatment of shock, snakebites, burns, poisoning, fractures and resuscitation methods.

UNIT-V

Reproductive Systems: Male and Female reproductive systems and their hormones, physiology of menstruation, coitus and fertilization. Sex differentiation, spermatogenesis & ogeneisis. Pregnancy its maintenance and parturition.

UNIT-VI

Basic Principles of Cell Injury and Adaptation: Causes of cellular injury, pathogenesis, morphology of cell injury. Intracellular alterations in lipids, proteins and carbohydrates. Cellular adaptations, atrophy, hypertrophy.

UNIT-VII

Basic Mechanism involved in the process of inflammation and repair: Alterations in vascular permeability and blood flow. Migration of WBCs, acute and chronic inflammation, mediators of inflammation, brief outline of the process of repair.

UNIT-VIII

Pathophysiology of common diseases: Like rheumatiod arthritis, gout, epilepsy, psychosis, depression, mania, hypertension, angina, congestive heart failure, atherosclerosis, myocardial intraction, diabetes, peptic ulcer, asthma, ulcerative colitis, hepatic disorders, acute and chronic renal failure, tuberculosis, urinary tract infections, Sexually transmitted diseases, anemias and common types of neoplasms.

TEXT BOOKS

1. Robbins, SL & Kumar, Basic Pathology.
2. Ross & Willson, Text Book of Human Anatomy.
3. Ross & Willson, Principles of anatomy and physiology
4. C.C.Chatterjee, Human Physiology, Pub by Medical allied agency, Delhi, India
5. Mary V. Buras, Pathophysiology: A self Instructional programme.
6. Mary Lou Mulvihill, Human Diseases: A Systemic approach.

REFERENCE BOOKS

1. A.C Guyton, Textbook of medicinal physiology by by W.B.Prism books Pvt. Ltd., Delhi.
2. Joseph Dipiro, Patho Physiology and applied therapeutics.
3. M.P. Rang, M.N.Dale, J.M Riter Anotamy & Physiology

II Year B. Pharmacy I-Semester	T	P	C
	0	3	2

(R7206) PHARMACEUTICAL ORGANIC CHEMISTRY-II LAB

I. Synthesis of some simple heterocyclic compounds.

a. 3, 5-Dimethylpyrazole from Acetylacetone.
b. 3, 5-Dimethylisooxazole from Acetylacetone.
c. 4, 5-Diphenylimidazole from Benzil.
d. Benzoxazole from o-Aminophenol.
e. 2, 5-Dioxopiperazine from Glycine.
f. Oxazolone from Benzoylglycine.

II. Molecular rearrangements and named reactions

a. Benzimidazole from o-phenylenediamine (Phillip's Reaction).
b. O-hydroxyacetophenone from phenyl acetate (Fries migration)
c. Benzanilide from benzophenone oxime (Beckmann's rearrangement) (**To be avoided from End Examination**)
d. Preparation of 2-phenylindole from Phenylhydrazine by Fischer's method.

III. Systematic analysis of organic binary mixtures

IV Analysis of oils & fats

a. Determination of Acid value of fixed oils.
b. Determination of Saponification value of a fixed oil.
c. Determination of Iodine value of a fixed oil.
d. Determination of Acetyl value of a fixed oil.

REFERENCES

1. Indian Pharmacopoeia. – 1996.
2. A.I. Vogel's – Practical Organic Chemistry

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

II Year B. Pharmacy I-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7207) STATISTICAL METHODS AND COMPUTER APPLICATIONS LAB

1. **Solving biostatistics problems** related to inference, sampling, graphical representation of data etc., with the help of calculators & software programs like Graph-pad.
2. **Sample programs in C**: Program to calculate simple and complex arithmetic expressions, program using structures, program using loops and nested loops, program using functions and simple programs using arrays.
3. **Operating systems** like WINDOWS, UNIX, etc.
4. **Software packages** like MS-WORD, EXCEL, ACCESS, and POWER POINT.

II Year B. Pharmacy I-Semester

T	P	C
0	3	2

(R7208) PHYSICAL PHARMACY-II LAB

1. Determination of bulk density, true density and percentage porosity.
2. Effect of particle size and effect of glidant on angle of repose.
3. Microscopic size analysis.
4. Determination of particle size by Andreason Pippette.
5. Determination of CMC of a surfactant.
6. Adsorption Isotherm.
7. Partition coefficient determination.
8. Determination of sedimentation volume and degree of flocculation.
9. Determination of Order of reaction – First order.
10. Determination of Second order reaction rate constant.
11. Effect of temperature on solubility of solid in liquid.
12. Effect of addition of Salt/pH/cosolvent on the solubility
13. Surface tension using Stalagmometer.
14. HLB value estimation of surfactants.
15. Viscosity – by Ostwald Viscometer.
16. Preparation of Multiple emulsion - Demonstration.
17. Preparation of Micro emulsion - Demonstration.
18. Determination of Zeta potential - Demonstration.

II Year B. Pharmacy I-Semester	T	P	C
	0	3	2

(R7209) HEALTH EDUCATION & PATHOPHYSIOLOGY – LAB
(14 Experiments)

1. Study of reproductive system with the help of charts and models – 2 Experiments.
2. Various devices used in Famliy planning like Copper T, Lippers loop, Pills, Diaphram and Condom.
3. Microscopic studies of abnormal tissue sections – 4 Experiments.
4. Simple experiments involved in the analysis of normal and abnormal urine; collection of specimen, appearance, determination of pH, sugars, proteins, urea and creatinine – 4 Experiments.
5. Physiological experiments on nerve-muscle preparations – 4 Experiments.

REFERENCES

1. Plummer, Practical Biochemistry
2. Chatterjee, Human Physiology

II Year B. Pharmacy II-Semester

T	P	C
4+1*	0	4

(R7301) PHARMACEUTICAL UNIT OPERATIONS – II

UNIT-I

Heat Transfer: Source of heat, heat transfer, steam and electricity as heating media, determination of requirement of amount of steam/electrical energy, steam pressure, boiler capacity, mathematical problems on heat transfer.

UNIT-II

Evaporation: Basic concept of phase equilibria, factors affecting the evaporation, evaporators, film evaporators, single effect and multiple effect evaporators.

UNIT-III

Distillation: Raoult's law, phase diagrams, volatility, simple steam and flash distillations, principles of rectification, Azeotropic and extractive distillation.

UNIT-IV

Drying: Moisture content and mechanism of drying, rate of drying and time of drying calculations, classification and types of dryers, dryers used in pharmaceutical industries tray dryer, Fluid bed dryer, spray dryer, vaccum oven and freeze-dryer.

UNIT-V

Size Reduction: Definition, objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of a mill, types of mills including ball mill, hammer mill, fluid energy mill etc.

UNIT-VI

Mixing: Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipment, double cone, twin-shell, silverson mixer, colloid mill, sigma blade mixer, planatery mixer, propeller mixer and turbine mixer.

UNIT-VIII

Automated process control systems: Process variables, temperature, pressure, flow level and vacuum and their measurements. Elements of automatic process control and introduction to automatic process control systems. Elements of computer aided manufacturing (CAM). Reactors and fundamentals of reactors design for chemical reactions.

TEXT BOOKS

1. S.J. Carter, Cooper and Gunn's Tutorial Pharmacy, 6th ed., CBS publisher, Delhi.
2. CVS Subhramanyam, Pharmaceutical Engineering.
3. K. Samba Murthy, Pharmaceutical Engineering
4. Mc Cabe & Smidth.Unit Operations.

REFERENCE BOOKS

1. W.I. Macebe and J. C. Smith Macro, Unit Operations To Chemical Engineering, Hill Int. Book Co., London.
2. L. Lachman, H. Lieberman & J. L Kaniz, The Theory And Practice Of Industrial Pharmacy, Lee & Febiger Philadelphia, USA
3. Badzer & Banchoro, Introduction to Chemical Engineering.
4. Perry's Handbook of Chemical Engineering
5. M.E.Aulton, Pharmaceutics- The science of dosage form design, 2nd ed.
6. E.A. Rawlin's, Bentley's Text Book of Pharmaceutics, 8th ed ELBS

II Year B. Pharmacy II-Semester | **T** | **P** | **C**
4+1* | **0** | **4**

(R7302) PHARMACEUTICAL ANALYSIS – I

UNIT –I

Computation of analytical results, significant figures, concept of error, precision, accuracy, standard deviation, rejection of doubtful values with special reference to volumetric analysis.
Calibration of analytical equipment used in volumetric analysis.

UNIT-II

(a) **Theory of Neutralization Titration**: Acidimetry, Alkalimetry, Acid-base concept, Common ion effect and Solubility product, pH, Buffers and indicators.

(b) General Principles and theory of oxidation-reduction methods, and precipitation methods. An account of the indicators used in these titrations.
Application of the above methods in the analysis of drugs, as under IP 1996 including the latest addendum.

UNIT -III

a) **Complexometric titration:** Theory, types and application in pharmaceutical analysis. Masking and demasking and their applications.
b) **Non-aqueous Titration:** Theory, types, solvents used and application in pharmaceutical analysis.
c) **Karl-Fisher method** of estimation of water and other methods of moisture determination.

Note: Principle, instrumentation and applications of instruments mentioned in UNIT IV to UNIT VI

UNIT - IV

Potentiometry, pH metry (including specific ion electrons), conductometry and polarography.

UNIT - V

Flourimetry, flame photometry, nephelometry & turbidometry.

UNIT – VI

Refractometry, polarimetry and spectropolarimetry.

TEXT BOOKS

1. Kasture & Wadodkar, Text Book of Pharmaceutical analysis Vol.I & II.
2. A. Day Under Wood, Text Book of Quantative Analysis
3. Connors, A Textbook of Pharmaceutical Analysis.
4. B.K. Sarma, Instrumental Chemical Analysis, Goel Publishers.
5. Chatwal & Anand, Instrumental Methods of Analysis.

REFERENCE

1. A.H. Beckett & J.B Stanlake Vol.I&II., Practical Pharmaceutical Chemistry, Athlone Press of the Univ of London
2. A.I Vogel, Quantitative Chemical Analysis, ELBS ed.
3. L M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry., Oxford University Press, Delhi.
4. Pharmacopoeia (IP, BP, USP).
5. Y.Anjaneyulu, K.Chandrasekhar, Valli Manickam, A Textbook of Analytical Chemistry

II Year B. Pharmacy II-Semester

T	P	C
4+1*	0	4

(R7303) PHARMACOGNOSY – I

UNIT-I
Definition, history, scope and development of Pharmacognosy.

UNIT-II
Brief introduction to natural sources of drugs with examples: Plant Source, Animal Source, Mineral Source, Marine Source and microorganisms.

UNIT-III
Classificaion of crude drugs: Alphabetical, morpholoigcal, taxonomical and chemical classification with suitable examples.

UNIT-IV
Cultivation, collection, processing, drying and storage of medicinal plants.
- Factors influencing cultivation of medicinal plants.
- Plant hormones and their applications.
- Definitions and examples for polyploidy, mutation and hybridization with reference to medicinal plants.

UNIT-V
Good Agriculture Practices: Strategies of obtaining improved cultivations of medicinal plants

UNIT-VI
Systematic pharmacognostic study of the following carbohydrates and derived products: Acacia, tragacanth, agar, starch, guar gum, pectin, isabgol and honey.

UNIT-VII
Systematic Pharmacognostic study of the following Lipids: Castor oil, cod liver oil, shark liver oil, linseed oil, coca butter, kokum butter, bees wax, wool fat, hyndocarpus oil, spremaceti, lard and olive oil.

UNIT-VIII
Systematic Pharmacognostic study of the following volatile oils: Mentha, coriander, cinnamon, lemon oil, nutumug, eucalyptus, ginger, cardmom, tulsi, lemon grass, caraway, cumin, dill, clove, fennel and black pepper

TEXT BOOKS

1. Kokate C.K, Purohit AP & Gokhale Pharmacognosy S.B (Nirali)
2. Trease and Evans Pharmacognosy, Latest Edition.
3. Tyler, Brady & Robert, Pharmacognosy.
4. T.E.Wallis, Textbook of Pharmacognosy, Pub by CBS Publishers and distributors, New Delhi.

REFERENCES

1. Atal C.R & Kapur B.M, Cultivation & Utilization of Medicinal Plants.
2. Ayurvedic Pharmacopoeia of India, Pub by Govt. of India.
3. A.A. Farooqi & B.S. Sree Ramu, Cultivation of Medicinal and Aromatic Crops, University Press, .
4. CSIR Publications, Wealth of India.
5. Handa and Kapoor, Text Book of Pharmacognosy.
6. Gokhale, Pharmacognosy.
7. Ali, Pharmacognosy.
8. Heinrich, Fundamentals of Pharmacognosy and Phytotherapy.
9. B.P. Pandey, Economic Botany.

II Year B. Pharmacy II-Semester	T	P	C
	4+1*	0	4

(R7304) DISPENSING & HOSPITAL PHARMACY

UNIT-I

Dispensing Pharmacy: Principles of dispensing, form of prescription, handling of prescription, source of errors for prescription, care required in dispensing procedures including labeling of dispensed products.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-II

Principles involved and procedures adopted in dispensing of the following classes of preparations.
(i) Mixtures ii) solutions iii) emulsions iv) powders v) lotions & liniments vi) ointments
Definition of the following preparations like creams, capsules, pastes, jellies, suppositories, ophthalmics, lozenges, pills, inhalations, paints, sprays, tablet triturates etc.

UNIT-III

Incompatibilities: Physical, chemical and therapeutic incompatibilities – methods of over coming and handling of incompatible prescriptions.

UNIT-IV

Extraction and galenical products: Principle and method of extraction preparation of infusion, tinctures, dry, soft liquid extracts.

UNIT-V

Hospital Pharmacy: Organization and structure, organization of a hospital and hospital pharmacy, responsibilities of a hospital pharmacist, pharmacy and therapeutic committee, Budget preparation and implementation hospital formulary, organization of drug store, purchase and inventory control, patient counseling, role of pharmacist in community health care and education.

UNIT-VI

The pharmacy procedural manual, drug distribution, dispensing to out-patients, in-patients and ambulatory patient-dispensing of ancillary and controlled substances, drug information center.

UNIT-VIII

Records and Reports: Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse reactions, idiosyncratic cases etc.

TEXT BOOKS

1 Cooper & Gunns Dispensing Pharmacy, CBS, Publ. and Distributors New Delhi.
2 Gupta AK, Health Education and Community Pharmacy, CBS, Publ. and Distributors New Delhi.
3 JS Quadry, Hospital Pharmacy.
4 K.Sampath, Hospital & Clinical Pharmacy, Vikas Publications.
5 Lorria & William, Essential dosage calculations.

