



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
ACADEMIC REGULATIONS 2005 FOR B. PHARM. (REGULAR) DEGREE COURSE

(Effective for the students admitted into I year from the Academic Year 2005-2006)

1. Award of B.Pharm. Degree

A student will be declared eligible for the award of the B. Pharm. Degree if he fulfills the following academic regulations:

- i. Pursued a course of study for not less than four academic years and not more than eight academic years.
 - ii. Registered for all the 224 credits and secured all the 224 credits.
2. Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Pharm course.

3. Credits

	I Year		Semester	
	Periods / Week	Credits	Periods / Week	Credits
Theory	03	06	04	04
	02	04	02	02
	04	08		
Practicals	03	04	03	02
	06	08	06	04
Seminar				02
Project	—	—	—	04

4. Distribution and Weightage of Marks

- i. The performance of a student in each semester / I year shall be evaluated subject –wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition, Seminar and Project Work shall be evaluated for 50 and 100 marks respectively.
- ii. For theory subjects the distribution shall be 20 marks for Internal Evaluation and 80 marks for the End-Examination.
- iii. For theory subjects, during the semester there shall be 4 tests, which include, 2 objective type tests each for a duration of 20 minutes each and 2 subjective type tests each for a duration of 90 minutes each. One objective type test and one subjective test to be conducted in 1 – 4 units and one objective type test and one subjective type test are to be conducted in 5 - 8 units of each semester. The best 3 tests will be considered for awarding 20 sessionals marks. For the I year class which shall be on yearly basis, there shall be 6 tests which include, 3 objective type tests

and 3 subjective type tests with the same duration and weightage for each test as mentioned above. However, the performance in the best 4 tests will be considered for awarding 20 sessional marks. The distribution of syllabus for the conduct of objective and subjective type tests in the first year shall be as follows:

- | | |
|-------------|--|
| 1 – 2 Units | one Objective type and one Subjective type test. |
| 3 – 5 Units | one Objective type and one Subjective type test. |
| 6 – 8 Units | one Objective type and one Subjective type test. |

Each objective test question paper shall contain 20 objective type questions for 20 marks. Each subjective type test question paper shall contain 5 questions out of which any 3 questions need to be answered. The subjective type question paper should also be for 20 marks. Though the test pattern is different, all the tests (objective and subjective type tests) have equal weightage.

For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks. Of the 25 marks for internal, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and another member of the staff of the same department.

There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

Out of a total of 100 marks for the project work, 20 marks shall be for Internal Evaluation and 80 marks for the End Semester Examination. The End Semester Examination (viva-voce) shall be conducted by the committee. The committee consists of an external examiner, head of the department, the supervisor of the project and a senior faculty member of the department. Seminar and project work shall be on the same topic. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.

Laboratory marks and the sessional marks awarded by the College are not final. They are subject to scrutiny and scaling by the University wherever felt desirable. The sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the

Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective departments as per the University norms and shall be produced to the Committees of the University as and when they ask for.

5. Attendance:

- i. A student shall be eligible to appear for University examinations if acquires a minimum of 75% of attendance in aggregate of all the subjects.
- ii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.
- iii. A student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester / I year, as applicable. They may seek re-admission for that semester / I year when offered next.
- iv. Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- v. Students whose shortage of attendance is not condoned in any semester / I year are not eligible to take their end examination of that class and their registration shall stand cancelled.
- vi. A stipulated fee shall be payable towards condonation of shortage of attendance.

6. Minimum Academic Requirements:

- i. The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 5.
 - A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together.
- ii. A student shall be promoted from II to III year only if he fulfils the academic requirement of 42 credits from one regular and one supplementary examinations of I year, and one regular examinations of II year I semester irrespective of whether the candidate takes the examination or not.
- iii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of total 70 credits from the following examinations, whether the candidate takes the examinations or not.
 - a. Two regular and two supplementary examinations of I year.
 - b. Two regular and one supplementary examinations of II year I semester.
 - c. One regular and one supplementary examinations of II year II semester.
 - d. One regular examination of III year I semester.

- v. A student shall register and put up minimum attendance in all 224 credits and earn all the 224 credits. Marks obtained in all the 224 credits shall be considered for the calculation of percentage of marks.
- vi. Students who fail to earn 224 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Pharm course and their admission shall stand cancelled.

7. Course pattern:

- i. The entire course of study is of four academic years. The first year shall be on yearly pattern and the second, third and fourth years on semester pattern.
- ii. A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the supplementary examination.

8. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the programme and is eligible for the award of B. Pharm Degree he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	From the aggregate marks secured in all the 224 Credits.
First Class with Distinction	70% and above	
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

9. Minimum Instruction Days:

10. The minimum instruction for each semester / I year shall be 95/180 clear instruction days.
10. There shall be no branch transfers after the completion of admission process.
11. There shall be no place transfer within the Constituent Colleges and Units of Jawaharlal Nehru Technological University.

General:

12. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
13. The academic regulation should be read as a whole for the purpose of any interpretation.
14. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
15. The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

Academic Regulations for B. Pharm. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2006-2007 and onwards)

1. The Students have to acquire 168 credits from II to IV year of B.Pharm. Programme (Regular) for the award of the degree.
2. Students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.
3. The same attendance regulations are to be adopted as that of B. Pharm. (Regular).

4. Promotion Rule:

A student shall be promoted from third year to fourth year only if he fulfills the academic requirements of 42 credits from the examinations.

- a. Two regular and one supplementary examinations of II year I semester.
- b. One regular and one supplementary examinations of II year II semester.
- c. One regular examination of III year I semester.

5. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the programme and is eligible for the award of B. Pharm Degree he shall be placed in one of the following four classes:

First Class with Distinction	70% and above	From the aggregate marks secured in 168 Credits. (i.e. II year to IV year)
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

6. All other regulations as applicable for B. Pharm. Four-year degree course (Regular) will hold good for B. Pharm. (Lateral Entry Scheme)

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B. PHARMACY

1 YEAR

COURSE STRUCTURE

Subject	T	C	P	C
1. Remedial Mathematics/Remedial Biology	4+1/2+1	8/4	0/3	0/4
2. Physical Pharmacy – I	2+1	4	3	4
3. Pharm. Inorganic and Analytical Chemistry	3+1	6	3	4
4. Pharmaceutical Organic Chemistry-I	2+1	4	3	4
5. Anatomy, Physiology - I & Health Education	3+1	6	3	4
6. English Language Communication Skills	2+1	4	-	-
7. Computer Applications and Statistical Methods	2+1	4	3	4
	25/23	36/32	15/18	20/24

II Year

COURSE STRUCTURE

I Semester

Subject	T	C	P	C
1. Pharmaceutical Unit Operations –I	4+1	4	-	-
2. Pharmaceutical Organic Chemistry – II	4+1	4	3	2
3. Pharmacognosy – I	4+1	4	3	2
4. Physical Pharmacy – II	4+1	4	3	2
5. Anatomy, Physiology –II & Pathophysiology	4+1	4	3	2
	25	20	12	8

Subject	T	C	P	C
1. Pharmaceutical Unit Operations- II	4+1	4	3	2
2. Pharmaceutical Microbiology and Molecular Biology	4+1	4	3	2
3. Pharmacognosy - II	4+1	4	3	2
4. Environmental Science	4+1	4	-	-
5. Dispensing, Hosp. & Community Pharmacy	4+1	4	3	2
	25	20	12	8

Subject	T	C	P	C
1. Medicinal Chemistry – I	4+1	4	3	2
2. Forensic Pharmacy	4+1	4	-	—
3. Pharmaceutical Technology-II	4+1	4	3	2
4. Pharmacology II	4+1	4	3	2
5. Chemistry of Natural Drugs	4+1	4	3	2
	25	20	12	8

Subject	T	C	P	C
1. Pharmaceutical Biochemistry	4+1	4	3	2
2. Pharmaceutical Analysis I	4+1	4	3	2
3. Pharmacology - I	4+1	4	-	-
4. Pharmacognosy - III	4+1	4	3	2
5. Pharmaceutical Technology –I	4+1	4	3	2
	25	20	12	8

Subject	T	C	P	C
1. Pharmaceutical Biotechnology	4+1	4	3	2
2. Biopharmaceutics & Pharmacokinetics	4+1	4	3	2
3. Pharmacy Administration	3+1	3	-	-
4. Pharmacology III	3+1	3	3	2
5. Medicinal Chemistry II	4+1	4	3	2
6. Seminar	-	-	-	2
	23	18	12	10

B.PHARMACY

IV Year

COURSE STRUCTURE

II Semester

Subject	T	C	P	C
1. Dosage Form Design	3+1	3	3	2
2. Pharmaceutical Analysis II	3+1	3	3	2
3. Medicinal Chemistry-III	3+1	3	3	2
4. Pharmacognosy IV	3+1	3	3	2
5. Clinical Pharmacy & Therapeutics	4+1	4	-	-
6. Project work*	-	-	-	4
	21	16	12	12

Suggested areas for project work.

- 1) Industrial Pharmacy
- 2) Clinical Pharmacy/Pharmacology
- 3) Pharmacognosy/Medicinal 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

I Year B.Pharmacy

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-focus-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 of inverse process of differentiation, 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, derivation of a differential equation.

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, Himayathagar, Hyderabad
3. Pharmaceutical Arithmetic's by Mohd. Ali CBS publishers and distributor, New Delhi.
4. Higher Engineering Mathematics by Grewal.

REMEDIAL BIOLOGY – 1**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 of life history of insects including their relation to medicinal crops as illustrated by cockroach, mosquito, housefly, mite and silkworm.

TEXT BOOKS

1. Intermediate First Year and Second Year Botany / Zoology Text Books printed and published by Telugu Academy, Himayatnagar, Hyderabad.
2. A.C. Dutta: Text Book of Botany

REMEDIAL BIOLOGY – LAB

i) Care and uses of microscope

ii) Gross identification of slides of structure and life cycle of plants/animals mentioned in theory.

iii) Morphology of plant parts indicated in theory.

iv) Preparation, microscopic End Examination of stem, root and leaf of mono and dicot leaves.

v) Structure of human parasites and insects mentioned in the theory with the help of specimens.

I Year B.Pharmacy

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: Concentration expressions, solutions of nonelectrolytes, ideal and real solutions, colligative properties, molecular weight determinations. 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 V

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 VI

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.

UNIT VII

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

UNIT VIII

Viscosity: Poiseuille's formula for liquids. Experimental determination of viscosity, Ostwald viscometer, comparison of viscosities. Surface tension: Definition, Determination of surface tension- significance in Pharmacy.

TEXT BOOKS

1. Bentley and Driver's Textbook of Pharmaceutical Chemistry Edited by L. M. Atherden. Oxford University Press, Delhi.
2. Inorganic Medicinal & pharmaceutical chemistry; J.H. Block, F.B. Roche, T.O. Sonie, C.V. Wilson, Varghese publishing house.
3. Inorganic pharmaceutical chemistry; P. Gundu Rao, Vallabh Prakashan, Delhi.
4. Textbook Of Physical Pharmaceutics By C.V.S. Subramanyam, Pub By Vallabh Prakhdan, Delhi 110 088

REFERENCES

1. Pharmacopoeia ; (Indian British, US and European etc.)
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.
5. Physical Pharmacy by Alfred Martin.

