

ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

B. PHARMACY

For
B. Pharm. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2009-2010)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY, HYDERABAD – 500 085.

Academic Regulations 2009 for B.Pharm (Regular)

(Effective for the students admitted into I year from the Academic Year 2009-2010)

1. Award of B.Pharm Degree

A student will be declared eligible for the award of the B.Pharm Degree if he fulfils 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) Register for all the 200 credits and secure all the 200 credits.
2. Students, who fail to fulfil 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	03	03
Practicals	03	03	03	02
Seminar	—	—	—	02
Project & Viva	—	—	—	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 25 marks for Internal Evaluation and 75 marks for the End-Examination.
- iii. For theory subjects, during the semester there shall be 2 mid term examinations. Each mid term examination consists of one objective paper, one subjective paper and one assignment. The objective

paper is for 10 marks and subjective paper is for 10 marks, with a duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for subjective paper). Objective paper is set for 20 bits of multiple choice questions, fill-in the blanks, matching type questions for the 10 marks.

Subjective paper of each semester shall contain 4 full questions (one from each unit) of which, the student has to answer 2 questions, each carrying 5 marks.

First mid term examination shall be conducted for 1-4 units of syllabus and second mid term examination shall be conducted for 5-8 units. 5 marks are allocated for Assignments (as specified by the concerned subject teacher) – first Assignment should be submitted before the conduct of the first mid, and the second Assignment should be submitted before the conduct of the second mid. The total marks secured by the student in each mid term examination are evaluated for 25 marks, and the better of the two mid term examinations shall be taken as the final marks secured by each candidate.

However, for first year, there shall be 3 mid term examinations (each for 25 marks), along with 3 assignments in a similar pattern as above [1st mid shall be from 1-2 units, 2nd mid from 3-5 units and 3rd mid shall be from 6-8 units], and the average marks of the best two examinations secured (each evaluated for a total of 25 marks) in each subject shall be considered as final marks for the internals / sessionals

- iv. For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks. Out of the 25 marks for internal day-to-day work in the laboratory shall be evaluated for 15 marks and internal examination for practical shall be evaluated for 10 marks conducted by the concerned laboratory teacher. The end examination shall be conducted with external examiner and laboratory teacher. The external examiner shall be appointed from the cluster of colleges as decided by the University examination branch.

- v. 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.
- vi. Out of a total of 100 marks for the project work, 25 marks shall be for Internal Evaluation and 75 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.
- vii. Laboratory marks and the sessional marks awarded by the College are not final. They are subject to scrutiny and scaling by the University wherever necessary. In such cases, 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 institutions as per the University norms and shall be produced to the Committees of the University as and when they ask for.
- viii. There shall be a Comprehensive Viva-Voce in IV year I semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of (i) Head of the Department (ii) two Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he / she studied during the B.Pharm course of study. The Comprehensive Viva-Voce is valued for 100 marks by the Committee.

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5. Attendance:

- i. A student shall be eligible to appear for University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- ii. Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- iii. 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.
- iv. 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.
- 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:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 5.

- i. 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 35 credits from one regular and one supplementary examinations of I year, and one regular examination 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 60 credits from the following

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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.
- iv. A student shall register and put up minimum attendance in all 200 credits and earn all the 200 credits. Marks obtained in all the 200 credits shall be considered for the calculation of percentage of marks.
- v. Students who fail to earn 200 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.
- iii. When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester / year is offered after fulfilment of academic regulations, whereas the academic regulations hold good with the regulations he was first admitted.

8. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program 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	Class Awarded
First Class with Distinction	70% and above	
First Class	Below 70% but not less than 60%	From the aggregate marks secured for the best 200 Credits.
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)

10. Minimum Instruction Days :

The minimum instruction days for each semester / I year shall be 90/ 180 clear instruction days.

- 11. There shall be no branch transfers after the completion of admission process.
- 12. There shall be no place transfer within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

13. General:

- i. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- ii. The academic regulation should be read as a whole for the purpose of any interpretation.
- iii. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- iv. 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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Academic Regulations for B. Pharma. (Lateral Entry Scheme)

(Effective for the students getting admitted into

II year from the Academic Year 2009-2010 and onwards)

- 1. The Students have to acquire 150 credits from II to IV year of B.Pharma. Program (Regular) for the award of the degree. Register for 150 credits and secure 150 credits.
- 2. Students, who fail to fulfil 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. Tech. (Regular).

4. Promotion Rule :

A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of 37 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 program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes :

Class Awarded	% of marks to be secured	Class Awarded
First Class with Distinction	70% and above	From the aggregate marks secured for 150 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. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)

MALPRACTICES RULES
DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/ Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in the subject only
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and

	(theory or practical) in which the candidate is appearing.	shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester / year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in-charge or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of

	the any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The

		continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.

10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
 - (i) A show cause notice shall be issued to the college.
 - (ii) Impose a suitable fine on the college.
 - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD
B.PHARMACY**

IYEAR**COURSESTRUCTURE**

Code	Subject	T	C	P	C
R9101	Remedial Mathematics /, Remedial Biology (R9107)	3+2+1*	6/3	0/3 (R9108)	0/3
R9102	Dispensing and Hospital Pharmacy	3+1*	6	3 (R9109)	3
R9103	Pharm. Inorganic Chemistry	3+1*	6	3 (R9110)	3
R9104	Pharmaceutical Organic Chemistry I	3+1*	6	3 (R9111)	3
R9105	Anatomy, Physiology and Health education	3+1*	6	3 (R9112)	3
R9106	English Language Communication Skills	2	2	2 (R9113)	2
Total		22/21	32/29	14/17	14/17

IYEAR I SEMESTER**COURSE STRUCTURE**

Code	Subject	T	C	P	C
R9201	Pharmaceutical Unit Operations – I	3+1*	3	-	-
R9202	Pharmaceutical Organic Chemistry – II	4+1*	4	3 (R9206)	2
R9203	Statistical Methods & Computer Applications	3+1*	3	3 (R9207)	2
R9204	Physical Pharmacy – I	4+1*	4	3 (R9208)	2
R9205	Anatomy, Physiology & Pathophysiology	3+1*	3	3 (R9209)	2
Total		22	17	20	8