REFERENCES

1. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
2. William Hassan, Hospital Pharmacy.
3. R.M Metha, Dispensing Pharmacy.
4. E.A. Rawlkins, Bentley's Text Book of Pharmaceutics, Elbs publ.
5. Hoover, Dispensing of Medication.
6. NK Jain, Health Education and Community Pharmacy by, CBS, Publ. and Distributors New Delhi.

II Year B. Pharmacy II-Semester	T	P	C
	4+1*	0	4

(R7305) ENVIRONMENTAL SCIENCE

UNIT-I:
The Multidisciplinary nature of environmental studies:
Definition, scope and importance.

UNIT-II:
Natural Resources:

a. ***Forest resources****:* Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
b. ***Water resources****:* Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. ***Mineral resources***: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d. ***Food resources****:* World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies
e. ***Energy resources****:* Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources, case studies.
f. ***Land resources***: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

UNIT-III:
Conservation of natural resources: Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.

UNIT-IV:
Ecosystems: Concept of an ecosystem.Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids.
Introduction, types, characteristic features, structure and function of the following ecosystem:
a) Forest ecosystem b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT-V:
Biodiversity and its conservation: Introduction, definition: genetic species and ecosystem diversity.
Biogeographically, classification of India. Value of biodiversity: consumptive use, productive use, and social, ethical, aesthetic and option values, biodiversity at global, national and local levels. India as a mega-diversity nation. Hot spots of biodiversity. **Threats to biodiversity:** Habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India.
Conservation of biodiversity: In-situ conservation of biodiversity
UNIT-VI :
Environmental Pollution: ***Definition, causes, effects and control measures of:***
a) Air pollution, b) Water pollution, c) Soil pollution, d) Marine pollution, e) Noise pollution, f) Thermal pollution and g) Nuclear hazards.
Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies.
Disaster management: Floods, earthquake, cyclone and landslides.

UNIT-VII:
Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns.
Case studies. **Environmental ethics**: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear Accidents and holocaust.
Case studies*:* **Wasteland reclamation**. Consumerism and waste products.

Unit VIII:
Environment protection Act. The air (prevention and control of pollution) act 1981. The Water (prevention and control of pollution) act 1974.The wildlife protection Act 1972. The Forest conservation Act 1980. Issues involved in enforcement of environmental legislation. Public awareness.
Human population and the Environment
Population growth, variation among nations. Population explosion – Family welfare programme. Environment and human health, human rights. Value education. HIV / AIDS, women and child welfare, role of information technology in environment and human health. ***Case studies.***

TEXT BOOKS

2. M. Anji Reddy, Text Book of Environmental Sciences & Technology, BS Publications

3. Connar, Basic Concepts of Environmental Chemistry, Lewis Publications.
4. D.K Asthana and Meera, Text book of Environmental studies.
5. Y. Anjaneyulu, Introduction to Environmental Science, B.S. Publication,
6. C. Manohar Chary, P Jayram Reddy, Principles of Environmental Studies, Pharma book syndicate.

REFERENCES

1. William P. Cunningham & Mary Ann Cunningham, Principles of Environmental Science - Inquiry & Applications.
2. W. P. Cooper& et al, Environmental Encyclopedia, Jaico Publishing House, Mumbai.
3. K. C. Agarwal, Environmental Biology, Nidi Publishers Ltd, Bikaner.
4. Environmental Protection and laws, Himalaya Publ House, New Delhi.
5. R.Rajagopalan, Environmental Studies, Oxford University Press.

II Year B. Pharmacy II-Semester	T	P	C
	0	3	2

(R7306) PHARMACEUTICAL UNIT OPERATIONS II LAB

1. Measurement of flow of fluids and their pressure, determination of reynold's number and calculation of frictional losses.
2. Evaluation of filter media, determination of rate filtration and study of factors affecting filtration including filter aids.
3. Experiments to demonstrate applications of centrifugation.
4. Determination of Humidity-use of Dry Bulb and Wet Bulb thermometers and Psychometric charts.
5 Determination of overall Heat Transfer Coefficient.
6. Determination of rate of evaporation.
7. Experiments based on steam. Extractive and Azeotropic distillations.
8. Determination of rate of drying, free moisture content and bound moisture content.
9. Experiments to illustrate the influence of various parameters on the time of drying.
10. Experiments to illustrate principles of size reduction, Laws governing energy and power requirements of a size reduction.
11. Experiments to illustrate solid-solid mixing, determination of mixing efficiency using different types of mixers.

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II Year B. Pharmacy II-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7207) PHARMACEUTICAL ANALYSIS – I LAB

1. Assay of Pharmaceutical compounds based on chemical methods such as acid base, oxidation-reduction, non-aqueous, complexometric titration methods.
2. Conductometric determination of equivalent point of titration of HCl with NaoH.
3. Potentiometric determination of pH of a soulation.
4. Potentiometric titration of an Acid.\
5. Potentiometric determination of strength of unknown solution and HCL with NaoH.
6. Nephelometric determination of sulfate.
7. Fluorimetric estimation of quinine.
8. Polarographic determination of amount of Nitrobenzene in solutions.
9. Flame photometric determination of Sodium.
10. Flame photometric determination of Potassium.
11. Determination of refractive index of liquids by Abbe refractrometer.

II Year B. Pharmacy II-Semester

T	P	C
0	3	2

(R7308) PHARMACOGNOSY – I LAB

1. Collection of natural herbs and preparation of herbariam/laminated photos for five drugs.
2. Macrosopy, microscopy and chemical tests for any five carbohydrates mentioned in theory.
3. Macrosopy, microscopy and chemical tests for any five lipids mentioned in theory. Identification of curde drugs listed in theory.
4. Macrosopy, microscopy and chemical tests for any five volatile oils mentioned in theory.
5. Cultivation of medicinal plants: Maintainence of one plant in Medicinal garden.

REFERENCES

1. Kandhelwal, Practical Pharmocognosy.
2. C.K. Kokate et.al, Practical Pharmocognosy.
3. Iyengar, Practial Pharmocognosy

II Year B. Pharmacy II-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7309) DISPENSING & HOSPITAL PHARMACY LAB

1. Dispensing of prescriptions falling under the categories; Mixtures, solutions, emulsions, creams, ointments, powders, pastes, lotions, liniments, inhalations, paints. etc.
2. Identification of various types of incompatabilities in a prescription, correlation thereof and dispensing of such prescriptions.
3. Dispensing procedures involving pharmaceutical calculations, pricing of prescriptions and dosage calculations for paediatric and geriatric patients.
4. Dispensing of prescriptions involving adjustment of tonicity.
5. Categorization and storage of pharmaceutical products based on legal requirements of labelling and storage.
6. Project report on visit to the community pharmacy for Counseling on the rational use of drugs and aspects of health care.
7. Preparation of Pharmacopoeial extracts and galenical products utilizing various methods of extraction.

III Year B. Pharmacy I-Semester

T	P	C
4+1*	0	4

(R7401) PHARMACEUTICAL BIOCHEMISTRY

UNIT - I
Bio chemical organization of the cell, molecular constitutents of membrane, active & passive transport process, sodium and potassium pumps, osmoregulation and heamostatis.

UNIT – II
Bio-energetics & Redox Reactions: The concept of free energy, laws of thermodynamics.Determination of change in free energy from equilibrium constant & reduction potential. Production of ATP and its biological significance.
Redox reactions, redox potential, the respiratory chain & its role in energy capture & its control. Oxidative phosphorylation & its energetics & E.T.S mechanism of actions.

UNIT – III
Enzymes & Co-Enzymes: Classification, Structure, mechanism of action, properties, factors affecting enzymes action. Activators & de activators of enzymes, enzyme kinetics & enzyme inhibitions, repressions with reference to drug action.

UNIT - IV
Introduction to Bio-Molecules: Structure, classification, cell and biological functions of carbohydrates, proteins, lipids, nucleic acids (DNA & RNA) vitamins & minerals.

UNIT - V
Metabolism of Carbohydrates: Glycolysis, glycogenolysis, gluconeogenesis, Kreb's cycle, HMP & uronic acid pathways, anaerobic respiration in muscle.

UNIT – VI
Metabolism of Proteins: ***Amino acid structure & classifications, de amination, Trans-amination, de-carboxylation, Urea cycle, Metabolism & examples:***
Valine, cystine, cystein, tryptophan, tyrocine, methionine.

UNIT – VII
Metabolism of Lipids:
Oxidations : Alpha, Beta, Gama & Omega oxidations of fatty acids, bio-synthesis of fatty acids, cholesterol, ketogenesis.

UNIT – VIII
Introduction to xenobiotic metabolism, detoxification, conjugation, prostaglandins & related products (Ecosanoids).

TEXT BOOKS

1. Harper, Biochemistry
2. A.L.Lehninger, Principles of Biochemistry.
3. J.L.Jain, Fundamentals of Biochemistry
4. Satyanarayana, Text Book of Biochemistry
5. Rama Rao, Text Book of Bio Chemistry.
6. Conn, Outlines of biochemistry

REFERENCES

1. L.Stryer, Text Book of Bio Chemistry.
2. E.E Conn & P.K. Stumpf, Outlines of Biochemistry by, Publ, John Wiley & sons, New York.
3. B.Harrow and A. Mazur, Text Book of Biochemistry, WB Saunders Co., Philadelphia.
4. Boyer Rodney, Modern experimental Bio Chemistry.
5. West, Edward Text Book of Biochemistry.
6. Conn, Outlines of Biochemistry.
7. Plummer, Practical Bio Chemistry.
8. Denniston, Topping & Caret; General, Organic, and Biochemistry, McGraw-Hill

III Year B. Pharmacy I-Semester

T	P	C
4+1*	0	4

(R7402) PHARMACEUTICAL MICROBIOLOGY

UNIT - I

Introduction to Microbiology: Origin, scope and discovery of spontanesous generations theory, contributions of Antony Von Lewvonhock, Pasteur, Koch and Lister.

UNIT – II

Diversity of Microorganisms: Prokaryotes versus eukaryotes – eukaryotic and prokaryotic cell structure, three domains of life (bacteria, archea and eurkaryotics). Pharmaceutical significance of protozoa, algae, fungi, bacteria and viruses. Characterisation and identification of microorganisms.

UNIT – III

Nutrition and Growth of Microbes: Nutritional requirements, Types of Nutrient media and growth conditions and Nutritional types based on energy source.

Isolation, cultivation (aerobic & anaerobic) and preservation of microorganisms, physiology of growth, bacterial growth curve, methods for determing bacterial numbers, mass and cell constitutents. Exponential growth and generation time. Bacterial growth in batch and continous cutlrue (chemostat and turbidostat) synchronous growth.

UNIT – IV

Microorganisms and their Environment: ***Effects and microbial adaptations to environmental conditions*** – Temperature, oxygen desiccation, extreme cold ionic effect, electricity, osmotic pressure, radiant energy, hydrostatic pressure, mechanical impact, vibration.

UNIT – V

Control of Microorganisms: General Concepts, Inhibition of growth and killing, sterilization and disinfection, antisepis and sanitation, mode of action application & limitation of physical agents (moist and dry heat, radiation and filtration), chemical agents. Various types of disinfectants, factors affecting sterilization and disinfection, evaluation of antimicrobial activity.

Chemotherapantic agents, mode of action and applications, drug resistance.

Official methods of sterility testing of pharmaceuticals and biosafety measures.

UNIT – VI

Bacterial Genetics: Genetic recombination in bacteria, DNA replication, transcription and translation. Gene regulation (lac operon and tryptophan operon). Mutagenesis, chemical and physical mutagens.

UNIT – VII

Epidimeology of Diseases: Study of etiology, diagnois, source of infection, mode of transmission, immunization methods, prevention and control of the following diseases. Bacillary dysentery, diphtheria, tuberculosis, leprosy, cholera, typhoid, syphilis, gonerrhoea, tetanus, food poisioning and infection hepatitis.

UNIT – VIII

Application of Microbes in Pharmaceutical Industry

a. ***Microbiological Assays:*** Principles and Methods involved in Assay of Antibiotics, Vitamins, Amino acids & Bio-Sensors in Analysis.

b. ***Microbial Source & applications of various pharmaproducts*** like Antibiotics,vitamins. amino acids, solvents, enzymes & genetic engineered products etc.

TEXT BOOKS

1. Pelczar and Reid, Text Book of Microbiology
2. Anantha Narayan and Jayram Panikar, Text Book of Microbiology, Orient Longman, Delhi, .
3. N.K. Jain, Pharmaceutical Microbiology
4. Alcamo, Microbiology.
5. R.C. Dubey, A textbook of Microbiology

REFERENCES

1 Heritage,J Introductory Microbiology.
2 Nester, Anderson, Roberts, Pearsall, Microbiology, McGraw-Hill.
3 Hugo,W B Pharmaceutical Microbiology.
4 Tortora, Gerard Text Book of Microbiology.
5 E.A Rawlins, Betley's Text Book of Pharmaceutics, 8th ed
6 Garg,F C Experimental Microbiology
7 Gaud, R.S Practical Microbiology

III Year B. Pharmacy I-Semester	T	P	C
	4+1*	0	4

(R7403) PHARMACOGNOSY – II

UNIT I

Definition, general test and detailed pharmacognostic study of the following glycoside containing drugs.

a. **Saponin Glycosides** **:** Glycyrrhiza, Ginseng, Discorea, Sarasaparilla & Senega.
b. **Cardioactive Glycosides** **:** Digitalis, Squill, Strophanthus, Thevetia.
c. **Anthraquinone Glycosides** **:** Aloe, Senna, Rhubarb & Cascara.
d. **Bitter Glycosides** **:** Psoralea, Gentian, Chirata.

UNIT II

Definition, general test and detailed pharmacognostic study of the following Alkaloid containing drugs.

a. **Pyridine – Piperidine derivatives** : Tobacco & Lobelia.
b. **Tropane** **:** Belladona, Hyoscyamus, Datura, Coca & Aswagandha.
c. **Quinoline & Isoquinoline** : Cinchona, Ipecac, Opium.
d. **Indole** **:** Ergot, Rauwolfia, Vinca, Nux-vomica
e. **Imidazole** **:** Pilocarpus
f. **Steroid** **:** Kurchi
g. **Alkaloidal amine** **:** Ephedra & Colchicum.
h. **Glycoalkaloid** : Solanum
i. **Purine** **:** Coffee, Tea.

UNIT III

Study of Tannins & Tannin containing drugs: Gambir, Black catechu, Myroblan & Arjuna.

UNIT IV

Definination & study of drugs contining resin & resin combinations: Benzoin, Asafoetida, Balsam of Tolu, Podophyllum.

UNIT-V

Biological sources, preparations, identification tests and uses of the following enzymes: Diastase, Papain, Pepsin, Trypsin, Pancreatin.