PHYSICAL PHARMACY – I LAB

I) Physical Properties of Liquids

1. Percent composition – Capillary Flow method
2. Percent composition – polarimeter & refractometer
3. Molecular weight – Landsberger method.
4. Molecular weight – Rast camphor method.
5. Dissociation constant – Distribution method.
6. pH Estimation – pH meter
7. pH Estimation – colourimetric method.
8. Refractive index of liquids.
9. Phenol water system – CST
10. Effect of addition of Salt/pH/consolvent on the solubility
11. Heat of neutralization
12. Distribution co-efficient – Benzoic acid
13. Surface tension – parachore
14. Phase diagram - Phenol – Water, Effect of Impurities.
15. Ternary phase diagram.
16. Cloud point – nonionic surfactant-water system.
17. Surface and Interfacial tension using Stalagmometer.
18. Viscosity – by Ostwald Viscomete.

PHARMACEUTICAL INORGANIC AND ANALYTICAL CHEMISTRY – I

UNIT - I

- (a) Limit tests for Arsenic, heavy metals, lead, iron, chloride and Sulphate and Pharmacopoeial standards.
- (b) Electrolytes: Sodium, Potassium and Calcium replenishers.

Sodium and Potassium Replenishers: Sodium chloride, compound Sodium chloride solution (Ringer solution), Potassium chloride, ORS.

Calcium Replenishers: Calcium chloride, Calcium gluconate, Dibasic calcium phosphate.

UNIT - II

Gastro-intestinal agents:

- (a) 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.

Adsorbents and related drugs: Light kaolin, Heavy kaolin, and activated charcoal.

- (c) Acidbase Regulators: Sodium bicarbonate, Sodium lactate, Sodium citrate/Potassium citrate, and Sodium acetate, Ammonium chloride.

(d) Dialysis fluids: Haemodialysis fluids and intraperitoneal dialysis fluids.

UNIT - III

1) Mineral Nutrients/Supplements

- (a) Haematinics – Ferrous sulphate, Ferrous fumarate, Ferrous gluconate, Ferric ammonium citrate, iron and dextrose injection.

(b) Halogens: Iodine and 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 - IV

(a) Expectorants: Ammonium chloride, Potassium iodide.

(b) Emetics: Potassium antimony tartarate, Copper sulphate, Zinc sulphate.

(c) Antidotes: Sodium thiosulphate, Sodium nitrite.

UNIT - V

- 1) Definition, Preparation, Properties, Assay methods, Limits and Uses of Topical agents: 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.

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.....)

UNIT- VI

Definition, Preparation, Properties, Assay methods, Limits and Uses of

- (a) 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).
- (b) Other Medicinal agents:
 - 1) Antineoplastic agents: Cisplatin
 - 2) Antidepressants: Lithium carbonate
 - 3) Diagnostic agent: Barium sulphate.
 - 4) Surgical aid: Plaster of Paris.

UNIT-VII

- 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 -VIII

- 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.
Application of the above methods in the analysis of drugs, as under IP 1996 (including the latest addenda).
- c) Karl-Fisher method of estimation of water and other methods of moisture determination and Piconometry.

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 Athlone press, University of London, London.
3. Pharmaceutical Inorganic Chemistry by J.S.Quady.
4. Pharmaceutical inorganic chemistry by Moh. Ali, CBS printers and publishers New Delhi.

REFERENCES

1. Bentley and Driver's Textbook of Pharmaceutical Chemistry Edited by L.M. Atherden, Oxford University Press, Delhi.
2. T.R.Morrison and R.N.Boyd, Organic Chemistry, peritce hall of India private limited, New Delhi.
3. I.L. Finar Vol.1, The Fundamentals principles of Organic Chemistry, ELBS/Longman.
4. Advanced Pharmaceutical Organic chemistry by Ball & Ball

I Year B.Pharmacy

**PHARMACEUTICAL INORGANIC AND ANALYTICAL
 CHEMISTRY – I 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.

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: 1,4 addition reactions.

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 and Anthracene. Resonance structures, electron density and reactivity. Electrophilic substitution, Oxidation and reduction reactions.

UNIT – IV

Halogen Compounds-Aliphatic: Nomenclature, two major methods of preparation, characteristic nucleophilic substitution reactions, Factors that play role in SN1 and SN2, Walden inversion, elimination reaction and Saytzeff's rule.

Halogen Compounds-Aromatic: Nomenclature, Low reactivity of halo benzenes towards nucleophilic substitution, Benzene ion concept.

UNIT – V

Alcohols: Nomenclature, classification, two important 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 Ponderoff Verley reduction
Ethers: Nomenclature, Williamson's synthesis, Action of HI on ethers (Ziessel's Method).

Phenols: Nomenclature, two important 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, peritice hall of India private limited, New Delhi.
2. I.L.Finar Vol.I. The Fundamentals principles of Organic Chemistry, ELBS/ Longman.
3. Advanced Pharmaceutical Organic chemistry by Ball & Ball

I Year B.Pharmacy

PHARMACEUTICAL ORGANIC CHEMISTRY-I LAB

Introduction to Equipment & Glassware,

Recrystallization method, details of M.P, B.P and distillation

1. 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 D-Naphthyl methyl ether from D-Naphthol
9. α-Halogenation-cum- : Preparation of Iodoform from Oxidation Acetone
10. Extensive Nuclear : 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.

I Year B.Pharmacy

ANATOMY, PHYSIOLOGY-I & HEALTH EDUCATION – I**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.

UNIT-II

Skeletal system: Structure, composition and functions of skeleton Classification of joints, types of movements at joints, Disorders of joints, types of movements at joints, Disorders of joints.

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

UNIT-III

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.

UNIT-IV

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

UNIT-V

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-VI

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.

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

UNIT-VIII

HEALTH EDUCATION:

- a) Concepts of health & disease, disease causing agents and prevention of disease.
- b) Classification of food requirements, balanced diet, nutritional deficiency disorders, their treatment and prevention, specifications for drinking water.
- c) Demography and family planning:
Demography cycle, family planning, various contraceptive methods, Medical termination of pregnancy.
- d) Brief outline of communicable diseases, their causative agents, modes of transmission and prevention (Chicken pox, measles, influenza, diphtheria whooping cough, tuberculosis, poliomyelitis, hepatitis, cholera, typhoid, food poisoning, helmenthiasis, malaria, filariasis, rabies, trachoma, tetanus, leprosy, syphilis, gonorrhoea, and Aids).
- e) First Aid: Emergency treatment of shock, snake bites, burns, poisoning, fractures and resuscitation methods.

TEXT BOOKS

1. M.P. Rang, M.N.Dale, J.M Rier Anatomy & Physiology.
2. M.J.Myceck S.B Gerther and MMPER, Text Book of Human Anatomy by Ross & Willison.
3. Human Physiology by C.C.Chatterjee

1. Study of human skeleton
2. Study of different systems with the help of charts and models.
3. Microscopic study of different tissues.
4. Estimation of haemoglobin in blood, Determination of bleeding time, clotting time, R.B.C. Count, T.L.C., D.L.C. and E.S.R.
5. Recording of body temperature, pulse rate and blood pressure, basic understanding of electrocardiogram-PQRST waves and their significance.

ENGLISH LANGUAGE COMMUNICATION SKILLS – I

UNIT-I:

Role and importance of communication, Verbal and non-verbal communication, Group communication, effective communication, barriers to communication, communication media, participating in discussions, conduct of seminars, conferences etc., making presentations through collection, evaluation, organizing the information, interacting with learners and teachers, Role of wit and humor in communication.

UNIT-II

Spoken english Vs Written English, reading method, formal /informal English (one way /two way); British/American/Indian English; how to introduce one self and others; how to tender apology; how to thank in different ways; greetings, some polite expressions;

UNIT III.

Agreement and disagreements; how to use a dictionary; how to use a thesaurus; vocabulary development; synonyms and antonyms; one word substitutes; comprehension.

UNIT- IV

Communication through letters: official and personal letters; letters of complaint; letters of enquiries; and responses; writing memos, circulars and notices; what to avoid while writing; paragraph writing;

UNIT- V

Scientific/technical report writing; drafting and delivering a speech, resume writing and interview techniques.

UNIT-VI

Grammar: Sequence of tenses, voice, articles, direct and indirect speech; degrees of comparison; common errors in English made by Indian learners of English.

UNIT- VII

Concepts of learning and listening: types and methods of learning and listening; learning and listening of knowledge, attitudes, skills, and practices.

UNIT-VIII

The following four essays from “*Selections from Modern English*” prose Edited by Haladhar Panda are prescribed:

- | | | |
|----|----------------------|---------------------|
| 1. | Our Own Civilization | - C.E.M.Joad |
| 2. | Andrew Carnegie | - E.H Carter |
| 3. | The Secret of work | - Swami Vivekananda |
| 4. | The Generation Gap | - Benjamin Spock |

TEXT BOOKS

1. “Business Correspondence and Report Writing”, R.C. Sharma and Krishna Mohan, Tata Mc Graw Hill Publishers, New Delhi.
2. “Communicative English”, E. Suresh Kumar, Raj Kamal Publications, Hyderabad.
3. “Selections of Modern English Prose”, Ed. By Haladhar Panda, Published by Universities Press (India) Pvt. Ltd., Hyderabad.

I Year B.Pharmacy

COMPUTER APPLICATIONS AND STATISTICAL METHODS – I**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 poisson distribution, normal distribution curve and properties, kurtosis and skewness;

UNIT-II

Regression: Correlation and regression analysis, method of least squares, 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-I**

Concept: History of computers, simple model of computer and its working parts of the computer, CPU, memory, input/output devices, computer languages and their hierarchical machine language, assembly language, high level language comparison 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-II

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-III

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-IV

Computer applications in pharmaceutical and clinical studies.

Computer validation – Introduction.

TEXT BOOKS

1. Fundamentals of computers by P.K. Sinha.
2. Let Us C++ by Yashvanth Kanetkar, BPB Publications New Delhi.
3. Working In Microsoft Office by Ron Mansfield.
4. SQL, PL/SQL The Programming Language of oracle by Ivan Bayross

REFERENCES

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

**COMPUTER APPLICATIONS AND
STATISTICAL METHODS - I 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.

Software packages like MS-WORD, EXCEL, ACCESS, POWER POINT.

PHARMACEUTICAL UNIT OPERATIONS- I**UNIT-I**

Unit operations: Introduction, basic laws. 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-II

Material handling systems:

- a. Liquid handling-Different types of pumps.
- b. Gas handling - Various types of fans, blowers and compressors.
- c. Solid handling -bins, bunkers, conveyors, air transport.

UNIT-III

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, and centrifugal filters, and centrifugal sedimenters.

UNIT-IV

Crystallization

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-V

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.

UNIT-VI

Refrigeration and Air Conditioning :

Principles and applications of refrigeration and air conditioning.

UNIT-VII

Material 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 dermatitis, accident records etc.

TEXT BOOKS

1. Pharmaceutical Engineering by Prof. K. Samba Murthy
2. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences
3. Introduction to Chemical Engineering by Badzer & Banchoro.