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD
B.PHARMACY

II YEAR II SEMESTER

COURSE STRUCTURE

Code	Subject	T	C	P	C
R9301	Pharmaceutical Unit Operations- II	3+1*	3	3 (R9306)	2
R9302	Pharmaceutical Analysis I	4+1*	4	3 (R9307)	2
R9303	Pharmacognosy - I	3+1*	3	3 (R9308)	2
R9304	Physical Pharmacy – II	4+1*	4	3 (R9309)	2
R9305	Environmental Science	3+1*	3	-	-
	Total	22	17	20	8

III YEAR I SEMESTER

COURSE STRUCTURE

Code	Subject	T	C	P	C
R9401	Pharmaceutical Biochemistry	3+1*	3	3 (R9406)	2
R9402	Pharmaceutical Microbiology	3+1*	3	3 (R9407)	2
R9403	Pharmacognosy-II	3+1*	3	3 (R9408)	2
R9404	Pharmaceutical Technology-I	4+1*	4	3 (R9409)	2
R9405	Pharmacology -I	4+1*	4	-	-
	Total	22	17	12	8

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.PHARMACY

III YEAR II SEMESTER

COURSE STRUCTURE

Code	Subject	T	C	P	C
R9501	Medicinal Chemistry – I	3+1*	3	3 (R9507)	2
R9502	Pharmaceutical Technology-II	3+1*	3	3 (R9508)	2
R9503	Pharmacology II	3+1*	3	3 (R9509)	2
R9504	Chemistry of Natural Drugs (Phytochemistry)	3+1*	3	3 (R9510)	2
R9505	Pharmaceutical Jurisprudence	3+1*	3	-	-
R9506	Advanced English Communication Skills Lab	-	-	3	2
	Total	20	15	15	10

IV YEAR I SEMESTER

COURSE STRUCTURE

Code	Subject	T	C	P	C
R9601	Pharmaceutical Analysis – II	3+1*	3	3 (R9307)	2
R9602	Biopharmaceutics and Pharmacokinetics	3+1*	3	3 (R9308)	2
R9603	Pharmacology III	4+1*	4	3 (R9309)	2
R9604	Medicinal Chemistry II	3+1*	3	3 (R9310)	2
R9605	Pharmacy Administration	3+1*	3	-	-
R9606	Industrial Training and Seminar	-	-	-	2
	Total	21	16	12	10

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.PHARMACY
IV YEAR II SEMESTER COURSE STRUCTURE

Code	Subject	T	C	P	G
R9701	Novel Drug Delivery Systems and Regulatory Affairs	3-1*	3	3 (R9707)	2
R9702	Pharmaceutical Biotechnology	3-1*	3	3 (R9708)	2
R9703	Medicinal Chemistry-III	3-1*	3	3 (R9709)	2
R9704	Pharmacognosy III	3-1*	3	3 (R9710)	2
R9705	Clinical Pharmacy & Therapeutics	4-1*	4	-	-
R9706	Project work** & Comprehensive Viva	-	-	-	4
	Total	21	16	12	12

** Suggested areas for project work.

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

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

T – Theory periods per week

P – Practical Periods per week

C – Credits

* – Tutorials

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B. Pharm

T	P	C
3+1*	0	6

(R9101) REMEDIAL MATHEMATICS

UNIT I: Algebra:

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

UNIT VI

Integral Calculus: Integration as an 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, solution of first order differential equations.

UNIT VIII

Applications of 1st order and 1st degree law of Natural growth and decay. Newton's Law of cooling. Linear differential equa from Homogenous and non homogenous 2nd higher order definition.

TEXT BOOKS

1. Intermediate first Year mathematics and
2. Intermediate Second year mathematics., printed and published by Telugu Academy, Himayatnagar, Hyderabad
3. Pharmaceutical Arithmetic's by Mohd. Ali CBS publishers and distributor, New Delhi.
4. Higher Engineering Mathematics by Grewal.
5. Text book of Remedial Mathematics by Dr. A Ramakrishna Prasad, Cengage Learning.

Reference:

1. Pharmaceutical Arithmetic's by Mohd. Ali CBS Publications & distributor, New Delhi.
2. Comprehensive remedial mathematics for B. Pharmacy by Patlcer Shyam.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY**HYDERABAD****I Year B. Pharm**

T	P	C
3+1*	0	6

(R9102) DISPENSING & HOSPITAL PHARMACY**Section-A, Dispensing Pharmacy****UNIT-I**

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

UNIT-II

Dispensing Pharmacy: Principles of dispensing, form of prescription, handling of prescription, source of errors in prescription, care required in dispensing procedures including labeling of dispensed products. Weights and Measures, introduction to Latin terms, Percentage calculations, alligation method, proof spirit calculations, displacement value and calculations of isotonicity adjustment. General dispensing procedure-posology-calculations of doses.

UNIT-III

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 |
| vii) Suspensions | |

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

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

UNIT-IV

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

Section-B, HOSPITAL PHARMACY

UNIT-V

Organization: Organization of a hospital and hospital pharmacy, responsibilities of a hospital pharmacist, pharmacy and therapeutic committee.

UNIT-VI

Drug Distribution: Procedural manual, drug distribution, dispensing to out-patients, in-patients and ambulatory patient-dispensing of ancillary and controlled substances, drug information center.

Unit VII

Hospital Management : Budget preparation and implementation, hospital formulary, organization of drug store ,purchase and inventory control, patient counseling, role of Pharmacist in community health care and education.

UNIT-VIII

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

TEXT BOOKS

1. Cooper & Gunns Dispensing Pharmacy, CBS, Publ. and Distributors New Delhi.
2. Gupta AK, Health Education and Community Pharmacy, CBS, Publ. and Distributors New Delhi.
3. JS Quadri, Hospital Pharmacy.
4. Lorria & William, Essential dosage calculations.
5. Jain 7 Gupta, Modern dispensing pharmacy.

REFERENCES

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

Year B. Pharm

T	P	C
3+1*	0	6

(R9103) PHARMACEUTICAL INORGANIC CHEMISTRY

UNIT-I

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

Note : Definition, Preparation, Assay principle, Limit tests and Uses of the compounds mentioned in Unit II to Unit VII

UNIT - II

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

UNIT III

Gastro-intestinal agents.