UNIT-VI

General techniques of biosynthetic studies and basic metabolic pathways.
Brief introduction to biogenesis of secondary metabolites of pharmaceuitcal importance.

UNIT – VII

Natural dyes and their applications in pharmacy.

TEXT BOOKS

1. Kokate C.K , Purohit AP & Gokhale, The Pharmacognosy S.B (Nirali)
2. Trease and Evans, Pharmacognosy, Latest Edition.
3. Tyler, Brady & Robert, Pharmacognosy.
4. Khare C.P, Indian Medicinal plants – An Illustrated dictionary

REFERENCES

1. Atal C.R & Kapur B.M, Cultivation & Utilization of Medicinal Plants.
2. Wallis, Textbook of pharmacognosy, Pub by CBS Publishers and distributors, New Delhi.
3. Ayurvedic Pharmacopoeia of India, Pub by Govt. Of India
4. Herbal Drug Industry Eastern Publishers., New Delhi.
5. J.B.Harbone, Phytochemical Methods: A guide to modern techniques of Plant analysis.

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III Year B. Pharmacy I-Semester	**T**	**P**	**C**
	4+1*	**0**	**4**

(R7404) PHARMACEUTICAL TECHNOLOGY – I

UNIT-I
Preformulation: Physicochemical properties like physical form, particle size, shape, density, wetting, dielectric constant, solubility, dissolution, organoleptic additives, hydrolysis, oxidation-reduction, recemization, polymerization etc and their effect on formulation, stability and bioavailability study of prodrugs in solving problems related to stability bio availability in formulations. Stability testing of finished products as per ICH guidelines.

UNIT-II
Liquid dosage forms: Introduction, types of additives used in formulations, vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubulizers, colors, flavours and others, manufacturing packaging and evaluation of clear liquids, suspensions and emulsions official in pharmacopoeia.

UNIT-III
Semisolid dosage forms: Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semi solids, clear gels manufacturing procedure, evaluation and packaging.Suppositories: Ideal requirements bases, manufacturing procedure, packaging and evaluation.

UNIT-IV
Pharmaceutical aerosols: Definition, propellants general formulation, manufacturing and packaging methods, pharmaceutical applications.

UNIT-V
Opthalmic Preparations: Requirements, formulation, methods of preparation, containers, evaluation.

UNIT-VI
Cosmeticology and Cosmetic Preparations –I: Fundamentals of cosmetic science, structures and functions of skin and hair. Formulation, preparation and packaging of cosmetics for skin, hair.

UNIT-VII
Cosmeticology and Cosmetic Preparations –II: Formulation, preparation & packaging of dentrifices like tooth powders, pastes, gels etc., and manicure preparations like nail polish, lipsticks, eye lashes, baby care products etc.

TEXT BOOKS

1. L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of industrial pharmacy, Lea & Febieger, Philadelphia Latest Edn.
2. CVS. Subramanyam, Pharmaceutical production and management, Vallabh Prakashan, New Delhi 2005.

REFERENCES

1. Shobha Rani, Text of Industrial Pharmacy, Hiremath Orient Longman
2. Sagarian & MS Balsam, Cosmetics Sciences &Technology Vol.1, 2 & 3
3. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.
4. E.A.Rawlkins, Bentley's Text Book of Pharmaceutics, Elbs publ
5. HC Ansel Introduction to Pharmaceutical Dosage forms
6. S.H. Willing, M.M Tucherman and W.S. Hitchings IV, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, Marcel Dekker, Inc., New York 1998.
7. Gilbert S. Banker and Christopher T Rhodes, Modern Pharmaceutics, IVth ed, Marcel Dekker, USA, 2005.
8. Yiew Chien, novel drug delivery systems, Marcel Dekker 2003.
9. Robert. A. Nash, Pharmaceutical Process Validation, 3rd Ed Marcel Dekker, 2003.
10. Good Manufacturing Practices – Schedule M Read With The Drugs And Cosmetic Rules 1945

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III Year B. Pharmacy I-Semester	**T**	**P**	**C**
	4+1*	**0**	**4**

(R7405) PHARMACOLOGY – I

UNIT I

General Pharmacology: Introduction to pharmacology, sources of drugs, dosage forms and routes of administration, mechanism of action, combined effect of drugs, factors modifying drug action, tolerance and dependence, pharmacogenetics. Absorption, distribution and excretion of drugs, principles of discovery and development of new drugs.

UNIT II

Pharmacology of Peripheral Nervous System:

a. Neurohumoral transmission (autonomic and Somatic)
b. Parasympathomimetics, parasympatholytics, sympathomimetics & sympatholytics

UNIT III

Adrenergic Receptor and neuron blocking agents, Ganglionic-stimulants and blocking agents.

a. Neuromuscular blocking agents
b. Local anesthetic agents.

UNIT IV

Pharmacology of Central Nervous System: I

a. Neurohumoral transmission in the C.N.S.
b. General anesthetics.
c. Alcohols and disulfiram.

UNIT V

Pharmacology of Sedatives, hypnotics, anti-anxiety agents and centrally acting muscle relaxants.

UNIT VI

Psychopharmacological agents (antipsychotics) Antidepressants, anti- maniacs and hallucinogens)

UNIT VII

Pharmacology of Anti-epileptic drugs, Anti-Parkinsonian Drugs

UNIT VIII

Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs.

a. Narcotic analgesics and antagonists.
b. C.N.S. stimulants
c. Drug Addiction and Drug Abuse.

TEXT BOOKS

1. Sathoskar, Pharmacology and pharmaco therapeutics Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.
2. Bertram. G. Katzung, Basic and clinical pharmacology, 9th Edn
3. Tripathi, Text book of Pharmacology
4. Rang & Dale, Text book of Pharmacology.

REFERENCE BOOKS

1. J.G. Hardman and Lee E. Limbard, Good Mann & Gilmann, The Pharmacological basis of therapeutics, Mc Graw hill, Health Professions Dvn.
2. H.P Rang, M. M. dale & J.M. Ritter, Pharmacology, Churchill living stone, 4th Ed.
3. J. Crossland, Lewis's Pharmacology, Church living stone.
4. Ruth Woodrow, Essentials of Pharmacology for Health Occupations by.

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III Year B. Pharmacy I-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7406) PHARMACEUTICAL BIOCHEMISTRY LAB

Experiments:

1. To prepare standard buffers (citrate, phosphate & carbonate) and measure the pH.
2. Titration curve for amino acids.
3. Separation of amino acids by two dimensional paper chromatography & gel electrophoesis.
4. The separation of lipids by T.L.C.
5. Identification of carbohydrates
6. Identification of amino acid.
7. Identification of lipids.
8. Estimation of glucose in urine.
9. Estimation of creatinine in urine.
10. Estimation of urea in blood.
11. Estimation of creatinine in blood.
12. Estimation of Serum protein.
13. Estimation of bile pigments in serum.
14. Estimation of alkaline phosphatase in serum
15. Effect of temperature on the activity of alpha-amylase.

III Year B. Pharmacy I-Semester	T	P	C
	0	3	2

(R7407) PHARMACEUTICAL MICROBIOLOGY LAB

1. Introduction to equipment and glassware used in microbiology laboratory.
2. Preparation of various culture media.
3. Sterilization techniques and their validations.
4. Aseptic transfer of culture into different types of medias.
5. Characterisation of microbes by staining methods (simple gram's, acid fast and negative staining) and motility testing by hanging drop method.
6. Enumeration of bacteria by pour plate/spread plate technique.
7. Enumeration of bacteria by direct microscopic count.
8. Isolation of pure cultures by streak plate, spread plate, pour plate.
9. Evaluation of antiseptics and disinfectants, sterility of pharmaceutical products as per ip requirements.
10. Observation of colony characteristics.
11. bio chemical reactions:
    - i) Indole test.
    - ii) Methyl red test.
    - iii) Voges proskauer test.
    - iv) Starch hydrolysis test.
    - v) Fermentation of carbohydrates.
12. Morphology of molds, yeasts.
13. Preseravation of microrganisms (slant and stab cultures)

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III Year B. Pharmacy I-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7408) PHARMACOGNOSY II LAB

1. Microscopy and macroscopy of any four glycoside containing crude drugs and study of their powder characters given in theory.
2. Microscopy and macroscopy of any four alkaloids containing crude drugs and study of their powder characters given in theory.
3. Microscopy and macroscopy of any three tanin containing crude drugs and study of theri powder characters given in theory.
4. Microscopy and macroscopy of any three resin containing crude drugs and study of theri powder characters given in theory.
5. Identification test for any two enzymes given in theory.

III Year B. Pharmacy I-Semester	T	P	C
	0	3	2

(R7409) PHARMACEUTICAL TECHNOLOGY - I LAB

1. Preparation, evaluation and packaging of solutions, suspensions and emulsions, ointments. Suppositories, aerosols, eye drops, eye ointments etc.
2. Formulation of various types of cosmetics for skin, hair, dentrifices and manicure preparations.

III Year B. Pharmacy II-Semester

T	P	C
3+1*	0	3

(R7501) MEDICINAL CHEMISTRY – I

UNIT – I

Basic considerations of Drug activity: Physico chemical properties of drug molecules in relation to biological activity – Solubility, lipophilicity, partition-coefficient, Ionization, hydrogen bonding, Chelation, redox potential and surface activity. Bioisosterism and steric features of drugs, drug distribution and protein binding: Introduction to Pro and soft drug approach in drug design.

UNIT – II

Mechanisms of Drug action: Introduction, Enzyme stimulation, Enzyme inhibition, Sulfonamides and Membrane – active drugs

Drug metabolism and inactivation: Introduction, Biotransformations, Metabolic reactions, and Conjugation reactions and factors affecting drug metabolism.

Note: Introduction, definition, nomenclature, chemical classification, structure, synthesis, general mechanism, mode of action, SAR including physicochemical and stereo chemical aspects, metabolism and therapeutic uses of the drugs from each category shall be studied for the following units. An outline of synthetic procedure of only the drugs, which are official as per Indian Pharmacopoeia and British Pharmacopoeia and mentioned in each category.

UNIT – III

Drugs acting on CNS: *A brief study of the chemistry of neurotransmitters*.

Hypnotics and Anxiolytics – Phenobarbital, diazepam, alprazolam, glutethimide
Anti-psychotics – Chlorpromazine, haloperidol, clozapine, oxypentine.
Anti-epileptics – Phenytoin, valproic acid, carbamazepine, ethosuximide, meprobamate
Anti-depressants – Imipramine, fluoxetine, doxepine, sertraline.

UNIT - IV

Local anesthetic and General anesthetic agents: Benzocaine, procaine, bupuvacaine and lidocaine, halothane, thiopental sodium and ketamine.

UNIT – V

Drugs affecting adrenergic mechanism **:** Introduction to adrenergic receptors, catabolism
Indirect acting sympathomimetics **:** Amphetamine, ephedrine, salbutamol, pseudoephedrine, dobutamine, dopamine.

UNIT – VI

Drugs affecting cholinergic mechanism:

Introduction to cholinergic system
Cholinergics - Carbachol, bethanichol
Anticholinesterase - Neostigmine, pyridostigmine
Antidotes for ach inhibitors - PAM (pralidoxime)
Cholinergic blockers - Propantheline, dicycloamine.
Neuromuscular blockers - Galamine, succinyl choline.

UNIT – VII

Anti-adrenergics:

α-blockers - Phenoxybenzamine, prazosine, tolazoline
ß – blockers - Propranolol, atenolol, labetelol.

UNIT – VIII

Anti-cholinergics: Atropine, ipratropium bromide, dicyclomine, bipyridine, propantheline

TEXT BOOKS

1. William O. Foye, Textbook of Medicinal Chemistry, Lea Febiger, Philadelphia.
2. JH Block & JM Beale (Eds), Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th Ed, Lipcott, Raven, Philadelphia, 2004.
3. S. N. Pandeya, Textbook of mediacinal chemistry, SG Publ. Varanasi, 2003.
4. Rama Rao Nadendla, Medicinal Chemistry

REFERENCES

1. D. Abraham (Ed), Burger Medicinal chemistry ad Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003, 6th Ed.
2. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences; 20th Edition.

3. M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry Ed: l. Oxford University Press, Delhi.
4. B.N. Lads, MG.Mandel and F.I. way, Fundamentals of drug metabolism & disposition, William & welking co, Baltimore USA.
5. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, Oxford
6. Daniel lednicer, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y. 1998.
7. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.
8. Kadam, Textbook of Medicinal Chemistry Vol. 1 & 2.
9. T Nogrady, Medicinal Chemistry – A Biochemical Approach. Oxford University Press, New York, Oxford
10. SS Dhara, A textbook of Pharmaceutical Chemistry

III Year B. Pharmacy II-Semester	T	P	C
	3+1*	0	3

(R7502) PHARMACEUTICAL TECHNOLOGY - II

UNIT-I

Capsules: Advantage and disadvantages of capsule dosage forms, material for production of hard and soft gelatin capsules, sizes of capsules, capsule filling, soft processing problems in capsule manufacturing, importance of base absorption and minimum/gm factors in soft capsules, quality control, stability testing and storage of capsule dosage forms.

UNIT-II

Microencapsulation: Types of microencapsulation and importance of microencapsulation in pharmacy, microcapsulation by coacervation phase separator, multi orifice centrifugal separation. Spray drying, spray congealing, polymerization complex emulsion, air suspension technique, and pan coating techniques, evaluation of microcapsules.

UNIT-III

Tablets: Formulation of different types of tablets, granulation technology on large-scale by various techniques, types of tablet compression machinery and the equipments employed evaluation of tablets.

UNIT-IV

Coating of Tablets: Types of coating, coating materials and their selection, formulation of coating solution, equipment for coating, coating processes, evaluation of coated tablets.

UNIT-V

Parenteral Products

a. Preformulation factors, routes of administration, water for injection, treatment apyrogenicity, non-aqueous vehicles, isotonicity and methods of its adjustment.
b. Formulation details, container and closures and selection.
c. Prefilling treatment, washing and sterilization of containers and closures, preparation of solution and suspensions, filling and closing of ampules, vials, infusion flulids, lyophillization & preparation of sterile powders, equipment for large-scale manufacture and evaluation of parenteral products.
d. Aseptic techniques, sources of contamination and method of prevention. Design of aseptic area, laminar flow benches, services and maintenance.

UNIT-VI

Packaging of Pharmaceutical products: Packaging components, types, specifications and methods of evaluation, stability aspects of packaging.

Packaging equipments, factors influencing choice of containers, legal and other official requirements for containers, package testing.

TEXT BOOKS

1. L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of industrial pharmacy, Lea & Febieger, Philadelphia Latest Edn
2. HC Ansel introduction to Pharmaceutical Dosage forms
3. Pharmaceutical Dosage forms Tablet by Lieberman, Lachman
4. CVS. Subramanyam, Pharmaceutical production and management, Vallabh Prakashan, New Delhi 2005.