REFERENCES

1. Perry's Handbook of Chemical Engineering.
2. Unit Operations by Mc Cabe & Smith.
3. Elements Of Chemical Engineering by Mc Cabe & Smith

II Year B.Pharmacy - I Semester**PHARMACEUTICAL ORGANIC CHEMISTRY - II****UNIT - I**

A Study of Some Simple Heterocyclic Systems:
Definition, nomenclature, structure, aromaticity, reactivity, acidity-basicity and characteristic reactions of the following heterocyclic compounds.
Five membered and six membered ring systems with one hetero atom: Furan, Pyrrole, Thiophene and Pyridine.

UNIT – II

Five membered and six membered ring systems with two hetero atoms: Pyrazole, Imidazole, Oxazole, Isoxazole, Thiazole and a comparative study of Pyrazine, Pyrimidine, Pyridazine

UNIT - III

Stereochemistry of Carbon compounds (with only one Chiral centre):
Optical rotation, plane polarized light, optical activity, chirality, Notations (Assignment of Configuration), Relative Configuration (Fischer D, L configuration), Absolute configuration, Sequence rules (with examples), Enantiomers, Meso Compounds, Racemic Mixture, Resolution Asymmetric Synthesis
Stereochemistry of Alkenes – Concept of E & Z configurations.

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) A study of the mechanism and application in synthesis of the following named reactions:
- A. Beckmann rearrangement
- B. Fries rearrangement
- C. Phillips condensation reaction
- D. Mannich reaction
- E. Michael addition reaction

TEXT BOOKS

1. Bentley and Driver's Textbook of Pharmaceutical Chemistry, L.M. Atherden 1983, Oxford University Press, Delhi.
2. Organic Chemistry, the fundamentals and principles by I L Finar.
3. Practical Organic Chemistry by A.I. Vogel
4. organic chemistry by TT Morrison and R. boyd, Pub by Printice Hall of India Pvt. New Delhi.

REFERENCES

1. Pharmacopoeia; (Indian British, US and European etc.).
2. Organic Chemistry by Ferguson.
3. Organic Chemistry by Cram & Hammond

I. Synthesis of some simple Heterocyclic Compounds.

- i) 2,5-Dimethylpyrrole from Acetylacetone.
- ii) 2,5-Dimethylthiophene from Acetylacetone.
- iii) 2,5-Dimethylfuran from Acetylacetone.
- iv) 3,5-Dimethylpyrazole from Acetylacetone.
- v) 3,5-Dimethylisooxazole from Acetylacetone.
- vi) 4,5-Diphenylimidazole from Benzil.
- vii) Benzoxazole from o-Aminophenol.
- viii) 2,5-Dioxopiperazine from Glycine.
- ix) 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

- a) Avoid the water-soluble compounds
- b) Avoid the binary mixtures having a risk of chemical interaction.

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.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.**

II Year B.Pharmacy - I Semester

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. Classification of crude drugs: Alphabetical, Morphological, Taxonomical and Chemical classification methods.

UNIT-IV. Cultivation of medicinal plants.

- Factors influencing cultivation of medicinal plants.
- Types of soils and fertilizers of common use.
- Pest management and natural pest control agents.
- Plant hormones and their applications.
- Polyploidy, Mutation and hybridization with reference to medicinal plants.
- Good Agriculture Practices.

UNIT-V. Strategies of obtaining improved cultivations of medicinal plants

UNIT-VI. Collection, processing, drying and storage of crude drugs

UNIT-VII. Evaluation of crude drugs.

Adulteration of curde drugs and their detection by

i) Organoleptic ii) Microscopic iii) Physical iv) Chemical and Biological methods of evaluation

UNIT-VIII. Systematic Pharmacognostic study of the following:

- a) Carbohydrates and derived products: Acacia, Tragacanth, Agar, Starch, Guar gum, Pectin, Isabgol, Honey.
- b) Lipids: Castor oil, cod liver oil, Shark liver oil, Linseed oil, Cocoa butter, Kokum butter, Bees wax, Wool fat, Hyndocarpus oil, Spremaceti, Lard, Oliveoil

THEORY:

1. Pharmacogony by Trease & Evans, 12th edition.
2. Latest editions of I.P & B.P.
3. Pharmacogony by Kokate, Purohit, Gokhale, Nirali Prakashan.
4. Pharmacogony by Tyles, Brady, Robert.

TEXT BOOKS

1. Pharmacogony by Kokate C.K , Purohit AP & Gokhale S.B (Nirali)
2. Pharmacogony by Trease and Evans, Latest Edition.
3. Pharmacogony by Tyler, Brady & Robert.

REFERENCES

1. Cultivation & Utilization of Medicinal Plants by Atal C.R & Kapur B.M
2. Textbook of pharmacy by Wallis, Pub by CBS Publishers and distributors, New Delhi.
3. Ayurvedic Pharmacopoeia of India, Pub by Govt. Of India

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.**

II Year B.Pharmacy - I Semester

PHARMACOGNOSY – I LAB

1 Identification of curde drugs listed in theory.

2. Chemical tests for important drugs containing carbohydrates and lipids.

3. Preparation of Herbarium belonging to different families.

4. Cultivation of medicinal plants.

5. Determination of Leaf constants.

II Year B.Pharmacy - I Semester

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, 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.

UNIT-IV Interfacial Phenomena: Liquid interfaces, measurement of surface and interfacial tensions, adsorption at liquid interfaces. Surface active agents, systems of Hydrophilic Lipophilic 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 particle 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. **Colloids:** Introduction, types of colloidal systems, solubilization.

UNIT-VII Coarse Dispersions:- Suspensions, Emulsions and Semisolids: suspensions, interfacial properties and suspended particles. Setting in suspensions. Formulation of suspensions: Emulsions- theories of emulsification, physical stability of emulsions, preservation of emulsions, Rheological properties of emulsions, suspensions and semisolids.

UNIT-VIII Physics of tablet making:
Compression and consolidation of powdered solids, Effect of applied forces, deformation, compression, consolidation role of moisture, granulation, properties of granules, compression and consolidation under high loads, effects of friction, force distribution, decompression, compaction profiles, energy involved in compaction, the instrumentation machines.

TEXT BOOKS

1. Physical Pharmacy by Alfred Martin.
2. Physical Pharmacy by CVS Subhramanyam.
3. Theory & practice of Industrial Pharmacy by Lachman.

II Year B.Pharmacy - I Semester

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 CMC of a surfactant.
5. Adsorption Isotherm.
6. Partition coefficient – Effect of Additives.
7. Determination of sedimentation volume and degree of flocculation.
8. Determination of Order of reaction – First order.
9. Second order Reaction.
10. Determination of Spreading Coefficient.
11. Buffers (Preparation and testing buffer capacity).
12. Effect of co-solvent on solubility.
13. Effect of temperature on solubility of solid in liquid.
14. Preparation of Multiple emulsion - Demonstration.
15. Preparation of Micro emulsion - Demonstration.
16. Determination of Zeta potential - Demonstration.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

HYDERABAD.

II Year B.Pharmacy - I Semester

ANATOMY, PHYSIOLOGY – II & PATHOPHYSIOLOGY**UNIT-I Nervous System**

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-II

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-III

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

UNIT-IV

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

UNIT-V

Sense organs: Basic anatomy and physiology of the eye (vision), ear (hearing) taste buds, nose (smell) and skin (superficial receptors).

Pathophysiology

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 rheumatoid arthritis, gout, epilepsy, psychosis, depression, mania, hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction, 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. Text Book of Human Anatomy by Ross & Willison.
2. Principles of anatomy and physiology by Ross & Willison
3. Human Physiology by C.C.Chatterjee. Pub by Medical allied agency, Delhi, India

REFERENCES

1. Textbook of medicinal physiology by A.C Guyton by W.B.Prism books Pvt. Ltd., Delhi.
2. Basic Pathology by Robbins SL & Kumar
3. M.P. Rang, M.N.Dale, J.M Riter Anatamy & Physiology

ANATOMY, PHYSIOLOGY – II & PATHOPHYSIOLOGY – LAB

1. Study of different systems with the help of charts and models.
2. Microscopic studies of different tissues.
3. Simple experiments involved in the analysis of normal and abnormal urine; collection of specimen, appearance, determination of pH, sugars, proteins, urea and creatinine.
4. Physiological experiments on nerve-muscle preparations.
5. Determination of vital capacity, experiments on spirometry.

PHARMACEUTICAL UNIT OPERATIONS – II

UNIT-I
Stoichiometry:
Unit processes material and energy balance, molecular units, mole fractions, the substance, 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
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-III
Evaporation:
Basic concept of phase equilibria, factors affecting the evaporation, evaporators, film evaporators, single effect and multiple effect evaporators, Mathematical problems on evaporation.

UNIT-IV
Distillation:
Raoult's law, phase diagrams, volatility, simple steam and flash distillations, principles of rectification, McCabe Thiele method for calculations of number of theoretical plates, Azeotropic and extractive distillation. Mathematical problems on distillation.

UNIT-V
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 and special drying methods, mathematical problems on drying.

UNIT-VI

Size Reduction and size separation:

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-VII

Mixing: Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipment.

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. Pharmaceutical Engineering by CVS Subhramanyam.
2. Pharmaceutical Engineering by Samba Murthy.
3. Perry's Handbook of Chemical Engineering.
4. Introduction to Chemical Engineering by Badzer & Banchoro.
5. Unit Operations by Mc Cabe & Smith.

REFERENCES

1. Unit Operations To Chemical Engineering by W.I. Macebe and J. C. Smith Macro Hill Int. Book Co., London.
2. The Theory And Practice Of Industrial Pharmacy by L. Lachman, H. Lieberman & J. L Kaniz Lee & Febiger Philadelphia, USA

II Year B.Pharmacy - II Semester

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

II Year B.Pharmacy - II Semester

PHARMACEUTICAL MICROBIOLOGY AND MOLECULAR BIOLOGY

UNIT – I

Study of morphology, broad classification of bacteria, yeasts, actinomycetes, protozoa, fungi and viruses.

Types and preparation of media for bacterial, fungal and actinomycete cultures.

Theory of staining, simple, Gram's, acid fast, negative, flagella and spore staining methods.

Different methods of isolation and preservation of microbial cultures.

UNIT - II

Study of bacterial growth. Effect of UV light, ultrasonic waves, temperature, pH, osmotic pressure, salt concentration and metal ions. An outline of theories of antimicrobial action of drugs and chemicals.

UNIT - III

Introduction to microbiology of air, water and milk. Methods of quantitative evaluation of microbial contamination.

Microbial limit tests official in I.P.

UNIT - IV

Genetic recombination- bacterial conjugation, transformation and transduction. Mutation, Mutagens, Mechanism of mutation, types of mutations, isolation of nutritional and antibiotic resistant mutants.

UNIT - V

Study of sterilization by moist heat and dry heat, construction and operation of autoclave, sterilization by filtration, sterilization by radiation and gases. Sterilization monitors.

Concept of asepsis. Maintenance of aseptic conditions.

Dynamics of disinfection, merits and demerits of different disinfectants, commonly used disinfectants, their mechanism of action. Evaluation of disinfectants.

UNIT - VI

Study of etiology, diagnosis, sources of infection, mode of transmission, immunization methods, prevention and control of the following diseases.

Bacillary dysentery, diphtheria, tuberculosis, leprosy, cholera, typhoid, syphilis, gonorrhoea, tetanus, food poisoning, amoebiasis, infective hepatitis.