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

UNIT - IV

- 1) Mineral Nutrients / Supplements

- (a) **Haematinics** – Ferrous sulphate, ferrous fumarate, ferrous gluconate, ferric ammonium citrate, iron and dextrose injection.
- (b) **Halogens**: Iodine, Iodides.
- 2) **Pharmaceutical aids:**
- Excipients**: Dicalcium phosphate, magnesium stearate, talc and calcium carbonate (Precipitated chalk).
 - Suspending agents**: Bentonite, colloidal silica.
 - Colorants**: Titanium oxide, Ferric oxide

UNIT-V

- Expectorants**: Ammonium chloride, potassium iodide.
- Emetics**: Potassium antimony tartarate, copper sulphate.
- Antidotes**: Sodium thiosulphate, sodium nitrite.

UNIT-VI

Topical agents:

- Astringents**: Zinc sulphate, calcium hydroxide, Bismuth subcarbonate.
- Topical protectants**: Zinc oxide, calamine, zinc stearate, talc, titanium-dioxide, heavy kaolin and light kaolin (only uses).
- 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 chloride)

UNIT-VII

Dental products:

- Fluorides**: Sodium fluoride, sodium monofluorophosphate and stannous fluoride.
- Oral antiseptics and Astringents**: Hydrogen peroxide, magnesium peroxide, zinc peroxide and mouth washes.
- Dentifrices**: Calcium carbonate, dibasic calcium phosphate, calcium phosphate, sodium metaphosphate and strontium chloride.
- Cements & fillers**: Zinc oxide (only uses)

UNIT-VIII : Miscellaneous Medicinal Agents

- | | | |
|--------------------------|---|---------------------------|
| 1) Antineoplastics | : | Cisplatin |
| 2) Antidepressants | : | Lithium carbonate |
| 3) Diagnostic agents | : | Barium sulphate |
| 4) Surgical Aids | : | Plaster of Paris |
| 5) Antirheumatic agents | : | Sodium aurothiomalate |
| 6) Internal parasiticide | : | Sodium antimony gluconate |
| 7) Anti-thyroid agents | : | Potassium perchlorate |

EXT BOOKS

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

REFERENCES

- L.M. Atherton, Bentley and Driver's Textbook of Pharmaceutical Chemistry Oxford University Press, London.
- Indian Pharmacopoeia 1996, 2006.

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(R9104) 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, electromerohydrocarbons: Nomenclature, classification, general methods of preparation, mesomeric effect, hyperconjugation, concept of resonance; typical properties, hydrogen bonding, characteristic nucleophilic substitution reactions (replacement of -OH by -Cl), elimination reactions, organic reagents and reactions.

UNIT - II

A Study of Hydrocarbons:

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

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

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

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

UNIT - III

Aromatic Hydrocarbons: Kekule's structure of benzene, bond 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 of monosubstituted benzenes.

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

UNIT - IV

Iogen Compounds-Aliphatic: Nomenclature, general methods of preparation, characteristic nucleophilic substitution reactions, factors that play role in S_N^1 and S_N^2 , Walden inversion, elimination reaction and nytzoff's rule.

Iogen Compounds-Aromatic: Nomenclature, low reactivity of haloarenes towards nucleophilic substitution, arenes.

UNIT - V

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

Enols: Nomenclature, general methods of preparation, physical properties, acidity of phenols, stability of phenoxide ion, reactions of enols, Kolbe-schmidt reaction stability of conjugated dienes, and Fries arrangement, Reamer-Tiemann Reaction.

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, cation-reduction reactions, aldol condensation, Cannizzaro reaction, azoion condensation, Perkins reactions, Reformatsky reaction, Baeyer-von Baeyer 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 carboxylic 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 preparation and properties of malonic and acetoacetic esters, their importance in organic syntheses.

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 reactivities, Hinsberg method of separation, acylation reactions. Diazotisation and reactions of diazonium salts.

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

TEXT BOOKS

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

REFERENCES

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

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(R9105) ANATOMY PHYSIOLOGY AND HEALTH EDUCATION

NIT-I

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

NIT-II

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

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

NIT-III

Aeropoietic system: Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, disorders of platelets and coagulation, anemias and its types, common types of neoplasms.

NIT-IV

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

NIT-V

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

NIT-VI

Concepts of health & disease, disease causing agents and prevention

of disease balanced diet and nutritional deficiency disorders,

Demography and family planning:

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

UNIT-VII

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

UNIT-VIII

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

TEXT BOOKS

1. Tortora, G.J and Anagnosatos, Principles of Anatomy and Physiology, N.P. Harper & Row Publishers N.Y.
2. Elaine N. Marieb, Essential of Human Anatomy & Physiology
3. Ross & Wilson, Text Book of Human Anatomy, M.J. Mycek S.B. Gerth and MMPER
4. Rizzo, fundamental of Anatomy Physiology

REFERENCES

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

UNIT - I

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

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

UNIT - II

2. Healths and Medicine from LEARNING ENGLISH: A Communicative Approach, Orient Longman, 2005
3. The Sounds of English – Consonants, oral presentations (prepared), Just A Minute sessions).

UNIT - III

4. Environment from LEARNING ENGLISH: A Communicative Approach, Orient Longman, 2005.
5. Stress in English – Oral presentations (extempore), Just A Minute sessions

UNIT - IV

6. Inspiration from LEARNING ENGLISH: A Communicative Approach, Orient Longman, 2005.
7. Intonation – Oral presentations (extempore), Just A Minute sessions

UNIT - V

8. Human Interest from LEARNING ENGLISH: A Communicative Approach, Orient Longman, 2005.
9. Role Play and Situational Dialogues – Informal, Semi-formal and Formal.

UNIT - VI

10. Media from LEARNING ENGLISH: A Communicative Approach, Orient Longman, 2005.
11. Role Play and Situational Dialogues – Informal, Semi-formal and Formal

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

UNIT – VII

Exercises on

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

UNIT – VIII

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

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

Tense and aspect

Vocabulary development covering

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

TEXTBOOKS PRESCRIBED:

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

For Detailed study

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

For Practice in Listening and Speaking skills

A Practical Course in English Pronunciation, (with two audio cassettes) by J. Sethi, Kamlesh

Sadanand and D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.