REFERENCES

1. Sagarian & MS Balsam, Cosmetics Sciences &Technology,Vol.1, 2 & 3
2. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
3. E.A.Rawlkins Bentley's Text Book of Pharmaceutics, Elbs publ
4. S.H. Willing, M.M Tucherman and W.S. Hitchings IV, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, 2nd ed, Marcel Dekker, Inc., New York 1998.
5. Gilbert S. Banker and Christopher T Rhodes, Modern Pharmaceutics, IVth ed, marcel dekker, usa, 2005.
6. Yiew chien, novel drug delivery systems, 2nd ed, marcel dekker 2003.
7. Robert. A. Nash, Pharmaceutical Process Validation, 3rd Ed Marcel Dekker, 2003.
8. Good Manufacturing Practices – Schedule M. Read With The Drugs And Cosmetic Rules 1945

M.E. Aulton, Pharmaceuitcs- The science of Dosage form Design 2nd ed.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Pharmacy II-Semester	**T**	**P**	**C**
	4+1*	**0**	**4**

(R7503) PHARMACOLOGY – II

UNIT-I

Pharmacology of Cardiovascular System **-** Hypertension & congestive heart failure

d. Digitalis and cardiac glycosides
e. Antihypertensive drugs.
f. Drugs used in the therapy of shock.

UNIT-II Pharmacology of Drugs used in coronary artery disease

UNIT-III Pharmacology of drugs used arrythmias

UNIT-IV

Drugs acting on hematopoietic system

a. Anti-coagulants, Anti-platelets & Thrombolytics.
b. Hematinics.

UNIT-V

Drugs acting on urinary system

a. Fluid and electrolyte balance
b. Diuretics

UNIT-VI

Autacoids-I

Histamine, 5-HT and their antagonists.

UNIT-VII

Autacoids -II

a. Prostaglandins, thromboxanes and leukotrienes
b. Pentagastrin, cholecystokinin, angiotensin, Bradykinin and substance P.

UNIT-VIII

Drugs Acting on the Respiratory System

a. Anti-asthamatic drugs including bronchodilators.
b. Anti-tussives and expectorants.
c. Respiratory stimulants.

TEXT BOOKS

1. Rang & Dale, Textbook of Pharmacology.
2. Sathoskar, Pharmacology and pharmaco therapeutics Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.
3. Bertram. G. Katzung, Basic and clinical pharmacology, 9th Edn, Mc Graw hill
4. Tripathi, Textbook of Pharmacology, JAYPEE
5. Leilani Grajeda, Understanding Pharmacology: A physiological Approach
6. F.S.K Barar, Essentials of Pharamcotheraptics.

REFERENCES

1. J.G. Hardman and Lee E. Limbard, Good Mann & Gilmann: The Pharmacological basis of therapeutics, Mc Graw hill, Health Professions Dvn.
2. H.P Rang, M. M. dale & J.M. Ritter, Pharmacology,: Churchill Living stone, 4th Ed.
3. J. Crossland, Lewis ‘s Pharmacology, Church living stone

III Year B. Pharmacy II-Semester

T	P	C
4+1*	0	4

(R7504) CHEMISTRY OF NATURAL DRUGS

UNIT – I

Alkaloids: Definition of alkaloids, pseudoalkaloids and protoalkaloids. General methods of extraction and isolation. Properties of alkaloids. Tests for alkaloids.

Opium alkaloids: Structural features of Morphine molecule – Peripheral groups. Modification of structure and effect on analgesic activity – SAR of morphine and morphine-like analgesics. **Narcotic antagonists:** Nalorphine, Levallorphan. Anti-tussive agents: Noscapine, Dextromethorphan. Smooth muscle relaxants: Papaverine and related compounds like ethaverine, Dioxyline. Structures and uses of these compounds.

Tropane alkaloids: Structures of Atropine/hyoscyamine, Hyoscine, Hydrolytic products of these – Tropine and Scopine. Relationship between tropine & pseudotropine. Bioligical actions and uses of tropane alkaloids. Homatropine.

UNIT – II

Rauwolfia alkaloids: Structures and uses of Reserpine, Rescinnamine, Deserpidine, ajmaline, syrosingapine. Hydrolysis of reserpine and rescinnamine. Mechanism of action of reserpine.

Ergot alkaloids: Classification, structures, hydrolytic products, pharmacological actions, therapeutic uses and toxicity. Synthetic derivatives: Methylergonovine (Methylergometrine), L S D, ethysergide.

UNIT – III

Terpenoids: Volatile oils: Definition of terpenoids, Classification, isoprene, special isoprene and gem-dialkyl rules.

Citrals: Sources and structures, isomerism in citral, citral-a (Geranial), citral-b (Neral). Reduction of citral to citronellal, citronellol, geraniol and nerol. Oxidation of citral to geranic acid. Cyclodehydration of citral to p-cymene. Conversion of citrals – a and b into alfa-terpeneol and ionones.

Alfa – Terpeniol: Sources and structure. Conversion into p-cymene, 1,8 – terpin, terpinolene, dipentene, dipentene dihydrochloride. Preparation of alfa-terpeneol from limonene/dipentene, 1,8-Terpin and pinene.

UNIT – IV

Carvone: Sources and structure. Conversion into Carvacrol. Reduction of Carvone with different reagents. Synthesis from Limonene/Dipentene and alfa – Terpeneol.

Menthol and menthone: Sources, structures and uses. Oxidation of menthol to menthone. Conversion of menthol into thymol.

1,8-cineole: Sources and structure. Preparation from Cis-terpin. Mention of 1,4-cineole.

Camphor: Source, properties, commercial method of preparation from α-pinene and uses. Oxidation to camphoric acid and camphoronic acids, conversion into p-cymene. Reduction of camphor to Borneol & isoborneol. Source, structures, uses of isoborneol. Oxidation of borneols to camphor.

UNIT – V

Steroids: Introduction: Brief history of development of steroid industry. Sources of steroidal drugs – diosgenin, cholesterol, stigmasterol and ergosterol – their structures. Marker's synthesis of progesterone. Nomenclature of steroids, stereochemistry and numbering the ring system. Colour reactions of steroids. Selenium distillation of steroids.

UNIT – VI

Steroidal Anti-Inflammatory drugs: Classification, structures, SAR, uses & toxicity.

Cardiac glycosides: structures of glycosides from Digitalis, Strophanthus, Squill and Bufa. Enzymatic and acid hydrolytic reactions of the glycosides. Mechanism of action, SAR, therapeutic uses and toxicity.

Bile acids: Names, structures and functions.

UNIT – VII

Hormones: Sex Hormones: Male and female sex hormones.

Estrogens – estradiol, estrone, estriol. Structures and their interconversion.

Structures of synthetic estrogens. Therapeutic uses and side effects.

Progesterone and selected progestins – structures, uses and side-effects.

Preparation of progesterone from diosgenin. A note on Steroid contraceptive agents and regimens.

Androgens – Testosterone and derivatives. Structure and biological activities & uses.

Hormones of Thyroid: Thyroxine and triiodothyronine – structure and functions.

UNIT – VIII

Adrenal Cortex Hormones:

Mineralocorticoids: Aldosterone, Deoxycorticosterone,

Fludrocortisone – structures, biological activity and uses. Aldosterone antagonist Spiranolactone.

Glucocorticoids: Cortisone & Hydrocortisone – Structure, biological actions, uses.

Hormones of Pancreas:

Insulin – introduction, structural features – some sequence differences in insulins of some species like humans, pork, beef. Metabolic effects of insulin. A note on insulin preparations. Glucagon – Structure and Physiological role.

NOTE:

1. ***Structure elucidation of compounds is not included in the syllabus.***
2. ***Structural features like the basic nucleus; presence of substituent groups will be discussed.***
3. ***Simple reactions like hydrolysis, selenium dehydrogenation, oxidation, reduction etc., will be taught wherever applicable***.

TEXT BOOKS

1. O.P.Agarwal, Natural products by. Vol.1 & 2, Goel publications – Meerut.
2. JB Harborne, Phyto Chemical methods.
3. I L Finar, Organic chemistry, Vol. 1 & 2, the English language book society, London, New Delhi.

REFERENCES

1. RT Morrison and R.N BOYD, Organic chemistry, Allyn and Bacon, inc., boston
2. Me – Wolf, ed., Burger's medicinal chemistry, J. Wiley & sons, NY.
3. F.G. Mann & B. Saunders, Practical Organic chemistry Longmans green & Co. Ltd., UK.
4. RM. Acheson, an introduction to the chemistry of heterocyclic compounds, Interscience NY.
5. Duquesn & others, Practical pharmacognocy, CBS Publ.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Pharmacy II-Semester	**T**	**P**	**C**
	4+1*	**0**	**4**

(R7505) PHARMACEUTICAL JURISPRUDENCE

UNIT-I
Introduction

a. Pharmaceutical Legislations - A brief review
b. Drugs & Pharmaceutical Industry - A brief review
c. Pharmaceutical Education - A brief review.
d. Pharmaceutical ethics & policy

An elaborate study of the following

UNIT-II
Pharmacy Act 1948
UNIT-III
Drugs and Cosmetics Act 1940 and Rules 1945
UNIT-IV
Medicinal & Toilet Preparations (Excise Duties) Act 1955
UNIT-V
Narcotic Drugs & Psychotropic Substances Act 1985 &A.P. N. D. P.S Rules 1986
UNIT-VI
Drugs (Prices Control) Order 1995.
UNIT-VII
Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 and Rules 1955.
UNIT-VIII
A study of the salient features of the following.

a. Prevention of Cruelty to animals Act 1960.
b. AP State Shops & Establishments Act 1988 & Rules 1990.
c. Factories Act 1948.
d. WTO, GATT and The Indian Patents Act 1970
e. Pharmaceutical Policy 2002.

Note: The teaching of all the above Acts should cover the latest amendments.

TEXT BOOKS

2. B.M.Mithal, Text book of Forensic Pharmacy, publ by Vallabh Prakashan
3. Prof. Suresh Kumar J.N, Text book of Forensic Pharmacy by. Frontline Publications
4. C.K.Kokate & S.B.Gokhale, Textbook of Forensic Pharmacy

REFERENCE BOOK

1. Bare Acts and Rules Publ by Govt of India/state Govt from time to time.
2. AIR – reported judgments of Supreme Court of India and other High Courts
3. Pharmaceutical policy of India
4. Notification from NPPA
5. Vijay Malik, Drugs & Cosmetics act 1940 and Rules, Eastern Law House Co. Delhi, Kolkata.
6 K.Sampath, Pharmaceutical Jurisprudence (Forensic Pharmacy)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

III Year B. Pharmacy II-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7506) ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

1. Introduction

The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be an integrated theory and lab course to enable students to use 'good' English and perform the following:

Gather ideas and information, to organise ideas relevantly and coherently.
Engage in debates.
Participate in group discussions.
Face interviews.
Write project/research reports/technical reports.
Make oral presentations.
Write formal letters.
Transfer information from non-verbal to verbal texts and vice versa.
To take part in social and professional communication.

2. Objectives:

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.

Further, they would be required to communicate their ideas relevantly and coherently in writing.

3. Syllabus:

The following course content is prescribed for the Advanced Communication Skills Lab:

UNIT – I

Fundamentals of interpersonal communication – starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations.

UNIT – II

Vocabulary building – synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases.

UNIT – III

Group Discussion – dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.

UNIT – IV

Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing.

UNIT – V

e-Mail – content, formats – formal/informal. Structure, etiquette, structure and presentation.

UNIT – VI

Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets, summary, formats and styles, letter-writing.

UNIT – VII

Reading comprehension – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading.

UNIT – VIII

Technical Report writing – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.

4. Minimum Requirement

Computer aided multimedia language lab with 60 systems with LAN facility with speakers, head phones and a teacher console to accommodate 60 students.

5. Suggested Software

The software consisting of the prescribed topics elaborated above should be procured and used.

6. Books Recommended:

1. Effective Technical Communication, M. Ashraf Rizvi, Tata Mc. Graw-Hill Publishing Company Ltd.
2. A course in English communication by Madhavi Apte, Prentice-Hall of India, 2007.
3. Communication Skills by Leena Sen, Prentice-Hall of India, 2005.
4. Academic Writing- A Practical guide for students by Stephen Bailey, Rontledge Falmer, London & New York, 2004.
5. Body Language- Your Success Mantra by Dr. Shalini Verma, S. Chand, 2006.
6. Books on TOEFL/GRE/GMAT/CAT by Barron's/cup
7. IELTS series with CDs by Cambridge University Press.
8. Technical Report Writing Today by Daniel G. Riordan & Steven E. Pauley, Biztantra Publishers, 2005.
9. Basic Communication Skills for Technology by Andra J. Rutherford, 2nd Edition, Pearson Education, 2007.
10. Communication Skills for Engineers by Sunita Mishra & C. Muralikrishna, Pearson Education, 2007.
11. Objective English by Edgar Thorpe & Showick Thorpe, 2nd edition, Pearson Education, 2007.
12. Objective IELTS by Michal Black & Wendy Sharp, Cambridge University Press.
13. Objective IELTS by Michal Black & Annette Capel, Cambridge University Press.
14. Cambridge Preparation for the TOEFL Test by Jolene Gear & Robert Gear, 4th Edition.
15. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press.