UNIT VII

Structure of DNA and. Replication of DNA, Transcription and Translation.

UNIT VIII

Control of Gene expression in Prokaryotes and mutagenesis.

TEXT BOOKS

1. Text Book of Microbiology Volum-I & II by Pelczar and Reid.
2. Text Book of Microbiology by Anantha Narayan and Jayram Panikar, Orient Longman, Delhi, Hyderabad

REFERENCES

1. Industrial Microbiology by Prescott Dunn.
2. Pharmaceutical Microbiology by Ruggu & Russel
3. Industrial Microbiology, L.E. Casida Jr. Wiley, Eastern Books Ltd, Hyderabad

PHARMACEUTICAL MICROBIOLOGY & MOLECULAR BIOLOGY – LAB

- 1) Introduction to equipment and glassware used in Microbiology Laboratory.
- 2) Simple Staining
- 3) Gram Staining
- 4) Negative Staining
- 5) Acid fast Staining
- 6) Aseptic Transfer
- 7) Enumeration of Bacteria by Pour Plate Technique.
- 8) Enumeration of Bacteria by Direct Microscopic Count
- 9) Isolation of pure Cultures by Streak Plate Method
- 10) Oligodynamic Action of Heavy Metals
- 11) Observation of Colony Characteristics
- 12) Microbiology of Air-Settling Plate Technique
- 13) Microbiology of Water – Presumptive, Confirmed & Completed tests
- 14) Biochemical Reactions:
 - i) Indole test
 - ii) Methyl Red Test
 - iii) Voges Proskauer Test
 - iv) Citrate Utilization Test
 - v) Starch Hydrolysis Test
 - vi) Gelatin Liquification Test
 - vii) Fermentation of Carbohydrates
 - viii) H₂S Production Test
- 15) Morphology of Molds
- 16) Morphology of Yeasts
- 17) Microbial Limit Tests – Viable Count
- 18) Microbial Limit Tests for *E. coli*, *Proteus*, *Pseudomonas*, etc.

PHARMACOGNOSY – II

- UNIT I:**
Role of medicinal & aromatic plants in national economy
- UNIT II:**
Definition, general test and detailed pharmacognostic study of the following groups of drugs containing.
- a) Saponins Glycoside:** Glycyrrhiza, Ginseng, Discorea, Saraparilla & Senega.
- b) Cardioactive Glycosides:** Digitalis, Squill, Strophanthus, Thevetia.
- UNIT III:**
Anthraquinone Glycosides: Aloe, Senna, Rhubarb & Cascara.
- a) Bitter Glycosides:** Psoralea, Ammi, Gentian, Saffron, Chirata.
- UNIT IV:**
Volatile Oils: Definition, Classification and Study of Volatile Oil of Mentha, Coriander, Cinnamon, Cassia, Lemon Oil, Nutmug, Eucalyptus, Ginger, Cardamom, Tulsi,
- UNIT V:**
Lemon Peel, Orange Peel, Lemon grass, Citronella, Caraway, Palmarosa, Gluttheria, Sandal Wood, Cumin, Dill, Clove, Fennel, Geranium oil, Black pepper
- UNIT VI:**
Study of tannins & tannin containing drugs like Gambir, Black catechu, Gall, Myroblan & Arjun.
- UNIT VII :**
Defination & study of drugs containing resin & resin combinations: Benzoin, Asafoetida, Balsam of Tolu, Peru, Myrrh,
- UNIT VIII:**
Capsicum, Turmeric, Colophony, Podophyllum.
- TEXT BOOKS**
1. The Pharmacognosy by Kokate C.K , Purohit AP & Gokhale S.B (Nirali)
 2. Pharmacognosy by Trease and Evans, Latest Edition.
 3. Pharmacognosy by Tyler, Brady & Robert.
- REFERENCES**
1. Cultivation & Utilization of Medicinal Plants by Atal C.R & Kapur B.M
 2. Textbook of pharmacognacy by Wallis, 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. Tissue Culture And Plant Science by Street.
 6. An Introduction To Plant Tissue Culture by M. K. Razdan, Oxford & IBH Publishing Co., New Delhi

PHARMACOGNOSY II - LAB

1. Identification of drugs mentioned in the theory.
2. Microscopic studies of some volatile oil containing crude drugs & their powders.
3. Microscopic study of some important glycosides containing crude drugs and study of powdered drugs.

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.
- 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, and 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

1. Introduction to Environmental Sciences by Y.Anjaneyulu, BS Publications Hyderabad.
2. Principles of Environmental Studies by C. Manohar Chary, P Jayram Reddy. Pharma book syndicate

REFERENCES

1. Air pollution and control technologies By Y. Anjaneyulu, Publ allied Publishers, Hyderabad.
2. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Hyderabad
3. Environmental Encyclopedia by W. P. Cooper & et, Jaico Publishing House Mumbai.
4. Environmental Biology by K. C. Agarwal Nidi Publishers Ltd, Bikaner.
5. Basic Concepts of Environmental Chemistry by Connor, Lewis Publications.
6. Environmental Protection and laws, Himalaya Publ House, New Delhi.

II Year B.Pharmacy - II Semester

DISPENSING, HOSPITAL & COMMUNITY 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. 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 and Definition of the following preparations like creams, capsules, pastes, jellies, suppositories, ophthalmics, lozenges, pills, inhalations, paints, sprays, tablet triturates etc.

UNIT-III

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

UNIT-IV

Community pharmacy: Organization and structure of retail and whole sale drugs store-types of drug store and design, legal requirements for establishment maintenance of drug store dispensing of proprietary products, maintenance of records of retail and whole sale, patient counseling, role of pharmacist in community health care and education.

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.

UNIT-VI

The pharmacy procedural manual, Drug distribution, dispensing to out-patients, in-patients and ambulatory patient-dispensing of ancillary and controlled substances, Procurement and distribution of alcohol.

Manufacturing of bulk and sterile supplies, quality control in Hospital pharmacy, Drug charges in Hospitals, Drug information center – professional practices.

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. Tutorial Pharmacy by Cooper & Gunn, CBS, Publ. and Distributors New Delhi.
2. Health Education and Community Pharmacy by Gupta AK, CBS, Publ. and Distributors New Delhi.
3. Hospital Pharmacy by JS Quadry

REFERENCES

1. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences.
2. Bentley's Text Book of Pharmaceutics by Rawlkins, Elbs publ.
3. Health Education and Community Pharmacy by NK Jain, CBS, Publ. and Distributors New Delhi.

II Year B.Pharmacy - II Semester**DISPENSING, HOSPITAL & COMMUNITY PHARMACY – LAB**

1. Dispensing of prescriptions falling under the categories; Mixtures, solutions, emulsions, creams, ointments, powders, suppositories, ophthalmics, capsules, pastes, jellies, pastilles, lozenges, pills, tablet triturates, lotions, liniments, inhalations, paints. etc.
2. Identification of various types of incompatibilities 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.

UNIT – I

Carbohydrate Metabolism: Glycolysis, glycogenolysis, gluconeogenesis, Kreb's cycle, direct oxidative pathway (H M P), uronic acid pathway.

UNIT – II

Metabolism of Proteins and Amino Acids: Essential and non-essential amino acids, general metabolic reactions of amino acids like deamination, transamination, decarboxylation, urea cycle; metabolism of the following amino acids: glycine, phenylalanine, tyrosine, cystein, cystine, methionine, tryptophan, valine and lysine.

UNIT – III

Metabolism of Lipids: Essential fatty acids, β -oxidation of fatty acids, ketogenesis, biosynthesis of fatty acids and cholesterol.

UNIT – IV

Enzymes: Classification, structure, mechanism of enzyme action, properties, factors influencing enzyme action, activators and deactivators of enzymes, competitive and noncompetitive inhibition with respect to drug action, coenzymes.

UNIT – V

The principles involved and the method used in the qualitative and quantitative analysis of blood for the following constituents: glucose, urea, cholesterol, bile salts, bile pigments, creatinine, calcium, phosphates, SGPT and SGOT.

UNIT – VI

The principles involved and the method used in the qualitative and quantitative analysis of urine for the following constituents: glucose, ketone bodies, bile salts, bile pigments and albumin.

UNIT – VII

Role of Minerals and Water in Biochemical Processes with emphasis on the following: calcium, sodium, potassium, magnesium, iron and phosphorous.

UNIT – VIII

Nucleic acid metabolism: Structure of DNA and RNA, Biosynthesis of purines and pyrimidines, Biosynthesis of DNA and RNA.

Biological oxidation: Introduction, brief account on the role of oxidases, dehydrogenases, hydroperoxidases and oxygenases in biological oxidation.

TEXT BOOKS

1. Review of physiological chemistry by Harold Hooper, Ph.D., Lange Med. Publ, SFO USA.
2. Textbook of biochemistry by Prof. D.U. Satyanarayana. Publ. Books and allied publ. Pvt. Ltd, Kolkata.
3. Text Book of Bio Chemistry by AVS Rama Rao

REFERENCES

1. Principles of Bio Chemistry by A.L Lehninger.
2. Text Book of Bio Chemistry by L Styer.
3. Biochemistry and clinical pathology (Theory and Practice) by Quadri and Pillai K.K., CBS Publ.
4. Outlines of Biochemistry by E.E Conn & P.K. Stumpf, Publ, John Wiley & sons New York

Experiments:

1. Identification of Carbohydrates
2. Preparation of Osazones
3. Identification of Amino acids
4. Identification of Proteins
5. Colour reactions of Cholesterol
6. Analysis of urine
 - a) Analysis of urine for abnormal constituents
 - b) Estimation of Chlorides in Urine
 - c) Estimation of Glucose in Urine
 - d) Estimation of Uric acid in Urine
 - e) Estimation of Creatinine in Urine
7. Estimation of Glucose in blood by Folin-Wu method
8. Estimation of glucose in blood by glucose oxidase method
9. Estimation of serum cholesterol (Enzymatic method)
10. Estimation of Urea in Blood
11. Estimation of Creatinine in blood
12. Estimation of Serum protein
13. Estimation of Urobilinogen in Blood
14. Estimation of Bile pigments in Serum
15. Estimation of alkaline phosphatase in Serum

PHARMACEUTICAL ANALYSIS – I

A Detailed account of the theory, instrumentation and pharmaceutical applications of:

UNIT-I Visible, UV & I.R. Spectrophotometry

UNIT-II Fluorimetry

UNIT-III Flame photometry

UNIT-IV Refractometry

UNIT-V Polarimetry and Spectropolarimetry

A brief account of the theory, instrumentation and applications of the following techniques:

UNIT-VI Nephelometry & turbidometry

UNIT-VII Potentiometry & pH metry (include specific ion electrons)

UNIT-VIII Conductometry, Polarography

TEXT BOOKS

1. Text book of Analytical chemistry by Prof. Y.Anjaneyulu, Chandra Sekhar Vallanarikkam
2. Text book of Pharmaceutical Analysis by Ravi Shanker
3. Text book of Pharmaceutical analysis by Kasture & Wadodkar Vol.I & II

REFERENCES

1. Practical Pharmaceutical Chemistry by A.H. Beckett & J.B Stanlake Vol.I&II., Athlone Press of the Univ of London.
2. Quantitative Chemical Analysis by A.I Vogel. ELBS Ed.
3. Bentley and Driver's Textbook of Pharmaceutical Chemistry L.M. Atherden., Oxford University Press, Delhi

PHARMACEUTICAL ANALYSIS – I LAB

1. Conductometric titration.
2. Potentiometric titration.
3. Determination of I- max of a drug
4. Determination of concentration of glycerine by Abbe's refractometer.
5. Assay of ibuprofen - UV-spectro photometry.
6. Assay of paracetamol - UV-spectro photometry.
7. Assay of riboflavin - Colorimetric method.
8. Assay of rifampicin - Colorimetric method.
9. Flame photometric determination of sodium.
10. Nephelometric determination of sulfate.
11. Fluorimetric estimation of quinine.
12. Polarographic method of analysis

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:

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

REFERENCES

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

PHARMACOGNOSY – III

UNIT- I.