REFERENCES

1. Strengthen Your English, Bhaskaran & Horsburgh, Oxford University Press
2. Basic Communication Skills for Technology, Andrea J Rutherford, Pearson Education Asia.
3. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
4. English Skills for Technical Students, WBSCTE with British Council, Orient Longman
5. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
6. A textbook of English Phonetics for Indian Students by T.Balasubramanian (Macmillan)

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(R9107) REMEDIAL BIOLOGY

UNIT I

Methods of classification of plants.

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

UNIT II

Simple and compound microscopes used in biology; section cutting, staining and mounting of sections.

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

UNIT III

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

UNIT IV

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

SUGGESTED TEXT BOOKS

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

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(R9108) REMEDIAL BIOLOGY LAB

- a. Care and uses of microscope
- b. Gross identification of slides of structure and life cycle of plants/ animals mentioned in theory.
- c. Morphology of plant parts indicated in theory.
- d. Preparation, Microscopic Examination of stem, root and leaf of mono and dicot leaves.
- e. Structure of human parasites and insects mentioned in the theory with the help of specimens.

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(R9109) DISPENSING & HOSPITAL PHARMACY LAB

1. Dispensing of prescriptions falling under the categories; Mixtures, solutions, emulsions, creams, ointments, powders, pastes, lotions, liniments, inhalations, paints, etc.
2. Identification of various types of 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.
7. Preparation of Pharmacopoeial extracts and galenical products utilizing various methods of extraction.

Text Book:

1. Dispensing and Hospital pharmacy lab by sanmathi & Mehta.

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(R9110) PHARMACEUTICAL INORGANIC CHEMISTRY LAB

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

- | | |
|--|--------------|
| 1) Chlorides | 2) Sulphates |
| 3) Heavy metals | 4) Iron |
| 5) Arsenic (demonstration) | |
| B) | |
| 6) Balances and Weighing; Calibration of weights, Pipette and Burette. | |
| 7) Preparation and standardization of Hydrochloric acid solution (0.1N). | |
| 8) Preparation and standardization of Potassium permanganate solution (0.1N & 0.1M). | |
| 9) Preparation of a primary standard solution of 0.1N Potassium hydrogen-phthalate. | |
| 10) Preparation and standardization of 0.1N EDTA solution. | |
| 11) Preparation and purification of Boric acid. | |
| 12) Preparation and purification of Sodium citrate. | |
| 13) Preparation and purification of Potash alum. | |
| 14) Preparation and purification of Magnesium stearate. | |
| 15) Assay of sodium bicarbonate and assay of Boric acid (Neutralization). | |
| 16) Assay of Calcium gluconate (or) any calcium compounds (Complexometry). | |
| 17) Assay of Copper sulphate (Redox titration). | |
| 18) Assay of Sodium acetate (Non-aqueous titration). | |
| 19) Assay of Ferrous sulphate (Oxidation-reduction / Redox titration). | |
| 20) Exercises related to assay by Gravimetric method. | |

REFERENCES

1. Indian Pharmacopoeia - 1996.
2. Vogel's Qualitative Analysis
3. Pharmaceutical in Organic Chemistry, Subba Rao

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(R9111) PHARMACEUTICAL ORGANIC CHEMISTRY-I LAB

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

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

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

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

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

REFERENCES

1. Vogel's Text Book of Practical Organic Chemistry, 5th Edition.
2. R.K. Bansal, Laboratory Manual of Organic Chemistry.
3. O.P. Agarwal, Advanced Practical Organic Chemistry.
4. F.G.Mann & B.C. Saunders, Practical Organic Chemistry.

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(R9112) ANATOMY AND PHYSIOLOGY LAB

(21 Experiments)

1. Study of human skeleton – 2 Experiments
2. Study of different systems with the help of charts and models – 2 Experiments.
3. Microscopic study of different tissues – 3 Experiments.
4. Estimation of Haemoglobin in blood, Determination of bleeding time, clotting time – 3 Experiments.
5. Estimation of R.B.C. count – 2 Experiments.
6. Estimation of W.B.C count – 2 Experiments.
7. Estimation of D.L.C. – 2 Experiments.
8. Recording of body temperature, pulse rate and blood pressure, basic understanding of electrocardiogram PQRST waves and their significance – 3 Experiments.
9. Determination of vital capacity, experiments on spirometry – 2 Experiments.

REFERENCES

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

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(R9113) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

1. Introduction

The introduction of the English Language Lab is considered essential at 1st year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for the professional and interpersonal communication in the globalised context.

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

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

2. Objectives:

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

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.

3. Syllabus:

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

Functional English - starting a conversation responding appropriately and relevantly using the right body language role play in different situations.

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

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

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

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

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

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

Minimum Requirement:

English Language Lab shall have two parts:

- i) **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.
- ii) **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo audio & video system and camcorder etc.

Minimum Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

- i) P. IV Processor
 - a) Speed 2.8 GHZ
 - b) RAM 512 MB Minimum
 - c) Hard Disk 80 GB
- ii) Headphones of High quality

5. Suggested Software:

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

Suggested Software:

Clarity Pronunciation Power part II

Oxford Advanced Learner's Compass, 7th Edition

DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.

Lingua TOEFL CBT Insider, by Dreamtech

TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

The following software from 'train2success.com'

- v Preparing for being Interviewed.
- v Positive Thinking,
- v Interviewing Skills,
- v Telephone Skills,
- v Time Management
- v Team Building,
- v Decision making

English in Mind, Herbert Puchta and Jeff Stranks with Meredith Lewis, Cambridge

6. Books Recommended:

1. Effective Technical Communication. M. Ashraf Rizvi, Tata Mc. Graw-Hills, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded for conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.
2. A Course in English communication by Madhavi Apte, Prentice-Hall of India, 2007.
3. Communication Skills by Leena Sen, Prentice-Hall of India, 2005.
4. Academic Writing- A Practical guide for students by Stephen Bailey, Routledge Falmer, London & New York, 2004.
5. English Language Communication : A Reader cum Lab Manual Dr Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai.

Body Language- Your Success Mantra by Dr. Shalini Verma, S. Chand, 2006.

DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice, New Age International (P) Ltd., Publishers, New Delhi.