TEXT BOOKS

1. Strengthen Your English, Bhaskaran & Horsburgh, Oxford University Press
2. English for Technical Communication, K R Lakshminarayana, SCITECH
3. Strategies for Engineering Communication, Susan Stevenson & Steve Whitmore (John Wiley and sons).
4. English for Engineers: With CD, Sirish Chaudhary, Vikas Publishing House Pvt. Ltd.With CD.
5. Basic Communication Skills for Technology, Andrea J Rutherfoord, Pearson Education Asia.
6. Murphy's English Grammar with CD, Murphy, Cambridge University Press
7. English Skills for Technical Students by Orient Longman
8. English for Professional Students, by S S Prabhakara Rao.
9. The Oxford Guide to Writing and Speaking, John Seely, Oxford.
10. Grammar Games, Renvolucri Mario, Cambridge University Press.
11. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
12. English Technical Communication, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications.
13. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP English Pronouncing Dictionary Daniel Jones Current Edition with CD.
14. Spoken English- R. K. Bansal, J. B. Marrison and Orient Longman 2006 Edn.
15. A Practical course in English Pronunciation, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
16. Pronunciation Practice Activities: A resource book for teaching English pronunciation by Martin Hewings, Cambridge University Press, 2004.
17. English Pronunciation in use by Mark Hancock (with 4 CD)- Cambridge University Press, 2005.
18. A text book of English Phonetics for Indian Students by T.Balasubramanian (Macmillan)
19. English Skills for Technical Students, WBSCTE with British Council, OL
20. Effective Technical Communication, M. Ashraf Rizvi, Tata Mc. Graw-Hill Publishing Company Ltd.
21. Professional Presentations- A Video based course by Malcolm Goodale, Cambridge University Press, 2005.
22. A course in English communication by Madhavi Apte, Prentice-Hall of India, 2007.
23. Communication Skills by Leena Sen, Prentice-Hall of India, 2005.
24. Academic Writing- A Practical guide for students by Stephen Bailey, Rontledge Falmer, London & New York, 2004.
25. Body Language- Your Success Mantra by Dr. Shalini Verma, S. Chand, 2006.
26. Books on TOEFL/GRE/GMAT/CAT by Barron's/cup.
27. IELTS series with CDs by Cambridge University Press.
28. Anderson, Technical Communication-Thompson publications
29. Delta's Key to the Next Generation TOEFL Test, Nancy Gallagher.
30. Technical Report Writing Today by Daniel G. Riordan & Steven E. Pauley, Biztantra Publishers, 2005.
31. Basic Communication Skills for Technology by Andra J. Rutherford, 2nd Edition, Pearson Education, 2007.
32. Communication Skills for Engineers by Sunita Mishra & C. Muralikrishna, Pearson Education, 2007.
33. Objective Engish by Edgar Thorpe & Showick Thorpe, 2nd edition, Pearson Education, 2007.

III Year B. Pharmacy II-Semester	T	P	C
	0	3	2

(R7507) MEDICINAL CHEMISTRY – I LAB

I. Synthesis of some medicinal compounds and their analogues.

i. Barbituric acid from Diethyl Malonate.
ii. Phenytion from Benzoin or Benzil.
iii. Paracetomol from *para*- nitro phenol or *para*- aminophenol.
iv. 1,4- di hydro pyridine from ethyl aceto acetate.
v. Quinazolinone from anthranilic acid via benzoxazinone.
vi. Sulfanilamide from acetanilide
vii. Isoniazid from γ-picoline.
viii. Antipyrine from ethyl aceto acetate.
ix. Benzocaine from *para*- nitro benzoic acid.

II. Qualitative estimation of some functional groups.

i. Halogens (Strepheno's method).
ii. Hydroxyl groups (acetylation method)
iii. Methoxyl groups (Zeissel's method)
iv. Carboxyl groups (silver salt method).

- ***Not to be given in End Examinations***

REFERENCES

1. A.I. Vogel, Text Book of Practical Organic Chemistry, 5th Edition.
2. R.K. Bansal, Laboratory Manual of Organic Chemistry.
3. F.G. Mann & B.C. Saunders, Pratical Organic Chemistry, 4th Edition.

III Year B. Pharmacy II-Semester	T	P	C
	0	3	2

(R7508) PHARMACEUTICAL TECHNOLOGY – II LAB

1. Experiments to illustrate preparation, stabilization, physical, chemical and biological evaluation of pharmaceutical products like capsules, tablets, parenterals, microcapsules etc.
2. Evaluation of materials used in pharmaceutical packaging.

III Year B. Pharmacy II-Semester	T	P	C
	0	3	2

(R7509) PHARMACOLOGY – II LAB

1. Introduction to Experimental Pharmacology
Preparation of different solutions for experiments.
Drug dilutions, use of molar and w/v solutions in experimental Pharmacology.
Common laboratory animals and anesthetics used in animal studies.
Commonly used instruments in experimental pharmacology.
Some common and standard techniques.
Bleeding and intravenous injection, intragastric administration.

2. Experiments on intact preparations:
Study of different routes of administration of drugs in mice/rats.

3. Experiments in Central Nervous system:
Recording of spontaneous motor activity, stereotype, analgesia, anticonvulsant activity, anti-inflammatory activity,

4. To study the effect of autonomic drugs on rabbit's eye
5. To study the effects of various agonists and antagonists and their characterisation using isolated preparations like frog's rectus abdominus muscle and isolated ileum preparation of rat& guinea pig.

Experiments on Isolated Preparations:

i. a. To record the concentration response curve (CRC) of acetylcholine using rectus abdominus muscle preparation of frog.
b. To study the effects of physostigmine and d-tubocurarine on the crc of acetylcholine using frog rectus abdominus muscle preparation of frog.
c. To record the CRC of 5-HT on rat fundus preparation.
d. To record the CRC of histamine on guineapig ileum preparation.

ii. a. To study the inotropic and chronotropic effects of drugs on isolated frog heart.
b. To study the effects of drugs on normal and hypodynamic frog heart.

6. Experiments pertaining to analgesia, anti-convulsant activity, anti-inflammatory activity (***Only demonstration)***.

III Year B. Pharmacy II-Semester	T	P	C
	0	3	2

(R7510) CHEMISTRY OF NATURAL DRUGS LAB

1. Preparation of different alkaloid testing reagents like Dragendroff, Mayer' Wagner's, etc. and testing some alkaloids and plant extracts using these reagents.
2. Identification of alkaloids by specific colour tests.
3. Tests for steroids, steroidal glycosides and cardiac glycosides. Liberman- Burchard test, Salkowski reaction, Kedde reaction, etc.
4. Tests for flavanoids and their glycosides. Shinoda Test (Mg /Hcl test), $Fecl_3$ test.
5. TLC end examination of alkaloids, steroids, steroidal glycosides and cardiac glycosides.
6. Identification of natural products.
7. Extraction of caffeine from tea leaves.
8. Extraction of lactose from milk.
9. Extraction of nicotine from tobacco.
10. Extraction of piperine from black pepper.
11. Extraction of lycopene from tomatoes.
12. Extraction of beta - carotene from carrots.
13. Volatile oil production by steam distillation (***Demonstration only)***

TEXT BOOKS

1. Indian Pharmacopoeia – 1996.
2. Weagners, Phyto Chemical Methods of Drug Analysis.
3. C.K. Kokate, Practical Pharmacognosy

IV Year B. Pharmacy I-Semester	T	P	C
	3+1*	0	3

(R7601) PHARMACEUTICAL ANALYSIS – II

UNIT – I
Visible, UV & IR Spectrophotometry: Principle, Electron Transition, Beer-Lamberts Law & Deviations, Chromophores, Instrumentation – Construction of Single Beam and Double Beam Spectrophotometers, Applications.

UNIT - II
NMR and Mass Spectrometry: Basic Principle, Instrumentation and Applications.

UNIT - III
Basic Principles and applications of differential thermal analysis (DTA) and differential scanning colorimetry (DSC).
Basic Principles and applications of atomic absorption spectroscopy and XRD.

UNIT – IV
Optical rotatory dispersion (ORD) and Circular dichroism: General Principle and Applications.
Radio Immuno Assay & Enzyme Linked Immuno Sorbate Assay.

NOTE: Introduction to chromatographic techniques
Principle, Instrumentation and applications of the instruments in UNIT V to UNIT VII

UNIT - V
Paper, TLC and column chromatography.

UNIT - VI
Gas Chromatography.

UNIT - VII
HPLC and HPTLC.

UNIT – VIII
Electrophoresis: Scope, Different types Electrophoresis and applications.

TEXT BOOKS

1. R.M. Silvesterin and G.C. Bassler.Spectrometric Identification of Organic Compounds.
2. AH Beckett & Stenlake, Text book of Practical Pharmaceutical chemistry, Vol.I&II
3. AI Vogel, Quantitative Chemical Analysis.
4. Hobart. H. Willard and others, Instrumental methods of analysis, CBS publ and Distributors New Delhi.
5. Robert D. Brown, Introduction to Instrumental Analysis.
6. Skoog, Principles of Instrumental Analysis.
7. B.K.Sharma, Instrumental and Chemical Analysis, Goel Publ House ,

REFERENCES

1. Settle, Handbook of Instrumental Techniques for Analytical Chemistry.
2. Y.Anjaneyulu & Maraiah, Quality Assurance & Quality Management in Pharmaceutical Industry.
3. P.D. Sethi, Quantitative analysis of Drugs and Pharmaceuticals.
4. K. A. Connors, A Textbook of pharmaceutical analysis, Wiley Interscienc, NY.
5. A.M. Knevel & F.E. Digengl, Jenkin's quantitative pharmaceutical chemistry, Mc Graw Hill Book Co., NY.
6. Pharmacopoeia (IP, BP, USP, PhI, Eu. PhI).

IV Year B. Pharmacy I-Semester	T	P	C
	3+1*	0	3

(R7602) BIOPHARMACEUTICS AND PHARMACOKINETICS

UNIT-I

Introduction to Biopharmaceutics and Pharmacokinetics and their role in formulation development and clinical setting

UNIT-II

Biopharmaceutics: Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion and pinocytosis) factors influencing absorption – physiochemical, physiological and pharmaceutical.

UNIT-III

Drug distribution in the body, Factors influencing distribution.

UNIT-IV

Plasma protein binding, binding sites, factors influencing protein binding

UNIT-V

Pharmacokinetics

Significance of plasma drug concentration measurement.
Compartment model: Definition and scope.
Pharmacokinetics of drug absorption – Zero order and first order absorption rate constant using Wagner Nelson and Loo-riegelman method.
Volume of distribution and distribution coefficient.
Comparative kinetics : One compartment and two compartment models. Determination of Pharmacokinetic parameters from plasma and urine data after drug administration by oral parenteral and other routes.
Curve fitting (Method of Residuals) Regression procedures.
Clearance concept, Mechanism of Renal clearance, clearance ratio, determination of renal clearance.
Non-linear pharmacokietics with special reference to one compartment model after I.V.Drug administration, Michales Mente Equation, detection of non-linearity (Saturation mechanism).

UNIT-VI

Clinical pharmacokinetics

Definition and scope
Dosage adjustment in patients with and without renal and hepatic failure.
Pharmakokinetic drug interactions and its significance in combination therapy.

UNIT-VII

Bioavailability and bioequivalance.

Measures of bioavailability, C-max, T-max and Area Under the Curve (AUC)
Design of single dose bioequivalance study and relevant statistics.
Overview of regulatory requirements for conduction of bio-equivalence studies.

UNIT-VIII

Bio availability and bio equivalence including evaluation testing protocols.

g. In vitro dissolution studies for solid dosage forms methods, interpretation of dissolution data in vitro, in vivo correlations.
h. Bioavailability testing protocol and procedures.
i. In vivo methods of evaluation – statistical treatment.

TEXT BOOKS

1. Venkateshulu, Fundamentals of Biopharmaceutics and Pharmacokinetics, Pharma Book Syndicate.
2. Milo Gibaldi, Biopharmaceutics and clinical pharmacokinetics 4/Edn. Pharma Book Syndicate.
3. DM Brahmankar and SB Jaiswal, biophamaceutics and pharmacokinetics- a treatise, vallabh prakasham, Delhi,
4. P.L. Madan, Biopharmaceuticas and Pharmacokinnetics, Jaypee Bros.

REFERENCES

1. Remington's pharmaceutical sciences, Mac Pub. Co., Easton Pensylvania.
2. Modern pharmaceutics by banker Marcel Dekker Inc., NY
3. L. lachman, H.A.Lieberman, JL. Kanig, the theory aad practice of industrial pharmacy, Varghese publ house, Mumbai.
4. AR. Gennerio Remington: the science andpractice of pharmacy, vol 1 &2 Lippincott Williams & wilkins, Philadelphia, 2004.

5. Robert E notary, Biopharmaceutics and pharmacokinetics – an introduction, arcel dekker inc., NY
6. L. Shargel and ABC Yu, textbook of applied biopharmaceutics & pharmacokinetics, 4th edn, Appleton – centuary – crofts, Connecticut, 2004.

IV Year B. Pharmacy I-Semester	T	P	C
	4+1*	0	4

(R7603) PHARMACOLOGY – III

UNIT-I

Drugs Acting on the Gastrointestinal Tract

a. Antacids, Antisecretory and Anti-ulcer Drugs
b. Laxatives and antidiarrhoeal drugs
c. Appetite Stimulants and Suppressants.
d. Emetics and anti-emetics
e. Miscellaneous; Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics.

UNIT-II

Chemotherapeutic agents and their applications:

a. General principles of chemotherapy.
b. Sulphonamides and co-trimoxazole.
c. Antibiotics: Penicillins, cephalosoporins, betalactams,

UNIT-III

Chemotherapeutic agents and their applications: Tetracyclines aminoglycosides, chloramphenicol, erythromycin, quinolones and miscellaneous antibiotics.

UNIT-IV

Chemotherapy of tuberculosis & leprosy.

UNIT-V

Chemotherapy of fungal diseases,viral diseases,urinary tract infections and sexually transmitted diseases.

UNIT-VI

Chemotherapy of malignancy and immunosuppressive Agents.

UNIT-VII

Principles of Toxicology: Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates opioids, organophosphorous and atropine poisoning. Heavy metals and heavy metals antagonisits.

UNIT-VIII

Principles of bioassys. Errors in bioassys. Study of bioassay methods for the following drugs
a. Digitalis, **b**. D – tubocaratine, **c**. Oxytocine , **d**. HCG.

TEXT BOOKS

1. Sathoskar, Pharmacology and pharmaco therapeutics, Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.
2. Bertram. G. Katzung, Basic and clinical pharmacology
3. Tripathi, Textbook of Pharmacology.
4. Rang & Dale, Textbook of Pharmacology.

REFERENCE BOOKS

1. J.G. Hardman and Lee E. Limbard, Good Mann & Gilmann: The Pharmacological basis of therapeutics, Mc Graw hill, Health Professions Dvn.
2. H.P Rang, M. M. dale & J.M. Ritter, Pharmacology, Churchill Living stone, 4th Ed.
3. J. Crossland, Lewis 's Pharmacology, Church living stone.

IV Year B. Pharmacy I-Semester

T	P	C
4+1*	0	4

(R7604) MEDICINAL CHEMISTRY – II

UNIT – I

Antibiotics: Brief historical background, definition, requirements for a substance to be considered as an antibiotic and classification of antibiotics.

Penicillins: Historical background and biological sources. Structures of different penicillins.

Nomenclature: Numbering and naming according to the CA and USP systems, as derivatives of penam, penicillanic acid and as penicillins (trivial system).

Reactions: Hydrolysis of penicillin by cold and hot dilute mineral acid, alkali, enzymatic hydrolysis with Pencillinase, amidase and methanolysis followed by aqueous mercuric chloride.

Classification: Oral and parenteral, based on spectrum of activity and resistance to β-lactamase, as natural, biosynthetic and semi-synthetic.

General method of synthesis of pencillins from 6-APA, SAR, mechanism of action, therapeutic uses, toxicity. A note on β-lactamase inhibitors.