Definition, General chemical tests and pharmacognostic study of the following alkaloid containing drugs.

- Pyridine – Piperidine derivatives : Tobacco, Areca & Lobelia.
- Tropane: Belladonna, Hyoscyamus, Datura, Coca & Aswagandha.

UNIT-II

- Quinine & Isoquinoline : Cinchona, Ipecac, Opium.
- Indole: Ergot, Rauwolfia, Vinca, Nux-vomica,
- Imidazole: Pilocarpus.

UNIT-III

- Stroidal: Veratrum & Kurchi.
- Alkaloidal amine: Ephedra & Colchicum.

UNIT-IV

- Glycoalkaloids : Solanum
- Purines: Coffee, tea.

UNIT-V

General techniques of biosynthetic studies and basic metabolic pathways,

UNIT-VI

Brief introduction to biogenesis of secondary metabolites of Pharmaceutical importance.

UNIT-VII

Biological sources, preparations, identification tests and uses of the following enzymes Diastase, papain, pepsin, trypsin, pancreatin.

UNIT-VIII

Plant Tissue Culture:- History, Types, Media requirements, methodology for establishment of cultures, growth measurements and applications.

TEXT BOOKS

- The Pharmacognosy by Kokate C.K , Purohit AP & Gokhale S.B (Nirali)
- Pharmacognosy by Trease and Evans, Latest Edition.
- Pharmacognosy by Tyler, Brady & Robert.

REFERENCES

- Cultivation & Utilization of Medicinal Plants by Atal C.R & Kapur B.M
- Textbook of pharmacy by Wallis, Pub by CBS Publishers and distributors, New Delhi.
- Ayurvedic Pharmacopoeia of India, Pub by Govt. Of India Cultivation & Utilization of medicinal plants by Atal CR & Kapur BM
- Text book of Pharmacognosy by Handa & Kapoor.

PHARMACOGNOSY – III LAB

1. Identification of crude drugs listed above.
2. Study of microscopic characters of drugs underlined in theory in entire and powdered form.
3. Chemical evaluation of some powdered drugs and enzymes.
4. Chromatographic studies of some herbal constituents.
5. Experiments on establishments of few callus cultures of higher plants.

PHARMACEUTICAL TECHNOLOGY – I

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

UNIT-II
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.

UNIT-III
Suppositories: Ideal requirements bases, manufacturing procedure, packaging and evaluation.

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

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

UNIT-VI
Ophthalmic Preparations:Requirements, formulation, methods of preparation, containers, evaluation.

UNIT-VII
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.

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

REFERENCES

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

PHARMACEUTICAL TECHNOLOGY – I LAB

1. Preparation, evaluation and packaging of liquid orals like solutions, suspensions and emulsions, ointments etc. suppositories, aerosols, eye drops, eye ointments etc.
2. Preparation of Pharmacopoeial extracts and Galenical products utilizing various methods of Extraction.
3. Formulation of various types of cosmetics for skin, hair, dentrifices and manicure preparations.

MEDICINAL CHEMISTRY - I

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 Penicillinase, amidase and methanolysis followed by aqueous mercuric chloride.

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

General method of synthesis of penicillins from 6-APA, SAR, mechanism of action, therapeutic uses, toxicity. A note on *b*-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 K₁, K₂, K₃ and K₄ – Structures – Physiological role and uses.

UNIT – VIII

Water soluble vitamins: Structures, physiological role and uses of Vit B₁, B₂, B₆, B₁₂; Nicotinic acid and amide, Cyanocobalamin, 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 riboflavin to lumiflavin 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:

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

TEXT BOOKS

- Text book of Medicinal Chemistry by William O. Foye, Lea Febiger, Philadelphia.
- Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry by JH Block & JM Beale (Eds), 11th Ed, Lippcott, Raven, Philadelphia, 2004.
- S. N. Pandeya, Text book of medicinal chemistry, SG Publ. Varanasi, 2003.

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

HYDERABAD.

III Year B.Pharmacy - II Semester

MEDICINAL CHEMISTRY – I LAB**Estimations of the following.**

1. Ascorbic acid.
2. Vitamin B₁.
3. Penicillin.
4. Alkaloid (by gravimetry).
5. Eugenol content in Clove oil.
6. Citral by Hydroxylamine hydrochloride.
7. Volatile oil production by steam distillation (Demonstration Experiment).
8. Phosphoric acid by Volumetric method
9. Lactic acid by Volumetric method
10. Salicylic acid by Volumetric method
11. Ibuprofen by Volumetric method
12. Aspirin by Volumetric method

PHARMACEUTICAL JURISPRUDENCE**UNIT-I Introduction**

- Pharmaceutical Legislations - A brief review
- Drugs & Pharmaceutical Industry - A brief review
- Pharmaceutical Education - A brief review.
- Pharmaceutical ethics & policy

An elaborate study of the following**UNIT-I** 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.

- Prevention of Cruelty to animals Act 1960.
- AP State Shops & Establishments Act 1988 & Rules 1990.
- Factories Act 1948.
- Patents Act 1970.

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

- Text book of Forensic Pharmacy by B.M.Mithal, publ by Vallabh Prakashan
- Text book of Forensic Pharmacy by Prof. Suresh Kumar J.N. Frontline Publications
- Drugs & Cosmetics act 1940 and Rules by Vijay Malik Eastern Law House Co. Delhi, Kolkata.

REFERENCE BOOK

- Bare Acts and Rules Publ by Govt of India/state Govt from time to time.
- AIR – reported judgments of Supreme Court of India and other High Courts
- Pharmaceutical policy of India
- Notification from NPPA

PHARMACEUTICAL TECHNOLOGY - II**UNIT-I**

Capsules

Advantage and disadvantages of capsule dosage form, 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, microencapsulation by coacervation phase separator, multi orifice centrifugal separation, spray drying, spray congealing, polymerization complex emulsion, air suspension technique, coating pan and other technique, 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 material and these selection, formulation of coating solution, equipments for coating, coating process, evaluation of coated tablets.

UNIT-V

Parenteral Products

- Preformulation factors, routes of administration, water for injection, treatment apyrogenicity, non-aqueous vehicles, isotonicity and methods of its adjustment.
- Formulation details, container and closures and selection.
- Prefilling treatment, washing and sterilization of containers and closures, preparation of solution and suspensions, filling and closing of ampules, vials, infusion fluids, lyophilization & preparation of sterile powders, equipment for large-scale manufacture and evaluation of parenteral products.

UNIT-VI

- a) Aseptic techniques, sources of contamination and method of prevention. Design of aseptic area, Laminar flow benches, services and maintenance.
- b) Sterility testing of parenterals.

UNIT-VII

Packaging of Pharmaceutical products

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

UNIT-VIII

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

TEXT BOOKS

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

REFERENCES

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

HYDERABAD.

III Year B.Pharmacy - II Semester

PHARMACEUTICAL TECHNOLOGY – II LAB

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

HYDERABAD.

III Year B.Pharmacy - II Semester

PHARMACOLOGY – II

UNIT-I

Pharmacology of Cardiovascular System - Hypertension & congestive heart failure

- Digitals and cardiac glycosides
- Antihypertensive drugs.
- Drugs used in the therapy of shock.

UNIT-II Pharmacology of Drugs used in coronary artery disease**UNIT-III** Pharmacology of drugs used arrhythmias**UNIT-IV**

Drugs acting on hematopoietic system

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

UNIT-V

Drugs acting on urinary system

- Fluid and electrolyte balance
- Diuretics

UNIT-VI

Autacoids.-I

Histamine, 5-HT and their antagonists.

UNIT-VII

Autacoids - II

- Prostaglandins, thromboxanes and leukotrienes
- Pentagastrin, Cholecystokinin, Angiotensin, Bradykinin and Substance P.

UNIT-VIII

Drugs Acting on the Respiratory System

- Anti-asthmatic drugs including bronchodilators.
- Anti-tussives and expectorants.
- Respiratory stimulants.

TEXT BOOKS

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

REFERENCES

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

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:
 - 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 guinea pig ileum preparation.
 - *e) Experiments pertaining to analgesia, anti-convulsant activity, anti-inflammatory activity
- * Only demos
2. Pharmacology of Cardiovascular System:
 - 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.

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, Hyosine, Hydrolytic products of these – Tropine and Scopolin. Relationship between tropine & pseudotropine. Biological 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.

Citral: 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 citral – a and b into alpha-terpineol and ionones.

Alfa – Terpenoid: Sources and structure. Conversion into p-cymene, 1,8 – terpin, terpinolene, dipentene, dipentene dihydrochloride. Preparation of alfa-terpineol 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:

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

TEXT BOOKS

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

REFERENCES

- RT Morrison and R.N BOYD, organic chemistry, Allyn and Bacon, inc., boston
- Burger's medicinal chemistry, me – wolf, ed., J. Wiley & sons, NY.
- F.g. Mann & B. Saunders, Practical Organic chemistry Longmans green & Co. Ltd., UK.
- RM. Acheson, an introduction to the chemistry of heterocyclic compounds, Interscience NY.
- Practical pharmacognocny by Duquesn & others CBS Publ.

CHEMISTRY OF NATURAL DRUGS – LAB

1. Preparation of different Alkaloid testing reagents like Dragendorff, 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), FeCl₃ 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.

PHARMACEUTICAL BIOTECHNOLOGY

UNIT-I
Immunology and immunological Preparations. Principles, antigens and haptens, immune system, cellular & humoral immunity, immunological tolerance, antigen-antibody reactions and their applications. Hypersensitivity, Active and passive immunization vaccines preparation standardization and storage as per I.P.

UNIT-II
Hybridoma Technology
Development of hybridoma for monoclonal antibodies and humanized monoclonal antibodies.

UNIT-III r- DNA
Technology & Production of high value low volume products.
Introduction to cloning & production of Vaccines & drugs like Activase, Humulin, Humatrope, Intonm A, Monoclate.

UNIT-IV
Antibiotics and other byproducts of fermentation
Historical development of antibiotics. Antimicrobial spectrum and methods used for their standardization. Screening of soil for organism producing antibiotics. Fermenter, its design, control of different parameters.

UNIT-V
Isolation of mutants, factors influencing rate of mutation. Design of fermentation process. Isolation of fermentation products with special reference to penicillins, streptomycins, tetracyclins, and vitamin B12.

UNIT-VI
Microbial Biotransformation
Introduction, types of reactions mediated by microorganisms, design of biotransformation processes, selection of organisms, biotransformation processes and its improvements with special reference to steroids. Immobilization of bacteria, plant cells and enzymes – Applications in biotransformations.