Books on TOEFL/GRE/GMAT/CAT by Barron's/cup

IELTS series with CDs by Cambridge University Press.

Technical Report Writing Today by Daniel G. Riordan & Steven E. Pauley, Biztantra Publishers, 2005.

Basic Communication Skills for Technology by Andra J. Rutherford, 2nd Edition, Pearson Education, 2007.

Communication Skills for Engineers by Sunita Mishra & C. Muralikrishna, Pearson Education, 2007.

Objective English by Edgar Thorpe & Showick Thorpe, 2nd edition, Pearson Education, 2007.

Cambridge Preparation for the TOEFL Test by Jolene Gear & Robert Gear, 4th Edition.

Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press.

DISTRIBUTION AND WEIGHTAGE OF MARKS:

English Language Communication Skills Lab Practicals:

The practical examinations for the English Language Laboratory practice will be conducted as per the University norms prescribed for the core engineering practical sessions.

For the English Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 sessional marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded for conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

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UNIT-VI

Dehumidification and Humidity control

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

UNIT-I

Stoichiometry: Unit processes, material and energy balance, molecular units, mole fractions, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states dimensionless equations, dimensionless formulae, dimensionless

UNIT-VIII

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

UNIT-II

Fluid Flow: Types of flow, Reynold's number, viscosity, concept of boundary

layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure.

UNIT-III

Material handling systems:

- Liquid handling : Study of different types of pumps such as Reciprocating pumps, Turbine pumps and centrifugal pumps.
- Gas handling : Various types of fans, blowers and compressors.
- Solid handling : Conveyors

UNIT-IV

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

UNIT-V

Crystallization: Characteristics of crystals like; purity, size, shape, geometry, habit, forms, size and factors affecting it. Solubility curves and calculation of yields. Supersaturation theory and its limitations. Nucleation mechanisms, crystal growth. Study of various types of crystallizers such as Swenson walker crystallizer, vacuum crystallizer, crystal crystallizer. Caking of crystals and its prevention. Numerical problems on yields.

UNIT-VII

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

UNIT-VIII

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

TEXT BOOKS

- S.J. Carter, Cooper and Gunn's Tutorial Pharmacy 6th ed CBS publisher, Delhi.
- C.V.S. Subramanayam, Pharmaceutical Unit Operation, Vallabh Prakashan
- Prof. K. Samba Murthy, Pharmaceutical Engineering.
- Badzer & Bandhera, Introduction to Chemical Engineering.
- Pharmaceutical Engg. by DERLE.

REFERENCES

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

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(R9202) PHARMACEUTICAL ORGANIC CHEMISTRY - II

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

Few Examples of Drugs which contain the cited ring system.

UNIT - I

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

Fused ring systems with one hetero atom: Indole, quinoline, isoquinoline, and acridine.

UNIT - II

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

Fused ring systems with two heteroatoms: Benzimidazole and phenothiazine, Cinnoline, Quinazoline and Quinoxaline.

UNIT - III

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

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

UNIT - IV

Carbohydrates: Definition, classification, nomenclature, relative configuration of some important monosaccharides, study of glucose structure, mutarotation, ring structure, oxidation-reduction reactions, osazone formation, epimerization, Lobry De Bruyn – Van Ekenstein-Olesen 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, C-terminal and N-terminal concept. Brief account of primary, secondary and tertiary structure. A brief account of the pharmaceutical importance of amino acids, polypeptides and proteins.

UNIT - VI

a) **Glycosides:** Definition and α , β – glycosidic linkages, enzymatic hydrolysis, physiological importance.

b) **Lipids (oils and fats):** Definition, fatty acids, characterization of lipids (Saponification value, acid value and Iodine value), hydrogenation and rancidity of oils and fats.

UNIT - VII

a) **Purine derivatives (xanthine bases):** Chemical structures of uric acid and methylated xanthines (caffeine, theophylline and theobromine) of physiological/ pharmaceutical significance.

b) Definitions of nucleic Acids, nucleotides, nucleosides. A brief account on structure of DNA & RNA.

UNIT - VIII

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

- A. Beckmann rearrangement
- B. Birch reduction
- C. Mannich reaction
- D. Michael addition reaction
- E. Wittig reaction
- F. Lossen rearrangement
- G. Curtius rearrangement

H. Schmidt reaction

TEXT BOOKS

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

REFERENCES

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

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Year	B. Pharm I-Sem	T	P	C
	3+1*	0	3	

(R9203) STATISTICAL METHODS AND COMPUTER APPLICATIONS

Section - A: Bio-statistics

UNIT-I

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

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

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

Section - B: Computer Applications

UNIT-V

Overview of Computer with general applications: components of computers., computer languages useage of computers. Interrelations of Operations system.

UNIT-VI

INTRODUCTION TO MS – OFFICE: MS-Word: Basics, working with files, working with text, formatting paragraphs, stayles, lists, tables, graphics, spellings and grammer and page formatting macros, table of contents.

MS-Excel: Basics, spreadsheets, data types, formulas, formatting, charts, graphs.

MS-Power Point: Power point Basics, views, slide controls, application design, page setup, templates, background control, colour screens, transitions, and animations, working with texts, and working with graphics.

MS- Access: Database concepts, screen layouts, creating tables, data sheet records, table relationships, sorting and filtering, queries forms, form controls, sub forms, reports, importing, exporting, linking.

UNIT.VII

Information Technology today: Internet and world Wide Web (WWW) structure and organization of the www, browsers, information search in www, search engines, pharmaceutical resources in www types of indexin tools & search strategies, Hyper Text Manuscripts Language (HTML) and E-mail.

Database Management: Concepts and Objectives of database management systems, advantages of the database management system and examples of DBMS packages (like DBASE III)

Introduction to structured Query language (SQL): overview of SQL Reserved words, SQL Commands.

UNIT.VIII

Computer Applications in pharmaceutical and clinical studies, computer validation introduction.

TEXT BOOKS

1. Pranab Kumar Banerjee, Introduction to Biostatistics
2. Khan and Khanum, Fundamentals of Biostatistics
3. Text book of STATISTICAL Methods and computer applications by Dr. A. Ramakrishna Prasad.
4. Ron Mansfield, Working In Microsoft Office.
5. Ivan Bayross, SQL, PL/SQL The Programming Language of oracle

REFERENCE

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

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4+1*	0	4

(R9204) PHYSICAL PHARMACY – 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 and optical rotatory dispersion.