UNIT – II

Cephalosporins: Historical background and biological sources. Structures of some important Cephalosporins and Cephamycins. Acid hydrolysis of Cephalosporin C. Comparison of 6-APA and 7-ACA, penam and cepham.

Classification: Generations of cephalosporins Oral and parenteral, SAR and Advantages over penicillins.

UNIT – III

Tetracyclins: Biological sources, structures of the important tetracyclines, important structural units and the three acidity constants in the tetracycline molecule, Amphoteric nature, epimerisation, chelation with metals, mechanism of action, spectrum of activity, SAR and toxicity.

UNIT – IV

Aminoglycosides: Structure of streptomycin, acid hydrolysis, mechanism of action, therapeutic uses and toxicity. Dihydrostreptomycin and its importance. A mention of other aminoglycoside antibiotics.

A brief account of chloramphenicol, macrolide and polypeptide antibiotics and Rifampicin (Structures not included).

UNIT – V

Vitamins: ***Introduction and Classification***.

Fat-soluble vitamins: Vitamins A– Structure, Physiological role and uses, Tretinoin (Retinoic acid), Isotretinoin.

UNIT – VI

Fat-soluble vitamins: Vit D – Structures – Physiological role and uses, preparation of ergocalciferol from ergosterol, and cholecalciferol from 7-dehydrocholesterol.

UNIT – VII

Fat-soluble vitamins: Vit E – Structures of α, β and γ - tocopherols – Physiological role and uses.

Fat-soluble vitamins: Vitamin Ks – Vit K_1, K_2, K_3 and K_4 – Structures – Physiological role and uses.

UNIT – VIII

Water soluble vitamins: Structures, physiological role and uses of Vit B_1, B_2, B_6, B_{12}, Nicotinic acid and amide, Cyanocobalamine, folic acid and Ascorbic acid.

Some important reactions of water soluble vitamins like: The oxidation of thiamine to thiochrome, the oxidation of nicotine to nicotinic acid, the amidation of nicotinic acid to nicotinamide, the degradation of riboflavine to lumiflavine and lumichrome, the reduction of folic acid to dihydro and tetrahydro folic acids in the biological system, the oxidation of Ascorbic acid to dehydroascorbic acid.

NOTE:

1. Structure elucidation of compounds is **not** included in the syllabus.
2. Structural features like the basic nucleus, presence of substituent groups will be discussed.
3. Simple reactions like hydrolysis, selenium dehydrogenation, oxidation, reduction etc., will be taught wherever applicable.

TEXT BOOKS

1. William O. Foye, Textbook of Medicinal Chemistry, Lea & Febiger, Philadelphia.
2. JH Block & JM Beale, Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry by (Eds), 11th Ed, Lipincott, Raven, Philadelphia, 2004.
3. S. N. Pandeya, Textbook of mediacinal chemistry, SG Publ. Varanasi, 2003.
4. Sri Ram, Medicinal Chemistry.
5. Rama Rao Nadendla, Medicinal Chemistry.

REFERENCES

1. D. Abraham (Ed), Burger Medicinal chemistry ad Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003.
2. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences
3. L. M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry. Oxford University Press, Delhi.
4. B.N. Lads, MG.Mandel and F.I. way, Fundamentals of drug metabolism & disposition, William & welking co, Baltimore USA.
5. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, oxford 1991.
6. Daniel lednicer, Strategies For Organic Drug Synthesis And Design, John Wiley, N. Y. 1998.
7. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.
8. Kadam, Textbook of Medicinal Chemistry Vol. 1 & 2.
9. O.P.Agarwal, Text book of natural products by Vol. 1 & 2

IV Year B. Pharmacy I-Semester	T	P	C
	4+1*	0	4

(R7605) PHARMACY ADMNISTRATION

UNIT – I

Features of Business Organisations & New Economic Environment:

Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-Liberalisation scenario.

UNIT – II

Manufacturing Management: Goals of Production Management and Organisation – Production, Planning and Control – Plant location -Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), New Product Development.

UNIT – III

Work Study -Basic procedure involved in Method Study and Work Measurement-Statistical Quality Control: $\overline{X}$ chart, R chart, *c* chart, *p* chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.

UNIT – IV

Organisation of Distribution and Marketing: Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle., Channels of distribution – Factors influencing channels of distribution, sales organization and sales promotion.

UNIT - V

Pharma Industry: Growth of Pharma Industry in India – current status and its role in building national economiy and national health – Structure of Pharma Industry in India – PSUs in Pharma Industry –Progress in the manufacture of basic drugs, synthetic and drugs of vegetable origin. Export and import of drugs and pharmaceuticals – Export and import Trade.

UNIT – VI

Insurance and Pharma: Various types of insurance including marine and health insurance.

UNIT – VII

Pharmaceutical associations and societies, statutory councils governing the profession. General Principles of medical detailing.

UNIT – VIII

Principles of drug store and community pharmacy administration: Drug store planning and layout, sales promotion and salesmanship in drug store. Accounting records in drug stores.

TEXT BOOK

1. Aryasri and Subbarao, Pharmaceutical Administration, TMH.
2. Smarta, Strategic Pharma Marketing
3. G.Vidya Sagar, Pharmaceutical Industrial Management.

REFERENCES

1. Subbarao Chaganti, Pharmaceutal Marketing in India – Concepts and Strategy Cases, Pharma Book Syndicate.
2. O.P.Khanna, Industrial Management, Dhanpatrai, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B. Pharmacy I-Semester	**T**	**P**	**C**
	0	**0**	**2**

(R7606) INDUSTRIAL TRAINING AND SEMINAR

a. Industrial Pharmacy
b. Clinical Pharmacy/Pharmacology
c. Pharmacognosy/Med. Chem.
d. Pharmaceutical Analysis/Quality assurance
e. Pharmaceutical Marketing

IV Year B. Pharmacy I-Semester	T	P	C
	0	3	2

(R7607) PHARMACEUTICAL ANALYSIS – II LAB

Experiments

1. Interpretation of IR Spectra.
2. Determination of λ- max of a drug.
3. Determination of concentration of glycerine by Abbe's refractometer.
4. Assay of ibuprofen - UV-spectro photometry.
5. Assay of paracetomol - UV-spectro photometry.
6. Assay of riboflavin- Colorimetric method.
7. Assay of rifampicin - Colorimetric method.
8. Ascending paper chromatography.
9. Radial paper chromatography.
10. Two dimension chromatography
11. Thin layer chromatography.
12. Column chromatography (***Demonstration Only***).
13. Paper electrophoresis of amino acids.
14. Gel electrophoresis (***Demonstration Only***).
15. HPLC ***(Demonstration Only***).

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IV Year B. Pharmacy I-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7608) BIOPHARMACEUTICS& PHARMACOKINETICS LAB

1. Experiments designed for the estimation of various pharmacokinetic parameters with given data
2. Analysis of biological specifications for drug content and estimation of the pharmakinetic parameters.
3. In vitro evaluation of different dosage forms for drug release
4. Absorption studies – *in vitro* and *in vivo*.
5. Statistical treatment of pharmaceutical data.

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IV Year B. Pharmacy I-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7609) PHARMACOLOGY – III LAB

1. Experiments on Isolated Preparations:
   a. To calculate the PA_2 value of atropine using acetylcholine as an agonist on rat ileum preparation.
   b. To calculate the PA_2 value of mepyramine or chloramphenіramine using histamine as agonist on guinea pig ileum.
   c. To find out the strength of the given sample on (e.g. Acetycholine, Histamine, 5-HT. Oxytocin etc.) Using a suitable isolated muscle preparation by
      i. Matching Assay
      ii. Two point Assay
      iii. Three point Assay

2. Pharmacology of the Gastrointestinal Tract
   To study the anti-secretory and anti-ulcer activity using pylorus ligated rats.

IV Year B. Pharmacy I-Semester	T	P	C
	0	3	2

(R7610) MEDICINAL CHEMISTRY – II LAB

Estimations of the following.

1. Ascorbic acid.
2. Vitamin B1.
3. Penicillin.
4. Alkaloid (by gravimetry).
5. Phosphoric acid by volumetric method
6. Lactic acid by volumetric method
7. Salicylic acid by volumetric method
8. Ibuprofen by volumetric method
9. Aspirin by volumetric method

REFERENCES

1. Indian Pharmacopoeia.. – 1996, 4th Edition.
2. P.D.Sethi – Quantitative Analysis of Drugs and Pharmaceuticals.
3. B.G.Nagavi Lab Hand Book of Instrumental Drug Analysis.

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IV Year B. Pharmacy II-Semester	**T**	**P**	**C**
	3+1*	**0**	**3**

(R7701) NOVEL DRUG DELIVERY SYSTEMS & REGULATORY AFFAIRS

UNIT-I
Oral Control Drug Delivery Systems: Fundamentals, Dissoultion Contolled, Diffusion Controlled, Ion Exchange Resins, Osmotic based systems, pH Independent Systems and altered density systems.

UNIT – II
Transdermal Drug Delivery Systems: Fundamentals, types of TDDS, Materials Employed and Evaluation of TDDS.

UNIT - III
Mucoadhesive Delivery Systems: Mechanism of bioadhesion, mucoadhesive materials, forumulation and evaluation of mucoadhesive-based systems.

UNIT – IV
Targeted Drug Delivery Systems: Fundamentals and applications, formulation and evaluation of liposomes, resealed erythrocytes and nano particles.

UNIT-V
Introduction Drug Regulatory Agencies: Indian CDSCO, US FDA, Canadian HPFBI, and Australian TGA

Introduction to NDA & ANDA Submissions of USFDA

UNIT-VI
Introduction to quality assurance activities related to warehouse control, manufacturing control, packaging control and quality control.

UNIT-VII
Introduction to Good Manufacturing Practices: Schedule – M (India), CFR 21 Part 210 and 211 of US FDA.

UNIT-VII
Introduction to Validations: Process validation (prospective, retrospective & concurrent), analytical method validation (accuracy, precision, specificity, linearity, range, robustness etc.), cleaning validation (sampling procedure and acceptance criteria)

TEXT BOOKS

1. N.K. Jain, Control Drug Delivery Systems by
2. Y.Anjaneyulu & Maraiah, Quality Assurance & Quality Management in Pharmaceutical Industry.
3. L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of industrial pharmacy by, Lea & Febieger, Philadelphia Latest Edn.
4. Shobhan Rani Hiremath Text Book of Industrial Pharmacy.

REFERENCES

1. Leon Shargel Isadore Kanfer, Generic Drug Product Development, Solid Oral Dosage Forms, Marcel Dekker.
2. Sagarian & MS Balsam, Cosmetics Sciences &Technology.Vol.1, 2 & 3
3. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
4. E.A Rawlkins, Bentley's Text Book of Pharmaceutics, Elbs publ
5. HC Ansel, Introduction to Pharmaceutical Dosage forms
6. S.H. Willing, M.M Tucherman and W.S. Hitchings IV, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, Marcel Dekker, Inc., New York
7. Gilbert S. Banker and Christopher T Rhodes, Modern Pharmaceutics, IVth ed, marcel dekker, usa, 2005.
8. Yiew Chien, novel drug delivery systems, 2nd ed, marcel dekker 2003.
9. Robert. A. Nash, Pharmaceutical Process Validation, 3rd Ed Marcel Dekker, 2003.
10. Good Manufacturing Practices – Schedule M Read with The Drugs And Cosmetic Rules 1945.
11. M.E. Aulton, Pharmaceuitcs- The science of Dosage form Design 2nd ed.
12. Aukunuru Jithan, Oral Drug Delivery Technology.

IV Year B. Pharmacy II-Semester

T	P	C
3+1*	0	3

(R7702) PHARMACEUTICAL BIOTECHNOLOGY

UNIT - I

Fermentation Technology: Isolation, Selection, Screening of Industrial important microbes, Strain improvement. Types, design & operation of Bioreactor. Types of fermentations, optimization of fermentation process, Principle and Procedure involving in downstream process and effluent treatment.

UNIT - II

Specific Fermentations: Selection of organism, fermentation & purification of various antibiotics, vitamins, aminoacids, organic acids, solvents like penicillin, streptomycin, tertacyclin, erythromycin, riboflavin, cynacobalamin, glutamic acid, lysin, citric acid, lactic acid, alcohol, acetone etc.

UNIT - III

Microbial Transformations: Types, Methods of bioconversions & Application in Pharma Industry, Steroidal transformation.

UNIT – IV

Recombinant DNA Technology: Introduction to r-dna technology and genetic engineering, steps involved, isolation of enzymes, vectors, recombination and cloning of ggenes.
Production of bio technology derived therapeutic proteins like humulin, humatrop, activase, intron a, monoclonal antibodies by hybridoma technique, recombivax HB(hepatitis b).

UNIT – V

Immunology & Immunological Preparations: Principles of Immunity, Humoral immunity, cell mediated immunity, antigen – antiboby reactions, hypersensitivity and its applications.
Active & passive immunizations vaccine preparation, standardization & storage of BCG, cholera, smallpox, polio, typhus, tetanus toxoide, immuno serum & diagnostic agents.

UNIT – VI

Enzyme Technology: Techniques of immobilization of enzymes, factors affecting enzyme kinetics, advantages of immobilization over isolated enzymes.
Study of enzymes such as hyaluronidas, penicillinase, streptokinase, streptodornase, amylase, protease etc. immobilization of bacteria & plant cells.

UNIT - VII

Introduction, role, collection, process & storage of blood products, plasma substitutes and sutures & ligatures like whole human blood, human normal ig, dextran, catgut etc.

UNIT – VIII

Introductory study & applications of bioinformatics, proteomics and genomics.

TEXT BOOKS

1. Wulf Crueger and Anneliese Crueger, Biotechnology, 2nd Ed, Publ- Panima publication co-operation, New Delhi.
2. P. F. Stanbury & A. Whitaker, Principles of fermentation technology, Pergamon Press
3. B.P. Nagori & Roshan Issari, Foundations in Pharmaceutical Biotechnology
4. Sambamurthy. K, Text Book of Pharmaceutical Biotechnology.
5. S. S. Kori, Pharmaceutical biotechnology.

REFERENCES

1. Prescott and Dunne, “Industrial Microbiology” MC Caraw Hill Bool Company
2. Peppler “Microbial Technology” Vol. 1 & 2.
3. K. Kielsliched “Biotechnology” Vol 6, Verlegchemic, Switzerland.
4. PF Standury & A. Whitaker, “Principles of fermentation Technology” Pergamon Press, Oxford
5. OP Ward” Fermentation Technology, Principles, Processes products” Open University press, Milton Keynes, UK.
6. A. M. Campbelli, Monoclinical antibody technology.
7. A. Wiseman, Handbook of enzyme biotechnology.
8. J. D. Watson, Recombinant DNA technology.
9. Smith and Hood, Molecular biology and biotechnology.
10. E.A. Rawlins, Bentley’s, A text book of pharmaceutics, 8th Ed, 1982 Bailler Tindall & Co.
11. Alexander N. Glazer & Hiroshi Nikaido, Microbial biotechnology, W. H. Freeman Co.
12. Ahwood.T.K, Introduction to Bio Informatics.
13. Cassida, Industrial microbiology.
14. H.K. Das, Textbook of Biochemistry.