UNIT-VII
Study of enzymes such as hyaluronidase, penicillinase, streptokinase and streptodornase, proteases etc.

Blood products and plasma substitutes.

Collection, processing and storage of; whole human blood, concentrated human RBC, dried human plasma, human fibrinogen, human thrombin, human normal immunoglobulin, PVP, dextran etc. control of blood pressure as per I.P.

TEXT BOOKS

1. Pharmaceutical biotechnology by S.S. Kori.
2. Principles of fermentation technology by P.F. Stanbury & A. Whitaker, Pergamon Press.
3. Industrial microbiology by Cassida.
4. Prescott and Dunne, "Industrial Microbiology" MC Carraw Hill Book Company.
5. Pepler "Microbial Technology" Vol. 1 & 2.
6. K.Kielesiched "Biotechnology" Vol 6, Verlegchemic, Switzerland
7. PF Standury & A.Whitaker, "Principles of fermentation Technology" Pergamon press, Oxford
8. OP Ward" Fermentation Technology, Principles, processes products" Open University press, Milton Keynes, UK

REFERENCES

1. Monoclinical antibody technology by A.M. Campbell.
2. Handbook of enzyme biotechnology by A. Wiseman.
3. Recombinant dna technology by J.D Watson.
4. Molecular biology and biotechnology by Smith AND Hood.
5. General pharmacy by Cooper and Gunn.
6. A text book of pharmaceuticals, A. O Bentley, 8th Ed, 1982 Bailier Tindall & Co.
7. Microbial biotechnology Alexander N. Glazer & Hiroshi Nikaido, W.H. Freeman Co
8. Biotechnology by Wulf Crueger and Anneliese Crueger, 2nd Ed, Publ – Panima publication cooperation, New Delhi.

IV Year B.Pharmacy - I Semester

PHARMACEUTICAL BIOTECHNOLOGY – LAB

1. Isolation of an 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.

BIOPHARMACEUTICS & 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 – Physicochemical, 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 pharmacokinetics with special reference to one compartment model after I.V.Drug administration, Michaelis-Menten 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.

Pharmacokinetic drug interactions and its significance in combination therapy.

UNIT-VII

Bioavailability and bioequivalence.

Measures of bioavailability, C-max, T-max and Area Under the Curve (AUC)

Design of single dose bioequivalence 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.

- a) In vitro dissolution studies for solid dosage forms methods, interpretation of dissolution data in vitro, in vivo correlations.
- b) Bioavailability testing protocol and procedures.
- c) In vivo methods of evaluation – statistical treatment.

TEXT BOOKS

1. Biopharmaceutics and clinical pharmacokinetics 4/Edn.- Milo Gibaldi.- Pharma Book Syndicate,Hyderabad
2. Fundamentals of Biopharmaceutics and Pharmacokinetics – Venkateshulu - Pharma Book Syndicate.
3. Biopharmaceutics and pharmacokinetics – an introduction by Robert E notary, arcel dekker inc., NY.
4. DM brahmankar and sb jaiswal, biopharmaceutics and pharmacokinetics – a treatise, vallabh prakasham, Delhi,
5. L. Shargel and abc yu, textbook of applied biopharmaceutics & pharmacokinetics, 4th edn, Appleton – century – crofts, Connecticut, 2004.

REFERENCES

1. Remington's pharmaceutical sciences, Mac Pub. Co., Easton Pennsylvania.
2. Modern pharmaceuticals by banker Marcel Dekker Inc., NY
3. L. lachman, H.A.Lieberman, J.L. Kanig, the theory and practice of industrial pharmacy, Varghese publ house, Mumbai.
4. AR. Gennorio Remington: the science and practice of pharmacy, vol 1 &2 lippincott Williams & wilkins, Philadelphia, 2004.

BIOPHARMACEUTICS & PHARMACOKINETICS – LAB

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

PHARMACY ADMINISTRATION

Principles of Pharmaceutical Industrial Management:

UNIT-I
Introduction to forms of Business Organization.

UNIT-II
Manufacturing Management: Plant location, factory building lay-out, production management goals and organization, operating problems, production policy, initiation of production purchasing and inventory control, works lay-out and plant management.

UNIT-III
Workman Safety: measures to health hazards and prevention of environmental pollution.

UNIT-IV
Organisation of Distribution and Marketing: Factors in distributions, Sales organization and sales promotions. General principles of medical detailing. Export and Import trade. New product development.

UNIT-V
Indian Scenario:
1. Pharmaceutical industry in India, mile - stones in the development of pharmaceutical industry, current status and its role in national economy and national health.
2. Structure of the industry, organized sector, small sector, manufacturers

UNIT-VI
Pharmaceuticals in public sector.
1. Progress in the manufacture of basic drugs – synthetic and drugs of vegetable origin.
2. Export and import of drugs and pharmaceuticals.
3. Various types of insurances including marine insurance.

UNIT-VII
Pharmaceutical associations and societies, statutory councils governing the profession.

Principles of Drug store & Community Pharmacy Administration
 Drug store planning and lay-out, sales promotion and salesmanship in drug store. Accounting records in drug stores.

TEXT BOOKS

1. Text book of industrial management by OP. Khanna.
2. Text book of Administration by K.Aswathappa
3. Text book of Administration by R.M.Metha
4. Principles of Accountancy - S.P.Gupta
5. Marketing Management - Rajan Saxena
6. Pharmaceutical Industrial Management – SAGAR - Pharma Book Syndicate.

REFERENCES

1. Marketing Management - Kotler
2. Principles & Practice of Management - L.M.Prasad
3. Current Documents Related to EXIM policy, WTO etc.,
4. Text book of Administration by R.D.Agarwal
5. Text book of Administration by Stoner & Gibert
6. Text book of Administration by Koontz & Heinz
7. Principles of Accountancy - M.C.Shukla
8. Construction Planning, Equipment and methods by R.L. Peurifoy etal. – Tata Mc. Graw Hill Publications.
9. PERT and CPM – Project planning and control with by Dr.B.C.Punmia & Khandelwal – Laxmi publications

IV Year B.Pharmacy - I Semester

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; Carninatives, 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, Cephalosporins, 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 antagonists.

Principles of bioassays. Errors in bioassays. Study of bioassay methods for the following drugs

- a. Digitalis, b. D – tubocaratine, c. Oxytocine , d. HCG.

TEXT BOOKS

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

REFERENCES

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

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 chloramphenitamine using histamine as agonist on guinea pig ileum.
 - c) To find out the strength of the given sample on (e.g. Acetylcholine, Histamine, 5-HT, Oxytoxin etc.) Using a suitable isolated muscle preparation by
 - d) Matching Assay
 - e) Two point Assay
 - f) Three point Assay
 2. Pharmacology of the Gastrointestinal Tract
 - a) To study the anti-secretory and anti-ulcer activity using pylorus ligated rats.

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IV Year B.Pharmacy - I Semester

MEDICINAL CHEMISTRY – II

UNIT – I

Basic considerations of Drug activity:

Introduction, Factors affecting bioactivity, Theories of drug activity, A brief account of quantitative aspects of drug action and Receptor concept of drug action mechanism. Basic concepts of computer Aided drug design; Activity/toxicity predictions, QSAR with the use of TSAR.

UNIT – II

Mechanisms of Drug action: Introduction, Enzyme stimulation, Enzyme inhibition, Sulfonamides and Membrane – active drugs
Drug metabolism and inactivation: Introduction, Biotransformations, Metabolic reactions, Conjugation reactions

UNIT – III

A study of the following classes of drugs including introduction, classification, structures, general method of synthesis (if any), mechanism of action and SAR. Synthesis of compounds specified against each class is to be studied.
Drugs acting on CNS:

A brief study of the chemistry of neurotransmitters.
Hypnotics and Anxiolytics – Phenobarbital, Diazepam, Alprazolam.
Anti-psychotics – Chlorpromazine, Haloperidol, Clozapine, Oxyphenite.
Anti-epileptics – Phenytoin, Valproic acid, Carbamazepine, Ethosuximide.
Anti-depressants – Imipramine, Fluoxetine, Doxepine, Sertraline.

UNIT - IV

General and Local anesthetic agents:

Definition, Introduction, chemical classification, SAR, mechanism of action and synthesis of Benzocaine and Lidocaine, Halothane and Ketamine.

UNIT – V

A study of the following classes of drugs including introduction, classification, structures, mechanism of action and SAR. Synthesis of compounds specified against each class is to be studied.

Drugs affecting adrenergic mechanism:

Introduction,
Adrenergic receptors, catabolism
Indirect acting sympathomimetics: Amphetamine
Ephedrine, Salbutamol, Pseudoephedrine, Dobutramine, Dopamine

UNIT – VI

A study of the following classes of drugs including introduction, classification, structures, mechanism of action and SAR. Synthesis of compounds specified against each class is to be studied.

Drugs affecting cholinergic mechanism:

Introduction – some aspects of cholinergic system
Cholinergics – Carbachol, pilocarpine
Anticholinesterase – Neostigmine
Antidotes for ACh Inhibitors:- PAM (Pralidoxime)
Cholinergic blockers: Propantheline, Dicycloamine.
Neuromuscular blockers: Galamine, Succinyl choline.

UNIT – VII

A study of the following classes of drugs including introduction, classification, structures, mechanism of action and SAR. Synthesis of compounds specified against each class is to be studied.

Anti-adrenergic drugs: α -blockers: Phenoxylbenzamine, Prazosine, Tolazoline
 β – blockers: Propranolol, Atenolol, Labetolol.

UNIT – VIII

A study of the following classes of drugs including introduction, classification, structures, mechanism of action and SAR. Synthesis of compounds specified against each class is to be studied.

Anti-cholinergic drugs: Atropine, Ipratropium bromide, Dicyclomine, Bipyridine, Propantheline

TEXT BOOKS

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

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. Bentley and Driver's Textbook of Pharmaceutical Chemistry Ed: I.M. Atherden. Oxford University Press, Delhi.
4. B.N. Lads, MG.Mandel and F.L. 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. Daniellednicer, 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. Text book of Medicinal Chemistry by Kadam Vol. 1 & 2.
9. Text book of natural products by O.P.Agarwal Vol. 1 & 2

MEDICINAL CHEMISTRY – II LAB

- I. **Synthesis of some medicinal compounds and their analogues.**
 - i. Barbituric acid from Diethyl Malonate.
 - ii. Phenyltion from Benzoin or Benzil.
 - iii. Paracetamol 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 g-picoline.
 - viii. Antipyrine from ethyl aceto acetate.
 - ix. Benocaine 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 Examination s – details are not given

ELECTIVES

- a) Industrial Pharmacy
- b) Clinical Pharmacy/Pharmacology
- c) Pharmacognosy/Medicinal Chemistry
- d) Pharmaceutical Analysis/Quality assurance
- e) Pharmaceutical Marketing

DOSAGE FORM DESIGN & NOVEL DRUG DELIVERY SYSTEMS

UNIT-I
 Preformulation: Physico chemical 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 bio availability study of prodrugs in solving problems related to stability bio availability in formulations.

UNIT-II
 Introduction to process validation of dosage forms manufacture.

UNIT-III
 GMP and Quality Assurance, Quality Audit.