UNIT IV

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

UNIT V

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

UNIT VI

Ionic equilibria: Modern theories of acids, bases and salts, Sorenson's pH scale, species concentration as a function of pH, calculation of pH and acidity constants.

UNIT VII

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

UNIT VIII

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

TEXT BOOKS

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

REFERENCES

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

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T	P	C
3+1*	0	3

(R9205) ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY**UNIT-I**

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. epilepsy, psychosis, depression, mania.

Unit-II

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

UNIT-III

Urinary System: Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid base balance, urinary tract infections, acute and chronic renal failure.

UNIT-IV

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-V

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., peptic ulcer, ulcerative colitis, hepatic disorders

UNIT - VI

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

Unit-VII

Endocrine System: Basic anatomy and physiology of pituitary, thyroid,

parathyroid, adrenals, pancreas, testes and ovary, their hormones and functions. Diabetes, thyroid.

UNIT-VIII

Basic Principles of Cell Injury , Adaptation & process of inflammation

Causes of cellular injury, pathogenesis, morphology of cell injury. Cell adaptations, atrophy, hypertrophy, acute and chronic inflammatory mediators of inflammation, brief outline of the process of repair.

TEXT BOOKS

1. Tortora, G.J. and Anagnoski, Principles of Anatomy & Physiology N.P. Harper & Row Publishers N.Y.
2. Elaine N. Marieb, Essential of Human Anatomy & Physiology.
3. Robbins, SL & Kumar, Basic Pathology.
4. Sherwood- Principles of Human Physiology.
5. Ross & Wilson, Principles of anatomy and physiology

REFERENCE BOOKS

1. A.C Guyton, Textbook of medicinal physiology by W.B. Prism book Pvt. Ltd., Delhi.
2. Joseph Dipiro, Patho Physiology and applied therapeutics.
3. M.P. Rang, M.N. Dale, J.M. Ritter Anatomy & Physiology
4. Zolanouric, Essentials of Pathophysiology for Pharmacy.

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(R9206) PHARMACEUTICAL ORGANIC CHEMISTRY-II LAB

Synthesis of some simple heterocyclic compounds.

- 3, 5-Dimethylpyrazole from Acetylacetone.
- 3, 5-Dimethylisoxazole from Acetylacetone.
- 4, 5-Diphenylimidazole from Benzil.
- Benzoxazole from o-Aminophenol.
- 2, 5-Dioxopiperazine from Glycine.
- Oxazolone from Benzoylglycine.

Molecular rearrangements and named reactions

- Benzimidazole from o-phenylenediamine (Phillip's Reaction).
- O-hydroxyacetophenone from phenyl acetate (Fries migration)
- Benzanilide from benzophenone oxime (Beckmann's rearrangement)

(To be avoided from End Examination)

Preparation of 2-phenylindole from Phenylhydrazine by Fischer's method.

III. Systematic analysis of organic binary mixtures

IV. Analysis of oils & fats

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

REFERENCES

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

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0 3

(R9207) STATISTICAL METHODS AND COMPUTER APPLICATIONS

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

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(R9208) PHYSICAL PHARMACY – I LAB

- Percent composition – Capillary Flow method
- Percent composition – polarimeter & refractometer
- Molecular weight – Landsberger method.
- Molecular weight – Rast camphor method.
- Calibration of pH Meter
- pH Estimation – pH meter
- pH Estimation – colourimetric method.
- pH Estimation by Half Neutralization Method
- Refractive index of liquids.
- Phenol water system – CST
- Lower consolute temperature – Tea and Water
- Heat of neutralization
- Phase diagram - Phenol – Water, Effect of Impurities.
- Ternary phase diagram.
- Preparation of Buffers and Buffer Capacity Determination.

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(R9209) HEALTH EDUCATION & PATHOPHYSIOLOGY – LAB
(14 Experiments)

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

REFERENCES

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

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II Year B. Pharm II-Sem

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(R9301) PHARMACEUTICAL UNIT OPERATIONS – II

IT-I

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

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

IT-III

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

IT-IV

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

IT-V

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

IT-VI

Size Separation: Official standards for powders, sieves, modes of motion size separation, Sieve

analysis – Testing of powders. Equipment for size separation.

IT-VII

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

UNIT-VIII

Automated process control systems: Elements of automatic process control and introduction to automatic process control systems. Elements of computer aided manufacturing (CAM). Reactors and fundamental reactors design for chemical reactions.

TEXT BOOKS

1. S.J. Carter, Cooper and Gunn's Tutorial Pharmacy, 6th ed., publisher, Delhi.
2. CVS Subramanyam, Pharmaceutical Engineering.
3. K. Samba Murthy, Pharmaceutical Engineering
4. McCabe & Smith. Unit Operations.

REFERENCE BOOKS

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

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4+1*	0	4

(R9302) PHARMACEUTICAL ANALYSIS-I

IT - I

Interpretation of analytical results, significant figures, concept of error, precision, accuracy, standard deviation, rejection of doubtful values with special reference to volumetric analysis.

Calibration of analytical equipment used in volumetric analysis.

IT - II

Theory of Neutralization Titrations: Acid-base concept, Acidimetry, Alkalimetry, Common ion effect and solubility product, pH, buffers and indicators.

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 2006

IT - III

Complexometric titration: Theory, types and application in pharmaceutical analysis. Masking and demasking and their applications.

Non-aqueous titration: Theory, types, solvents used and application in pharmaceutical analysis.

IT - IV

Potentiometry: Introduction, electrochemical cells and half cells. Electrode, measurement of potential, applications in pharmaceutical analysis.

Conductometric titrations: Basic concepts, different types of conductometric titrations, apparatus used, applications in pharmaceutical analysis.

IT - V

Polarography: Basic concepts, apparatus and principles, general polarographic analysis, applications in Pharmaceutical Analysis.

Amperometric titrations with one polarized electrode, general procedure, titration curves, applications in pharmaceutical analysis.

Unit-VI

Flamephotometry: Introduction, study and working principle, Instrumentations used for analysis, applications in pharmaceutical analysis.