IV Year B. Pharmacy II-Semester

T	P	C
3+1*	0	3

(R7703) MEDICINAL CHEMISTRY – III

Note:
***A study of the following classes of drugs including introduction, classification with examples of structures, mechanism of action, SAR and metabolism. Synthesis of compounds specified against each class is to be studied* for the following UNITS**

UNIT – I
Drugs acting on Cardio-vascular diseases:
General account of cardiovascular diseases
Antihypertensives – Methyldopa, amlodipine, enalapril, losartan.

UNIT – II
Anti-arrhythmics – Procainamide
Diuretics – **Acetazolamide, hydrochlorthiazide, furosemide**
Anticoagulants, Anti-anginals and Coronary vasodilators – Isosorbide dinitrate, verapamil, diltiazem

UNIT – III
Antihyperlipidemics (Hypocholesteremic drugs)- Clofibrate. A brief account on statins

General account on pancreatic and thyroid hormonal malfunctions.
Antidiabetics – Phenformin, Glipizide including a brief account on PPAR inhibitors, Meglitinide analogues,
α-Glucosidase inhibitors – Acarbose, Miglitol

Drugs affecting Thyroid Function: Methimazole, Propylthiouracil, Insulin preparations

UNIT – IV
Analgesics and NSAIDS (Non-steroidal anti-inflamatory agents):

i. Introduction and types of pain and inflammation
ii Classification and systematic development of analgesics of morphine, mild analgesics and strong analgesics: Meperidine and Methadone
iii. NSAIDS – Aspirin, paracetamol, oxyphenbutazone, ibuprofen, indomethacin, diclofenac and meloxicam
iv. A brief account on Cox-2 inhibitors and Nimsulide.

UNIT – V
Chemotherapeutic Agents:
Sulpha drugs - Sulphadiazine, Suphasalzine, Trimethoprim, Sulphamethoxazole, Sulphameter
Anti viral Drugs - Acyclovir, Zidovudine
Antifungal Agents - Fluconazole and Itraconazole.

UNIT – VI
Anti tubercular agents : Isonicotinic acid hydrazide and ethambutol,
Anti leprotic agents : Dapsone, clofazemine
Antiamoebics : Metronidazole, diloxanide furoate

UNIT - VII
Anthelmintics : Diethylcarbamazine citrate, pyrantel pamoate, mebendazole, albendazole
Antimalarial drugs : Chloroquine, primaquine and pyrimethamine, norflaxacin and ciprofloxacin

UNIT – VIII
Anticancer Drugs : Chlorambucil, busulphan, procarbazine, carmustine, 5-flurouracil, 5-mercaptopurine methotrexate, vinca alkaloids – vinblastin, vincristine

TEXT BOOKS

1. William O. Foye, Textbook of Medicinal Chemistry by, Lea Febiger, Philadelphia.
2. JH Block & JM Beale, Wilson & Giswold's Textbook of organic Medicinal Chemistry and pharmaceutical chemistry by (Eds), 11th Ed, Lipcott, Raven, Philadelphia, 2004.
3. S. N. Pandeya, Textbook of mediacinal chemistry, SG Publ. Varanasi, 2003.
4. Rama Rao Nadendla, Medicinal Chemistry.

REFERENCES

1. D. Abraham (Ed), Burger Medicinal chemistry ad Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003, 6th Ed.
2. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences
3. L. M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry. Oxford University Press, Delhi.
4. B.N. Lads, MG.Mandel and F.I. way, Fundamentals of drug metabolism & disposition, William & welking co, Baltimore USA.
5. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, oxford
6. Daniel lednicer, Strategies For Organic Drug Synthesis And Design, John Wiley, N. Y. 1998.
7. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.

IV Year B. Pharmacy II-Semester

T	P	C
3+1*	0	3

(R7704) PHARMACOGNOSY – III

UNIT – I

Evaluation of crude drugs.

Adulteration of curde durgs and their detection by
i) Organoleptic ii) Microscopic iii) Physical iv) Chemical and Biological methods of evaluation

UNTI - II

Phytochemical Screening: Identification & isolation of plant constituents, identification and estimation of various functional groups in phytoconsitituents.

UNIT – III

Introudction, classfication and study of different chromatographic methods and their applications in evaluation of crude drugs.

UNIT – IV

Plant Tissue Cultue: History, types, media requirements, methodology for establishment of cultures, growth measurements and applications.

UNIT – V

Study of traditional drugs: Common and vernacular names, sources, chemical constituests and uses of kantakari, malkanguni, shatavari, sankhapushphi, tylophora, bilva, kalijeeri, rasna, apamarga, gokhru, gudhuchi, bach, amla, methi, guggul, kalimusli, punarnava, chitrak and brahmi.

UNIT – VI

Herbal Formulations

a. General introduction to alternative systems of medicine like Ayurveda, Siddha, Unani and Homoeopathy.
b. Methods of preparation of formulations in Ayurveda like churnas, lehyas, tailas, bhasmas, asavas and arishta.

UNIT – VII

Herbal Formulations

a. ***General introduction to cosmecuticals role of herbs in cosmetics***: Study of the following drugs. Amla, henna, cyperus, soap nut, aloe vera, turmeric, sandal wood, bitter organge peel
b. ***Definition and study of Neutraceuticals***: Garlic, spirulina, soya and royal jelly.

UNIT – VIII

Introduction and importance of herbal medicine, herbal cosmetics and herbal drug industry.

TEXT BOOKS

1. J.B.Harbone, Phytochemical Methods: A guide to modern techniques of Plant analysis by
2. Kokate C.K, Purohit AP & Gokhale S.B, The Pharmacognosy (Nirali)
3. Trease and Evans, Pharmacognosy, Latest Edition.
4. T.E. Wallis, Text Book of Pharmacognosy.

REFERENCES

1. Atal C.R & Kapur B.M Cultivation & Utilization of Medicinal Plants.
2. Ayurvedic Pharmacopoeia of India, Pub by Govt. of India.
3. Pharmacognosy and Phytotherapy Research: Chapter contributed by Subhash C. Mandal & S.Mohana Lakshmi in the book Biodiversity and Environmental Biotechnology by P.Dwiveit ateal, Scientific Publisher, Jodhpur.
4. Handa & Kapoor, Text book of Pharmacognosy.
5. S.S. Agarwal & M. Paridhavi, Herbal Drug Technology, University Press, .
6. Timir Baran JHa & Biswajit Gosh, Plant Tissue Culture, University Press, .
7. P. Dwiveti, Tissue Culture and Plant Science, Scientific Publisher, Jodhpur.
8. M. K. Razdan, An Introduction To Plant Tissue Culture, Oxford & IBH Publishing Co., New Delhi

IV Year B. Pharmacy II-Semester	T	P	C
	4+1*	0	4

(R7705) CLINICAL PHARMACY AND THERAPEUTICS

UNIT – I

Introduction to Clinical Pharmacy

UNIT – II

Basic concepts of Pharmacotherapy

a. Clinical Pharmacokinetics and individualization of Drug Therapy.
b. Special precautions in drugs usage during infancy and in the elderly (Pediatrics & Geriatrics).
c. Special precautions in drugs usage during pregnancy & lactation
d. Adverse Drug Reactions
e. The Basics of Drug Interactions
f. Interpretation of Clinical laboratory Tests.

UNIT – III

Important Disorders of Organ Systems and their Management:

a. ***Cardiovascular Disorders***: Hypertension, congestive heart failure, angina, acute myocardial infarction, cardiac arrhythmias
b. ***CNS Disorders***: Epilepsy, parkinsonism, schizophrenia depression

UNIT – IV

a. ***Respiratory Disease:*** Asthma.
b. ***Gastrointestinal Disorders:*** Peptic Ulcer Disease, Ulcerative Colitis, Hepatitis, and Cirrhosis.

UNIT –V

a. ***Endocrine Disorders:*** Diabetes mellitus and Thyroid Disorders.
b. ***Infectious Diseases****:* Tuberculosis, Urinary Tract Infefction, Enteric Infections,

UNIT – VI

Upper Respiratory Infections.

a. ***Hematopoietic Disorders***: Anemias.
b. ***Joint and Connective Tissue Disorders***: rheumatic diseases, gout and Hyperuricemia.
c. ***Neoplastic Diseases***: Acute leukaemias, Hodgkin's disease

UNIT – VII

Therapeutic Drug Monitoring

UNIT – VIII

Concept of Essential Drugs and Rational Drug use.

TEXT BOOKS

1. Katzung, B.G.Basic and Clinical Pharmacology, Prentice hall, International.
2. Laurence, DR and Bennet PN. Clinical Pharmacology, Scientific book agency
3. Dr. D.R Krishna, V. Klotz, Clinical pharmaco kinetics, Publ Springer Verlab
4. M Rowland and T N Tozer, "Clinical Pharmacokinetics" 2nd ed Lea & Febiger, NY.

REFERENCES

1. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences, 20th Edition.
2. Hamsten, Drug interaction, Kven Stockley.
3. J.K. Mehra, Drug interaction, Basic Bussiness Publ, Bombay.
4. Grahame smith and Aronson, Clinical pharmacology and drug therapy
5. Richard A Helms, Text Book of Therapeutics Drug and Disease Management Hardbound.
5. Herfindal E T and Hirschman JL, Williams and Wilkins, Clinical Pharmacy and therapeutics
6. Applied Therapeutics, The clinical uses of Drugs applied therapeutics INC
7. Dr. A.R. Paradker, Hospital and Clinical Pharmacy, Nirali Prakashan.

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IV Year B. Pharmacy II-Semester	**T**	**P**	**C**
	0	**0**	**4**

(RPROJECT WORK (200 MARKS)

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IV Year B. Pharmacy II-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7707) NOVEL DRUG DELIVERY SYSTEMS AND REGULATORY AFFAIRS LAB

1. Preparation and Evaluation of Matrix Tablets
2. Formualtion and Evaluation of Film Coated Tablets.
3. Formualtion and Evaluation of Enteric Coated Tablets.
4. Prepartion and Evaluation of Transdermal Drug Delivery Systems.
5. Formulation and Evaluation of Mucoadhesive Delivery Systems.
6. Evaluation of Market SR Formualtions.
7. Preparation and Evaluation of Alginate Beads.
8. Analytical Method Validation.
9. Assignment on Product development and filing to various regulatory agencies , FDA,MCC, EMEA,TGA.Etc (Ref.: www.fda.gov)

IV Year B. Pharmacy II-Semester	T	P	C
	0	3	2

(R7708) PHARMACEUTICAL BIOTECHNOLOGY LAB

1. Isolation of antibiotic producing microorganism from soil.
2. Enzyme immobilization by Ca-alginate method.
3. Determination of minimum inhibitory concentration of the given antibiotic. Antibiotic assay by cup plate method.
4. Collection, Processing, Storage and fractionation of blood.
5. Standardization of Cultures.
6. Microbiological assay of Antibiotics / Vitamins.
7. Production of alcohol by fermentation techniques.
8. Comparison of efficacy of immobilized cells.
9. Sterility testing of Pharmaceutical products.
10. Isolation of mutants by gradient plate technique.
11. Preparation of bacterial vaccine.
12. Preparation of blood products / Human normal immunoglobulin injection.
13. Extraction of DNA.
14. Separation techniques: Various types of Gel Electro Phoresis, Centrifugation.

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IV Year B. Pharmacy II-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7709) MEDICINAL CHEMISTRY – III LAB

Assay of some drugs from their formulations:

1. Sulpha methoxazole (anti bacterial)
2. Glibenclamide (hypoglycemic agent)
3. Metronidazole (antiprotozoal)
4. Ibuprofen (analgesic, antiinflammatory)
5. Furosemide (diuretic)
6. Isoniazid (anti tubercular)
7. Aspirin (analgesic, antipyretic, antiinflamatory and antithrombotic)
8. Phenytoin (anticonvulsant)
9. Phenobarbitol (sedative and hypnotic)
10. Diethylcarbamizine (antihelmintic)
11. Salbutamol (antiasthamatic)
12. Phenyl butazone (anti inflammatory)
13. compound benzoic acid (anti fungal)

REFERENCES

1. I.P. – 1996.
2. P.D.Sethi – Quantative Analysis of Drugs and Pharmaceuticals.
3. B.P. - 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B. Pharmacy II-Semester	**T**	**P**	**C**
	0	**3**	**2**

(R7710) PHARMACOGNOSY – III LAB

1. Determination of Leaf Constants (6 Experiments).
2. Laboratory experiment on isolation, separation, purification of various groups of chemical constituents (2 Experiments).
3. Experiments on paper and thin layer chromatographic evaluations of herbal drug constituents (8 Experiments).

BOOKS RECOMMENDED FOR REFERENCE:

PHARMACEUTICS

Cooper and Gunns "Tutorial Pharmacy" ed. S.J Carter, 6th edition, CBS Publisher, Delhi,

A N Martin, Arthur Cammarata, James Swarbrick, "Physical Pharmacy", 3rd edition, K M Varghese & Co., Bombay,

E Shotton and K Ridgway, "Physical Pharmaceutics" Oxford University Press, London,

"Remington's Pharmaceutical Sciences", ed. A R Gennaro, 18th ed, Mack Publishing Co.. P.A..

Leon Lachmen, H A Lieberman and J L Kanig, "The Theory and Practice of Industrial Pharmacy, 3rd ed. Lea & Febiger Philadelphia.

H C Ansel "Introduction to Pharmaceutical Dosage Forms", 3rd (Indian ed)
K M Varghese & Co. Bombay .

Cooper and Gunn's "Dispensing for Pharmaceutical Students" ed S J Carter, 12th ed., CBS Publishers, Delhi.

"Sprowl's American Pharmacy" ed L W Dittert, 7th ed J & B Lippincott Co., Philadelphia .

"Bentley's Textbook of Pharmaceutics" ed EA Rawlines, 8th ed ELBS Bacilliere Tindall.

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William E Hassan, "Hospital Pharmacy", 5th ed Lea & Febiger, Philadelphia.

"Modern Pharmaceutics" ed G S Banker and C T Rhodes, 2nd ed Marcel Dekker Inc., NY.

"Pharmaceutical Dosage, Forms and Drug Delivery Systems", 5th ed Lea and Febiger, Philadelphia .

S.Turco and R.E.King, "Sterile Dosage Forms" 3rd ed Lea and Febiger, Philadelphia.

H M Chitton and R L Witcofski, "Nuclear Pharmacy", Lea and Febiger, Philadelphia.