UNIT-IV
 Regulatory Affairs & IPR

UNIT-V
 Novel Drug Delivery systems: Sustained release dosage forms: principles and concepts involved, dosages calculation methods adopted in release controlling.

UNIT-VI
 Design, manufacture and evaluation of various types of sustained release products concept of controlled drug delivery, oral, parenteral, long acting products, implants and transdermal drug delivery systems.

UNIT-VII
 Design, manufacture and evaluation of nanoparticle technology & liposomes.

UNIT-VIII
 Stabilization and stability testing protocol for various pharmaceutical products.

TEXT BOOKS

1. HC Ansel introduction to Pharmaceutical Dosage forms
2. Quality Assurance in Pharmaceutical Industry by Y.Anjaneyulu & Marraiah
3. Theory & Practice of industrial pharmacy by L. Lachman, H.a, Lieberman and J.L. Kanig,, Lea & Febieger, Philadelphia Latest Edn.
4. CVS. Subramanyam, Pharmaceutical production and management, Vallabh Prakashan, New Delhi

REFERENCES

1. Cosmetics Sciences & Technology by Sagarian & MS Balsam. Vol.1, 2 & 3
2. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences
3. Bentley's Text Book of Pharmaceutics by Rawlkins, Elbs publ
4. HC Ansel Introduction to Pharmaceutical Dosage forms
5. 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
6. Gilbert S. Banker and Christopher T Rhodes, Modern Pharmaceutics, 1Vth ed, marcel dekker. usa, 2005.
7. Yiew Chien, novel drug delivery systems, 2nd ed, marcel dekker 2003.
8. Robert . A. Nash, Pharmaceutical Process Validation, 3rd Ed Marcel Dekker, 2003.
9. Good Manufacturing Practices – Schedule M Read With The Drugs And Cosmetic Rules 1945

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

HYDERABAD.

IV Year B.Pharmacy - II Semester

DOSAGE FORM DESIGN & NOVEL DRUG DELIVERY SYSTEMS – LAB

1. Formulation studies including drugs excipients compatibilities studies, effect of stabilizers, in dosage form design.
2. Stability evaluation of various dosage forms and their expiration dating.
3. Design, Development and evaluation of controlled release formulations.
4. Solubility parameters in liquid dosage forms like syrups.
5. Physical properties, versus therapeutic efficacy of dosage forms

PHARMACEUTICAL ANALYSIS – II

A brief account of the theory, instrumentation and applications of the following techniques:

- UNIT – I** Paper, thin layer and column chromatographies
UNIT – II Gas Chromatography
UNIT – III HPLC & HPTLC
UNIT – IV Electrophoresis
UNIT – V Radio Immuno Assay & Enzyme Linked Immuno Sorbate Assay
UNIT – VI Basic principles of Nuclear Magnetic Resonance & Mass Spectrometry
UNIT – VII Basic principles of Differential Thermal Analysis and Differential Scanning Calorimetry
UNIT – VIII Basic principles of Atomic Absorption Spectroscopy and XRD

Note. *Not for End Examinations.

TEXT BOOKS

1. Spectroscopy by Silvesterin.
2. Instrumental and Chemical Analysis by B.K.Sharma, Goel Publ House, Hyderabad.
3. Text book of Practical Pharmaceutical chemistry by Beckett & Stenlae Vol.1&II
4. Quantitative Chemical Analysis by AI Vogel.
5. Instrumental methods of analysis by Hobart. H. Willard and others CBS publ and Distributors New Delhi:

REFERENCES

1. Pharmacopoeia (IP, BP, USP, PhI, Eu. PhI)
2. Quality Assurance in Pharmaceutical Industry by Y.Anjaneyulu & Marajah
3. Quantitative analysis of Drugs and Pharmaceuticals by P.D. Sethi.
4. A text book of pharmaceutical analysis by K. A. Connors, Wiley Interscienc, NY.
5. Jenkin's quantitative pharmaceuticals chemistry by A.M. Knevel & F.E. Digengl, Mc Graw Hill Book Co., NY.

PHARMACEUTICAL ANALYSIS – II LAB

Practical experiments

1. Ascending paper chromatography.
2. Radial paper chromatography.
3. Thin layer chromatography.
4. Column chromatography * (demonstration only).
5. Paper electrophoresis of amino acids.
6. Gel electrophoresis* (demonstration only).
7. HPLC*(demonstration only).
8. PAGE * (demonstration only).
9. Kinematic viscosity*(demonstration only)
10. IR- Analysis* - related problems (demonstration only).

MEDICINAL CHEMISTRY – III**UNIT – I**

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

Drugs acting on Cardio-vascular diseases:

General account of cardiovascular diseases

Antihypertensives – Methyl Dopa, Amlodipine, Enalapril, Losartan.

UNIT – II

A study of the following classes of drugs including introduction, classification, structures, mechanism of action and SAR. Synthesis of compounds specified against each class is to be studied.

Anti-arrhythmics – Procainamide

Diuretics – Acetazolamide, Hydrochlorothiazide, Furosemide

Anticoagulants, Anti-anginals and Coronary vasodilators – Isosorbide dinitrate, Verapamil, Diltiazem

Antihyperlipidemics (Hypocholesteremic drugs): Clofibrate

UNIT - III

General account on pancreatic and thyroid hormonal malfunctions. A brief account on statins

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

A. Analgesics and NSAIDS (Non-steroidal anti-inflammatory agents):

a) Introduction and types of pain and inflammation, b) classification and systematic development of analgesics of morphine, mild analgesics and strong analgesics : Meperidine and Methadone, c) NSAIDS – Aspirin, Paracetamol, Ibuprofen & Diclofenac d) A brief account on Cox-2 inhibitors and nimsulide.

UNIT – V

Chemotherapeutic Agents:

Definition, Chemical Classification, SAR and mechanism of action and synthesis of the specified drugs in the following:

Sulpha drugs : Sulphadiazine, Suphasalazine,

Trimethoprim, Sulphamethoxazole, Sulphamer

Anti viral Drugs : Acyclovir, Zidovudine

Antifungal Agents : Fluconazole and Itraconazole.

UNIT – VI
Anti tuberculars : Isonicotinic acid hydrazide and Ethambutol & Rifampicin
Anti leprotics : Dapsone

UNIT - VII

Antiamoebics : Metronidazole, Diloxanide furoate

Anthelmintics : Diethylcarbamazine citrate, Pyrantel pamoate, Mebendazole, Albendazole

Antimalarial Drugs : Chloroquine, Primaquine and pyrimethamine

UNIT – VIII

Anticancer Drugs : Chlorambucil, Busulphan, Procarbazine, Carmustine, 5-Fluorourasil, 5-Mercaptopurine Methotrexate, Vinca alkaloids – Vinblastin, Vincristine

TEXT BOOKS

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

REFERENCES

1. D. Abraham (Ed), Burger Medicinal chemistry and Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003, 6th Ed.
2. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences Bentley and Driver's Textbook of Pharmaceutical Chemistry L. M. Atherden. Oxford University Press, Delhi.
3. B.N. Lads, MG, Mandel and F.L. 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.

Assay of some drugs from their formulations:

1. Sulpha methoxazole (sulpha drug)
2. Gilbenclamide (sulphonylurea, hypoglycemia)
3. Metronidazole (antiprotozoal)
4. Ibuprofen (analgesic-antiinflammatory)
5. Flurosemide (diuretic)
6. Isoniazid (anti-tubercular)
7. Aspiin (analgesic, antipyretic, and antiinflammatory, antithrombotic)
8. Phenytoin (anticonvulsant)
9. Phenobarbitol (sedative-hypnotic)
10. Diethylcarbarnazine (anthelmintic)
11. Salbutamol (antiasthmatic)
12. Phenyl butazone (Anti inflammatory)

UNIT – I

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

UNIT – II

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

UNIT – III

Marine Pharmacognosy: Studies on novel natural products from marine sources.

UNIT – IV

Study of traditional drugs: common and vernacular names, sources, chemical constituents and uses of Kantakari, Malkanguni, Shatavari, Sankhapushphi, Tylophora, Bilva, Kalijeeri, Rasna, Apamarga, Gokhru, Gudhuchi, Bach, Amla, Methi, Guggul, Kalimusli, Punarnava, Chitrak and Brahmi.

UNIT – V

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 – VI

Herbal Formulations

- a) General introduction to cosmeceuticals role of herbs in cosmetics: Study of the following drugs: Amla, Henna, Cyperus, Soap nut, Aloe vera, Turmeric, Sandal wood, Bitter orange peel
- b) Definition and study of Neutraceuticals: Garlic, Spirulina, Soya and Royal Jelly.

UNIT – VII

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

UNIT – VIII

Natural dyes and their applications in pharmacy.

TEXT BOOKS

1. The Pharmacognosy by Kokate C.K , Purohit AP & Gokhale S.B (Nirali)
2. Pharmacognosy by Trease and Evans, Latest Edition.
3. Pharmacognosy by Tyler, Brady & Robert.

REFERENCES

1. Cultivation & Utilization of Medicinal Plants by Atal C.R & Kapur B.M
2. Textbook of pharmacy by Wallis, Pub by CBS Publishers and distributors, New Delhi.
3. Ayurvedic Pharmacopoeia of India, Pub by Govt. Of India
4. Text book of Pharmacognosy by Handa & Kapoor.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY**HYDERABAD.****IV Year B.Pharmacy - II Semester****PHARMACOGNOSY – IV LAB**

- 1 Laboratory experiment on isolation, separation, purification of various groups of chemical constituents.
2. Experiments on paper and thin layer chromatographic evaluations of herbal drug constituents.

CLINICAL PHARMACY & THERAPEUTICS**UNIT – I**

Introduction to Clinical Pharmacy

UNIT – II

Basic concepts of Pharmacotherapy

- Clinical Pharmacokinetics and Individualization of Drug Therapy.
- Special precautions in drugs usage during infancy and in the elderly (Pediatrics & Geriatrics).
- Special precautions in drugs usage during pregnancy & lactation
- Adverse Drug Reactions
- The Basics of Drug Interactions
- Interpretation of Clinical laboratory Tests.

UNIT – III

Important Disorders of Organ Systems and their Management:

- Cardiovascular Disorders: Hypertension, Congestive Heart Failure, Angina, Acute Myocardial Infarction, Cardiac Arrhythmias
- CNS Disorders: Epilepsy, Parkinsonism, Schizophrenia Depression

UNIT – IV

- Respiratory Disease: Asthma.
- Gastrointestinal Disorders: Peptic Ulcer Disease, Ulcerative Colitis, Hepatitis, and Cirrhosis.

UNIT – V

- Endocrine Disorders: Diabetes mellitus and Thyroid Disorders.
- Infectious Diseases: Tuberculosis, Urinary Tract Infection, Enteric Infections,

UNIT – VI

Upper Respiratory Infections.

- Hematopoietic Disorders: Anemias.
 - Joint and Connective Tissue Disorders: Rheumatic Diseases, Gout and Hyperuricemia.
 - Hyperuricemia.
- Neoplastic Diseases: Acute Leukaemias, Hodgkin's disease

UNIT – VII

Therapeutic Drug Monitoring

UNIT – VIII

Concept of Essential Drugs and Rational Drug use.