UNIT – VII

Study of separations and determinations involving the following techniques and their applications in pharmacy

- Column chromatography : Adsorption and partition theory, preparation, procedure, methods of detection.
- Thin layer chromatography: theoretical consideration, preparation, procedure, detection of compounds.
- Paper Chromatography: theory of partition, different techniques employed, filter papers used, quantitative and quantitative detection.

Unit-VIII

- Principle, instrumentation and applications involved in the following:
 - Refractometry
 - Polarimetry
 - Nephelometry and turbidimetry
- Physical and chemical methods of determination of moisture content (including Karl-Fisher method).

TEXT BOOKS

- Kasture & Wadodkar, Text Book of Pharmaceutical analysis Vol I & II.
- A. Day Under Wood, Text Book of Quantitative Analysis
- Connors, A Textbook of Pharmaceutical Analysis
- B.K. Sarma, Instrumental Chemical Analysis, Goel Publishers
- Chatwal & Anand, Instrumental Methods of Analysis.
- Skoog-Instrumental Analysis and Skoog fundamentals of analytical Chemistry

REFERENCE

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

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(R9303) 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 with suitable examples.

UNIT-IV

Cultivation, collection, processing, drying and storage of medicinal plants.

- Factors influencing cultivation of medicinal plants.

UNIT-V

Good Agriculture Practices : Strategies of obtaining improved cultivations of medicinal plants.

- Plant hormones and their applications.
- Definitions and examples for polyploidy, mutation and hybridization with reference to medicinal plants.

UNIT-VI

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

UNIT-VII

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

UNIT-VIII

Systematic Pharmacognostic study of the following volatile oils: Mentha,

coriander, cinnamon, lemon oil, nutmeg, eucalyptus, ginger, cardmom, tulsi, lemon grass, caraway, cumin, dill, clove, fennel and black pepper.

TEXT BOOKS

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

REFERENCES

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

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T	P	C
4+1*	0	4

(R9304) PHYSICAL PHARMACY - II

UNIT-I

Solubility and Distribution Phenomena: Solvent-solute interaction, solubility of gases in liquids, solubility of liquids in liquids, solubility of solids in liquids, distribution of solutes in immiscible solvents.

Introduction to phenomena of diffusion: Ficks first law and second law.

UNIT-II

Complexation: Types, classification, metal complexes, organic molecular complexes, inclusion complexes, methods of analysis and drug action.

UNIT-III

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

UNIT-IV

Interfacial Phenomena: Liquid interfaces, measurement of surface and interfacial tensions, adsorption at liquid interfaces. Surface-active agents and HLB scale. 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: Newtons law of flow, Newtonian systems, non-Newtonian systems, thixotropy, measurement and applications in formulations. Determination of viscosity and its applications.

UNIT - VII

Colloids: Introduction, types of colloidal systems, solubilization, Stability of colloids, optical properties, kinetic properties, electrical properties and

Donnan Membrane equilibrium.

UNIT-VIII

Coarse Dispersions: Suspensions: Types of suspensions, interface properties of suspended particles, stability evaluation, settling of suspensions, formulation of suspensions.

Emulsions: Theories of emulsification, physical stability of emulsions, preservation of emulsions, rheological properties of emulsions and suspensions.

TEXT BOOKS

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

REFERENCE

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

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3+1*	0	3

(R9305) ENVIRONMENTAL SCIENCE

UNIT-I:

The Multidisciplinary nature of environmental studies:

Definition, scope and importance.

UNIT-II:

Natural Resources:

- Forest resources**: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources**: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food resources**: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- 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

Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuarine)

UNIT-V:

Biodiversity and its conservation: Introduction, definition; genetic specie and ecosystem diversity.

Biogeographically, classification of India. Value of biodiversity: consumptive use, productive use, and social, ethical, aesthetic and other 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-wild 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 hazard.

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 production.

Unit VIII:

Environment protection Act. The air (prevention and control of pollution) act 1981. The Water (prevention and control of pollution) act 1974.

wildlife protection Act 1972. The Forest conservation Act 1980. Issues involved in enforcement of environmental legislation. Public awareness.

Human population and the Environment

Population growth, variation among nations. Population explosion – Family welfare programme. Environment and human health, human rights. Value education. HIV / AIDS, women and child welfare, role of information technology in environment and human health. Case studies.

TEXT BOOKS

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

REFERENCES

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

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(R9306) PHARMACEUTICAL UNIT OPERATIONS II LAB

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

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(R9307) PHARMACEUTICAL ANALYSIS – I LAB

Assay of Pharmaceutical compounds based on chemical methods such as acid base, oxidation-reduction, non-aqueous, complexometric titration methods.

Conductometric determination of equivalent point of titration of HCl with NaOH.

Potentiometric determination of pH of a soulation.

Potentiometric titration of an Acid.

Potentiometric determination of strength of unknown solution and HCl with NaOH.

Nephelometric determination of sulfate.

Fluorimetric estimation of quinine.

Polarographic determination of amount of Nitrobenzene in solutions.

Flame photometric determination of Sodium.

Flame photometric determination of Potassium.

Determination of refractive index of liquids by Abbe refractometer.

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(R9308) PHARMACOGNOSY - I LAB

1. Collection of natural herbs and preparation of herbarium/lan photos for five drugs.
2. Microscopical, Physical and Chemical Methods of evaluation of drugs containing carbohydrates.
 - a. Measurement of starch grains
 - b. Swelling factor of Isabgol
 - c. Chemical tests for identification and detection to adalatia acacia, Tragacanth, Agar.
3. Physico Chemical methods of evaluation of crude drugs containing fixed oils and lipids - methods mentioned in I.P for Castor Oil, Shark liver oil, Olive oil, Kokum butter bees wax.
4. Morphology, Microscopy and Chemical evaluation of following oil contained drugs as per I.P.
 - Fennel, coriander, clove, cinnamon and Ginger.
5. Organoleptic study of organized and unorganized crude drugs mentioned in theory.