K A Connores, G L Amiden and V J Stella, "Chemical Stability of Pharmaceuticals" , 2nd ed John Wiley & Sons NY 1986.

"Pharmaceutics - The Science of Dosage Form Design" , ed M E Aulton, ELBS/Churchill Livingstone

J T Carstensen, "Drug Stability", Marcel Dekker Inc NY.

"Cosmetic Science and Technology" ed Sagarian and M S Balsam, Vol 1-3, 2nd ed John Wiley & Sons, NY

J S Jellinek, "Formulation and Function of Cosmetics", John Wiley & Sons, NY.

S G Thomsen, "Modern Cosmetics" Universal Publishing Corporation, Bombay.

"Advance in Pharmaceutical Sciences", ed H S Hean, A H Beckett, and J E Carless, Vol 1-4 Academic Press, London.

W L Macbe and J C Smith, "Unit Operation of Chemical Engineering" 4th ed McGraw Hill International Book Co., London.

C G Brown etal, "Unit Operations" (Indian ed) Asia Publishing House, Bombay.

W L Badger and J T Banchero, "Introduction to Chemical Engineering" McGraw Hill International Book Co., London.

B T Loftus and Robert Nash, "Pharmaceutical Process Validation", Marcel Dekker Inc. NY.

M L Schroff, "Professional Pharmacy", Five Star Enterprises, Calcutta

"Dispensing of Medication", Ed, E W Martin, 7th ed Mack Publishing Co., Eastern PA.

M J Stocklose, "Pharmaceutical Calculation", 6th ed Lea & Febiger, Philadelphia.

Joel L Zatz, "Pharmaceutical Calculations" John Wiley & Sons, NY.

J G Wagner, "Fundamentals of Clinical Pharmacokinetics", Drug Intelligence Publications, Hamilton.

R L Juliano, "Drug Delivery System", Oxford University Press, Oxford.

R E Notari, "Biopharmaceutics and Pharmacokinetics - an Introduction" 2nd ed Marcel Dekker Inc NY.

M Rowland and T N Tozer, "Clinical Pharmacokinetics" 2nd ed Lea & Febiger, NY.

M Gibaldi & D Perrier, "Pharmacokinetics", 2nd ed Marcel Dekker Inc NY

J G Wagner, "Pharmacokinetics for the Pharmaceutical Scientist", Technomic Publishing A G Basel, Switzerland .

"Milo Gibaldi, "Biopharmaceutics & Clinical Pharmacokinetics" 3rd ed. Lea & Fibiger, Philadelphia .

"Pharmaceutical Dosage Forms Tablets, Vols. 1-3 ed H A Lieberman, L Lachman & J B Schwartz, 2nd ed K E Avis, L Lachman and H A Lieberman, Macel Dekker Inc. NY.

"Pharmaceutical Dosage Forms; Disperse Systems", Vols. 1&2 ed H A Liberman, N M Rieger and G S Banker, Marcel Dekker Inc. NY.

J R Robinson & Vincent Lee, "Controlled Drug Delivery Fundamentals & Applications" 2nd ed Marcel Dekker Inc..

M C Winter, "Basic Clinical Pharmacokinetics", Applied Therapeutics, Inc San Fransisco

"Pharmacokinetics" eds A Pecile and A Rescigno, Plenum Press, NY.

S H Willing, IV, "Good Manufacturing Practices for Pharmaceuticals" 2nd ed Marcel Dekker Inc NY .

"Hard Capsules", ed K Ridgwey. The Pharmaceutical Press, London.

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A Owunwonne, "Handbook of Radiopharmaceuticals", Narosa Publishing House, New Delhi.

Peter G Welling and Francis L S Tse. "Pharmacokinetics", 2nd ed Marcel Dekker Inc NY.

H K Bharati, "Drugs and Pharmacy Laws in India", Sadhana Mandir, Indore .

Sanford Bolton, "Pharmaceutical Statistics" 2nd ed Marcel Dekker Inc NY .

"Chemical Engineers" Handbook ed R H Parry & C H Chilton, 5th ed McGraw Kogakusha Ltd .

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W A Ritschel, "Handbook of Basic Pharmacokinetics", Drug Intelligence Publications, Hamilton .

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British Pharmacopoeias, Her Majesty's Staionery office, University Press, Cambridge.

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The Merck Index 9th ed, Merck & Co., Inc NJ.

R Y Stanier, Ingraham, "General Microbiology" 5th ed, Wheellis and Painter.

Rugu and Russel, "Pharmaceutical Microbiology; Blackwell Scientific Publication, Oxford.

A J Salle, "Fundamental Principles of Bacteriology",

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G Sykes, "Disinfection and sterlization, II ed.

Davis, Dulbertro, Eisen "Microbiology".

Benjamin Lewis, Gene V "Microbiology"

Prescott and Dunn, "Industrial Microbiology" , 2nd ed McGraw Hill Book Company Inc.

Peppler, "Microbial Technology", Vol I & II

Suichi Aiba Humphrey and Millis, "Biochemical Engineering", University of Tokyo

K Kielslich Ed "Biotechnology" Vol 6a, Verleg Chemie, Switzerland.

P F Standury & A Whitaker, "Principles of Fermentation Technology" Pergamon Press, Oxford, 1987.

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G Reeves, "Lecture Notes on Immunology", Blackwell Scientific Publications, Oxford 1987.

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T D Brock, M T Madigen "Biology of Micro-organism" 5th aed Prentice Hall, New Jersey USA 1988.

Biopharmaceutics and clinical pharmacokinetics 4/Edn.- Milo Gibaldi.-Pharma Book Syndicate..

Pharmaceutical Industrial Management – SAGAR - Pharma Book Syndicate.

Biopharmaceutics and Pharmacokinetics – Venkateshulu - Pharma Book Syndicate.

BOOKS RECOMMENDED (PHARMACOGNOSY)

Atal, C Kssssss and Kapur, B M, Cultivation and utilization of Medicinal plants, RRL, Jammu

Barz, W, Reinhard, E and Zenk, M H, Plant Tissue Culture and its Biotechnological Application, Springer, Berlin.

Brain, K R and Turner, T D The Practical Evaluation of Phytopharmaceuticals, Wright-Scientechnics, Bristol.

Bullock, J D. The Biosynthesis of Natural Products, McGraw & Hill.

Chadha, K L and Gupta, R, "Advance in Horticulture, Medicinal and Aromatic Plants Vol XI Malhotra Publishing, New Delhi.

Chopra, R N, Nayar S L and Chopra, I C Glossary of Indian Medicinal Plants, CSIR, New Delhi.

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Gamborg, G.L and Wetter. L R. Plant Tissue Culture Methods, National Research Council of Canada, Saskatchewan.

Gibbs, R Darneley, Chemotaxonomy of Flowering Plants, 4 volumes McGill University Press.

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Harborne, JB, Biochemistry of Phenolic Compounds Academic Press. New York.

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Kokate C K. Practical Pharmacognosy, Vallabh Prakashan, Delhi.

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Miller, L.P.,Phytochemistry, 1-3 Van Nostrand Reinhold Co.,

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Rosenthaler, L., The chemical investigations of plants, G.Bell and sons Limited, London

Ross, M S F and Brain K R., An Introduction to Phytopharmacy, pitman medical, Kent

Schellard, E J., Practical plant chemistry for pharmacy students, pitman medical London.

Scheuer, P.J., Marine natural products, Academic press, London

Sinnott, E W., Dunn L C., and Dobzhansky, T., Principles of Genetics, Tata McGraw Hill Publishing Co., Limited, New Delhi

Staba, E J., Plant tissue culture as a source of Biomedicinals, CRC Press, Florida

Stahl, E., Thin Layer Chromatography - A Laboratory handbook, Springer - verlag, Berlin

Street, H E., Tissue Culture and plant science, Academic press, London

Stumpf, P K and Conn, E E., The Biochemistry of Plants ; A Comprehensive
treatise, 1-8, Academic press.

Swain, T., Chemical plant Taxonamy, Academic press, London

Swain, T.,Comparative Phytochemistry, Academemic press, London

The Merck Index, Merck and Company, Rahway, New Jersey, USA

The National Formulary, United States Pharmacopoeial convention Inc., Rockville, Meddison, USA

The Wealth of India, Raw Materials (all Volumes) Council of Scientific and Industrial Research, New Delhi

Trease, G E and Evans, W C, Pharmacognosy, 12th Ed., Bailliers Tindall, Easbourne UK

Tyler, V C., Brady, L R and Roberts, J E Pharmacognosy, Lea and Febiger, Philadelphia

United States Pharmacopoeia, United States Pharmacopoeal Convention Inc., Rockville Meddison

Wallis, T E, Analytical microscopy, J&A Churchill limited, London.

Wallis, T.E Textbook of Pharmacognosy, J&A Churchill Limited London

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Guyton, Textbook of Medical Physiology, AC Guyton WB Sannders Company, 1995

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Medical Allied Agency, Calcutta 1991

Human Physiology, Subhash Shalya
CBS Publishers & Distributors, 1994

Samson Wright's Applied Physiology, Keele, C.A., Neil, E. and Joels, N. Oxford University Press

Review of Medical Physiology, Ganong, W.F.,Prentice Hall International

Principles of Anatomy and Physiology- Tortora, G.J. and Anagnodokos, N.P., Harper & Row Publishers N.Y.

Human Physiology, Vander, A.J., Sherman, J.H and Luciano, D.S. Tata Mcgraw Hill Publishing Co., New Delhi/

Best and Taylor's Physiological Basis of Medical Practice.

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B.D.Chaurasia's Human Anatomy, Regional & Applied, Part I, II & III, CBS Publishers and Distributors, New Delhi.

Textbook of Practical Physiology, Ranade, V.G., Pune Vidyarthi Griha Prakashan, Pune.

Atlas of Normal Histology, Difore Marionon S.H. Lea and Febiger, Philadelphia

Basic Pathology, Robbins, S.L. and Kumar, V.,W.B. Sanders Company

Davidson's Principles and Practice of Medicine, ELBS/Churchill Living Stone.

Goodman and Gilman's The Pharmacological basis of Therapeutics Editors : A Goodman Gilman, T.W. Rall, A.S.Nies, P.Taylor, pergamon Press,

Modern Pharmacology, C.R.Craig and R.E.Stitzel,Little brown and Company

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M.P.Rang, M.N.Dale, J M Riter., Pharmacology, 3rd edition, Churchill Livingstone

M.J Mycek, S.B Gerther and M M perper, Pharmacology: Lipponcott's illustrated Reviews, J B Lipponcott company

Crossland, J and Thomson, J H., Essentials of pharmacology, Harper and Row

Katzung, B.G., Basic and clinical pharmacology, prentice hall, International.

Laurence, D R and Bennet P N., Clinical Pharmacology, Scientific book agency, calcutta.

Berar F S K., Text book of pharmacology, Interprint, New Delhi.

P S R K Harnath, Synopsis of Pharmacology, Bombay.

Clinical Pharmacy and therapeutics, Herfindal E T, and Hirschman J L., Williams and Wilkins.

Applied Therapeutics : The clinical use of Durgs, Applied therapeutics INC.,

Pharmacotherapy: A pathophysiological approach, dipiro, J L Elsevier.

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J Bassett, R C Denny, G H Jeffery, J Mendham, Vogel's Text book of quantitative Inorganic analysis, ELBS/Longman, London.

L M Atherden, Benteley and Driver's Text book of Pharmaceutical Chemistry, oxford university Press , London

L M Kothoff and V A Stenger, Volumetric analysis, Vol.II Titration methods, Interscience Publishers, INC., new York

Pharmacopoea of India, Government of India, Ministry of Health

L G Chatten, A Text book of Pharmaceutical Chemistry, VolI and II, Marcel Dekker, New York.

A H Beckett and J B Stenlake, Practical Pharmaceutical Chemistry Vol. I and II. The athlone press of the university of London.

A M Knevel and FE Digani, Jenkin's Quantitative Pharmaceutical Chemistry, McGraw Hill Book Co., New York.

J H Block, F Roche, I O Soine and C O Wilson, Inorganic Medicinal and Pharmaceutical Chemistry, Lea and Febiger, Phildelphia, P A.

L A Disheher, Modern Inorganic Pharmaceutical Chemistry

W S Brey, Physical Chemistry and its biological applications Academic Press.

K J Laidler, Physical Chemistry with Biological applications, Benjamin

V R Williams and H S Williams, basic Physical Chemistry for the life sciences, W H Freeman

S R Pali and S K D E Prabartak, practical Physical Chemistry, Haltone Limited, Calcutta.

D P Shoemaker, C W Garland, Experiments in Physical Chemistry, McGraw Hill Book Co., New York.

J A Ritchener, Findley's physical chemistry, (Ed) Green & Co., London

A N Acheson, An Introduction to the chemistry of heterocyclic compounds, Interscience Publication, New Delhi.

P Sykes, A guidebook to mechanism in organic chemistry, Orient Longman, New Delhi.

J D Roberts and M C Caserio, Basic principles of Organic Chemistry, W A Benjamin, Inc ., New York.

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F C Mann, and B C Saundes, practical organic chemistry. The English language book society and long man group limited, London.

A I Vogel, A text book of practical organic chemistry. The English language society and longman group limited, London.

E L Eliel, Stereochemistry of carbon compounds, Mc Graw Hill book company, Inc., New York

B.S Furniss, A J Hannaford, P W G Smith and A R Tatehell vogel's Text boook of practical organic chemistry. The ELBS/Longman, London

D T Plumer., An Introduction to practical biochemistry, Tata McGraw Hill, New Delhi

J Jayaraman, laboratory manual in Biochemistry, Willey Estern Limited, New Delhi

D W Martin, P A Mys and V M Redwell, Harpers Review of Biochemistry, lange Medical Publications.

E E Conn and P K Stumpf, Outlines of biochemistry, John Willey and sons, New York.

A L Lehninger, Biochemistry, Worth Publisher, Inc.,

A L Lehninger, Principles of Biochemistry, CBS Publishers and Distributors

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Computers and Commonsense – N Hunt and J Shelley, prentics – Hall of India, New Delhi, 1981.

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Organic Reaction Mechanisms – GALLEGO- Pharma Book Syndicate.

Text book of Forensic Pharmacy – KOKATE - Pharma Book Syndicate..

The art of writing Reason. Organic REAC.MECH – GROSS MAN - Pharma Book Syndicate..

Hand Book of Instrumental Techniques for Analytical Chemistry – SETTLE - Pharma Book Syndicate. .

Quality Assurance and Quality Management in Pharma Industry –Y. ANJANEYULU, R. MARRAYA, - Pharma Book Syndicate.

What Everyone should know about PATENTS.- SUBBA RAM - Pharma Book Syndicate

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