TEXT BOOKS

- Katzung, B.G: Basic and Clinical Pharmacology, Prentice hall, International.
- Laurence, DR and Bennet PN. Clinical Pharmacology, Scientific book agency
- Clinical Pharmacy and therapeutics, Herfindal E T and Hirschman JL, Williams and Wilkins
- Applied Therapeutics: The clinical uses of Drugs applied therapeutics INC
- clinical pharmaco kinetics by Dr. D.R Krishna, V. Klotz, Publ Springer Verlag
- clinical pharmaco kinetics Rowland – Pharma book syndicate Hyderabad.

REFERENCES

- Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences: 20th Edition.
- Drug interaction by hamsten, Kven Stockley.
- Drug interaction by J.K. Mehra, Basic Bussiness Publ, Bombay.
- Clinical pharmacology and drug therapy Grahame smith and Aronson

IV Year B.Pharmacy - II Semester

PROJECT WORK (200 MARKS)

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 Rawlins, 8th ed ELBS Bacilliere Tindall.

"Dispensing of Medication", ed J E Hoover, 8th ed Mack Publishing Co., Easton PA.

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 Connors, G L Amidon 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 Machbe 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 Bancharo, "Introduction to Chemical Engineering" McGraw Hill International Book Co., London.

BT 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 .

"Millo Gibaldi, "Biopharmaceutics & Clinical Pharmacokinetics" 3rd ed. Lea & Febiger, 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 Ridgway. The Pharmaceutical Press, London.
- "Textbook of Hospital Pharmacy", ed M C Allwood and J T Fell, Blackwell Scientific Publications, Oxford .
- 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 .
- J C KacChenney "Packaging of Cosmetics and Toiletries, Newness - Butterworth, London.
- W A Ritschel, "Handbook of Basic Pharmacokinetics", Drug Intelligence Publications, Hamilton .
- Pharmacopoeias of India, published by the Controller of Publications, Delhi, 1st ed- 1966 3rd ed .
- British Pharmacopoeias, Her Majesty's Stationery office, University Press, Cambridge.
- The United States Pharmacopoeias, 22nd revision. The United States Pharmacopoeial Convention, Mack Pub Co. Easton, PA.
- The British Pharmaceutical Codex, 12th ed. The Pharmaceutical Press, London.
- Martindale: The Extra Pharmacopoeias, ed J E F Reynolds, 28th ed. The Pharmaceutical Press, London .
- British National Formulary, No.15 Pub jointly by British Medical Association and Royal Pharmaceutical Society of Great Britain .
- The Merck Index 9th ed, Merck & Co., Inc NJ.
- R Y Stanier, Ingraham, "General Microbiology" 5th ed, Wheelis and Painter.
- Rugu and Russel, "Pharmaceutical Microbiology; Blackwell Scientific Publication, Oxford.
- A J Salle, "Fundamental Principles of Bacteriology",

- Bergy's Manual of Determinative Bacteriology.
- G Sykes, "Disinfection and sterilization, II ed.
- Davis, Dulberto, Eisen "Microbiology".
- Benjamin Lewis, Gene V "Microbiology"
- Prescott and Dunn, "Industrial Microbiology", 2nd ed McGraw Hill Book Company Inc.
- Pepler, "Microbial Technology", Vol I & II
- Suichi Aiba Humphrey and Millis, "Biochemical Engineering", University of Tokyo
- K Krielsch Ed "Biotechnology" Vol 6a, Verlag Chemie, Switzerland.
- P F Standury & A Whitaker, "Principles of Fermentation Technology" Pergamon Press, Oxford, 1987.
- O P Ward "Fermentation Technology, Principles, Processes & Products" Open University Press, Milton Keynes, UK 1989.
- G Reeves, "Lecture Notes on Immunology", Blackwell Scientific Publications, Oxford 1987.
- L M Prescott, G P Jarley, D A Klein, "Microbiology", 2nd Ed., Wmc Borrow Publishers, Oxford 1993.
- T D Brock, M T Madigen "Biology of Micro-organism" 5th aed Prentice Hall, New Jersey USA 1988.
- Biopharmaceutics and clinical pharmacokinetics 4/Edn.- Mlio Gibaldi.-Pharma Book Syndicate.Hyderabad.
- Pharmaceutical Industrial Management – SAGAR - Pharma Book Syndicate.
- Biopharmaceutics and Pharmacokinetics – Venkateshulu - Pharma Book Syndicate.
- BOOKS RECOMMENDED (PHARMACOGNOSY)**
- Atal, C Ksssss 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-Scientechics, 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, Nayyar S L and Chopra, I C Glossary of Indian Medicinal Plants, CSIR, New Delhi.
- Clarke, ECG, Isolation and Identification of Drugs, The Pharmaceutical Press, London.

- De Mayo, P The Chemistry of Natural Products, 2-3, Interscience, New York.
- Export Potential of Selected Medicinal Plants, prepared by a Basic Chemicals, Pharmaceuticals and Cosmetic Export Promotion Council, Bombay, and other reports.
- Fahn, A, Plant Anatomy, 3rd Ed., Pergamon Press, Oxford.
- Faulkner, D J and Fencical, W H, Marine Natural Products a Chemistry (NATCO Conference Series 4). Plenum Press, New York.
- Gamborg, G.L and Wether. L R. Plant Tissue Culture Methods, National Research Council of Canada, Saskatchewan.
- Gibbs, R Darneley, Chemotaxonomy of Flowering Plants, 4 volumes McGill University Press.
- Guenther, E. The Essential Oils-4D Van Nostrand Co Inc New York.
- Harborne, JB, Biochemistry of Phenolic Compounds Academic Press. New York.
- Barborne JB, Phytochemical Methods, Champam, and Hall, International Edition, London.
- Henry TA, The Plant Alkaloids, 5th Ed, EcGrwd Hill, New York.
- Kokate C K. Practical Pharmacognosy, Vallabh Prakashan, Delhi.
- Kokate C K, Purohit A P and Gokhale S B. The Pharmacognosy (Degree) Nirrali Prakashan, Pune
- Manitto P. The Biosynthesis of Natural Products, Ellis ahorwood, Chichester.
- Manske RHF. The Alkaloids-Academic Press. New York.
- Martindale, The Extra Pharmacopoea, Pharmaceutical Society of Great Britain, London
- Medicinal Plants of India, 1.Indian Council of Medical Research New Delhi.
- Medicinal Plants of India. Zafar, R.,C.B.S.Publisher, New Delhi
- Miller, L.P.,Phytochemistry, 1-3 Van Nostrand Reinhold Co.,
- Nackarni, A K, Indian Materia Medica, 1-2, Popular Prakashan Pvt.Ltd.,Bombay
- Official methods of analysis, Association of official analytical chemists publications, Washington.
- Peach, K and Tracey M V., Modern methods of plant analysis, 1-4, Narose Publishing house, New Delhi
- Pharmacopoea of India, Govt.of India, Ministry of Health. 7
- Pridham, J B, and Swain, T., Biosynthesis pathways in higher plants, Academic press, New York.
- Pridham, J.B., Terpenoids in plants, Academic press, New York
- Reinert, J and Bajaj Y P S., Applied and fundamental aspects of plant cell, Tissue and organ culture, Berlin.

- Robinson, T., The Biochemistry of alkaloids, Springer- Verlag, New York.
- 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 Taxonomy, Academic press, London
- Swain, T., Comparative Phytochemistry, Academic 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., Bailiers Tindall, Eastbourne 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
- Walls, T E, Analytical microscopy, J&A Churchill limited, London.
- Walls, T E Textbook of Pharmacognosy, J&A Churchill Limited London
- BOOKS RECOMMENDED ON PHYSIOLOGY AND ANATOMY**
- Guyton, Textbook of Medical Physiology, AC Guyton WB Saunders Company, 1995
- Human Physiology C.C. Chatterjee
- 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.
- William & Wilkins, Baltimore
- Illustrated Physiology, McNaught, A.B. and Callander, R., Churchill Livingstone.
- 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 Mariron 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. Rail, A.S.Nies, P.Taylor, pergamon Press,
- Modern Pharmacology, C.R.Craig and R.E.Stitzel, Little brown and Company
- Modern Pharmacology, C.R.Craig and R.E. Stitzel, Little brown and Company
- Paul, L., Principles of Pharmacology, Chapman and Hall,
- T.C.Theoharides, Pharmacology, Little Brown and Co.,
- 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 Harrath, 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.

- BOOKS RECOMMENDED (PHARMACEUTICAL ANALYSIS, PHARMACEUTICAL CHEMISTRY BIOCHEMISTRY)**
- 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 Textbook of Pharmaceutical Chemistry, Voll 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 Digan, 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, Philidelphia, 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, Firdley'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.
- I L Finar, Organic Chemistry, Vol. I., The Fundamentals of Principles, ELBS/ Longman
- 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

L Stryer, Biochemistry, W H Freeman and Company, Sanfransisco

B Harrow and A Mazur, Text Book of Biochemistry, W B Saunders Co., Philadelphia.

C Hanch, Comprehensive medicinal chemistry, Vol. IV, quantitative Drug Design, Pergamon Press. Oxford

V.C. Martin, quantitative Drug Design – Critical Introduction (Medicinal Research Monographah, Vol. 8 Marcel Dekker, Inc. New York

Exploring QSAR : Vol. I Fundamentals and applications in chemistry and biology and C Hanch, A Leo and D Hockman ACS Book Catalog.

P C Jurs, Computer software application in chemistry, John Wiley & Sons, New York.

M E Wolff, Ed. Burger's Medicinal Chemistry, John Wiley & New York

J N Delgado and W A R Remers, Eds., Wilson and Gisworld's Text book of Organic Medicinal and pharmaceutical chemistry, J Lippincott Co., Philadelphia

W C Foye, principles of Medicinal Chemistry, Lea & Febiger, Philadelphia 1955

T Nogrady, Medicinal Chemistry – A Biochemical Approach. Oxford University Press, New York, Oxford

B.N.Ladu, H G Mandel and E L Way., Fundamentals of Drug Metabolism and Disposition, William and Welkins Co., 428 E, Preston street, Baltimore

Analytical Chemistry – Y. ANJANEYULU - Pharma Book Syndicate,Hyderabad.

T Nogrady, Medicinal Chemistry – A Biochemical Approach.- Pharma Book Syndicate. Hyderabad.

OTHER BOOKS RECOMMENDED

Popst and Perum "Computer Aided Drug Design". Academic Press, New York.

Computer Programming in pascal – V Ragaraman, Prentice – hall of India New Delhi, 1983.

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

PASCAL USER MANUAL AND Report – K Jensen and N Wirth., Narosa Pub. House, New Delhi, 1983.

Systematic programming in Introduction – N Wirth, Prentice Hall Englewood cliff's New Jersey, 1973.

Programming in Pascal – P Grogona, Adeison Wesley, Reading, M.A., 1980.

Text Book of Drug design and discovery 3/Edn.- LARSEN.- Pharma Book Syndicate.

Name Reaction: LI - Pharma Book Syndicate. Hyderabad.

Organic Reaction Mechanisms – GALLEGO- Pharma Book Syndicate,Hyderabad

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

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

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

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

Elementary Bioinformatics – KHAN - Pharma Book Syndicate.

Analytical Chemistry – Y. ANJANEYULU - Pharma Book Syndicate,Hyderabad.

Phytochemical Methods by HARBONE, Published by Chapman & Hall