REFERENCES

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

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(R9309) PHYSICAL PHARMACY-II LAB

- Determination of bulk density, true density and percentage porosity.
 Effect of particle size and effect of glidant on angle of repose.
 Microscopic size analysis.
 Determination of particle size by Andreason Pipette.
 Determination of CMC of a surfactant.
 Adsorption Isotherm.
 Partition coefficient determination.
 Determination of sedimentation volume and degree of flocculation.
 Determination of Order of reaction – First order.
 Determination of Second order reaction rate constant.
 Effect of temperature on solubility of solid in liquid.
 Effect of addition of Salt/pH/cosolvent on the solubility.
 Surface tension using Stalagmometer.
 HLB value estimation of surfactants.
 Viscosity – by Ostwald Viscometer.
 Preparation of Multiple emulsion - Demonstration.
 Preparation of Micro emulsion - Demonstration.
 Determination of Zeta potential - Demonstration.

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III Year B. Pharm I-Sem

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(R9401) PHARMACEUTICAL BIOCHEMISTRY

UNIT - I

Bio chemical organization of the cell, molecular constituents of membrane, active & passive transport process, sodium and potassium pumps, osmoregulation and haemostasis.

UNIT - II

Bio-energetics: The concept of free energy, laws of thermodynamics. Determination of change in free energy from equilibrium constant & reduction potential.

UNIT - III

The respiratory chain & its role in energy capture & its control. Oxidative phosphorylation & its energetics & Electron Transport Chain, mechanism of actions. Production of ATP and its biological significance.

UNIT - IV

Enzymes & Co-Enzymes: Classification, Structure, mechanism of action, properties, factors affecting enzymes action. Activators & deactivators, enzymes, enzyme kinetics & enzyme inhibitions, repressions, reference to drug action.

UNIT - V

Metabolism of Carbohydrates: Biochemistry of carbohydrates, Glycogenesis, glycogenolysis, gluconeogenesis, Krebs cycle, HMP & uronic acid pathways, anaerobic respiration in muscle.

UNIT - VI

Metabolism of Proteins: Biochemistry of proteins, Amino acid structures, classifications, de-amination, Trans-amination, de-carboxylation, cycle, Metabolism of Valine, cystine, cysteine, tryptophan, tyrosine, methionine.

UNIT - VII

Metabolism of Lipids:

Biochemistry of lipids, Alpha, Beta, Gamma & Omega oxidations of acids, bio-synthesis of fatty acids, cholesterol, ketogenesis.

UNIT - VIII

Introduction to xenobiotic metabolism, detoxification mechanisms, chemistry and metabolism of nucleic acids and vitamins.

TEXT BOOKS

Harper, Biochemistry

A.L Lehninger, Principles of Biochemistry

J.L Jain, Fundamentals of Biochemistry

Satyanarayana, Text Book of Biochemistry

Rama Rao, Text Book of Bio Chemistry

Conn, Outlines of biochemistry

REFERENCES

L.Stryer, Text Book of Bio Chemistry, Quarto, W.H. Freeman & Company
E.E Conn & P.K. Stumpf, Outlines of Biochemistry by, Publ. John Wiley & sons, New York.

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

Boyer Rodney, Modern experimental Bio Chemistry.

West, Edward Text Book of Biochemistry.

Conn, Outlines of Biochemistry.

Plummer, Practical Bio Chemistry.

Denniston, Topping & Caret; General, Organic, and Biochemistry, McGraw-Hill

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(R9402) PHARMACEUTICAL MICROBIOLOGY

UNIT - I

Introduction to Microbiology: Origin, scope and discovery of microorganisms, spontaneous generations theory, contributions of Antony van Leeuwenhoek, Pasteur, Koch and Lister.

UNIT - II

Diversity of Microorganisms: Prokaryotes versus eukaryotes – the three domains of life (bacteria, archea and eukaryotes). A detailed study of bacteria, yeasts, molds and viruses. Pharmaceutical significance of protozoa, algae, fungi, bacteria and viruses. Characterisation and identification of microorganisms.

UNIT - III

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

Isolation, cultivation (aerobic & anaerobic) and preservation of microorganisms, physiology of growth, bacterial growth curve, influence of various factors (including environmental factors) on microbial growth. Enumeration of bacteria. Exponential growth and generation time. Bacterial growth in batch and continuous culture (chemostat and turbidostat), synchronous growth.

UNIT - IV

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

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

V – V. General methods of sterility testing of pharmaceuticals and biosafety measures.

UNIT - VI

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

UNIT - VII

Introduction to Microbiology of Air, Water and milk and methods of quantitative evaluation of microbial contamination.

UNIT - VIII

Biological Assays: Principles and Methods involved in Assay of antibiotics, Vitamins, Amino acids & Bio-Sensors in Analysis.

BOOKS

Delecjar and Reid, Text Book of Microbiology
Anantha Narayan and Jayram Panikar, Text Book of Microbiology, Orient Longman, Delhi, Hyderabad.

Tortora / Funke / Care / Microbiology an introduction.
N.K. Jain, Pharmaceutical Microbiology

Alcamo, Microbiology
R.C. Dubey, A textbook of Microbiology
Indian Pharmacopoeia

REFERENCES

Heritage, J. Introductory Microbiology.
Nester, Anderson, Roberts, Pearsall, Microbiology, McGraw-Hill

Hugo W B Pharmaceutical Microbiology
Tortora, Gerard Text Book of Microbiology.

E.A Rawlins, Betley's Text Book of Pharmaceutics, 8th ed
Garg, F C Experimental Microbiology

Gaud, R.S Practical Microbiology
Harnish M.Baillere, Tindal&Co., London. Pharmaceutical Microbiology.

Pharmaceutical Microbiology, Dr. K. N. Jayaveera.

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III Year B. Pharm I-Sem

T P

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(R9403) PHARMACOGNOSY - II

UNIT I

Definition, classification, tests and detailed pharmacognostic study of the following glycoside containing drugs.

- Saponin Glycosides : Glycyrrhiza, Ginseng, Discorea and Sennas.
- Cardioactive Glycosides : Digitalis, Squill, Strophanthus.
- Anthraquinone Glycosides : Aloe, Senna, Rhubarb & Cascara.
- Bitter Glycosides : Psoralea, Gentian, Chirata.

UNIT II

Definition, classification, general methods of extraction, tests and detailed pharmacognostic study of the following Alkaloid containing drugs.

- Pyridine – Piperidine derivatives : Tobacco & Lobelia.
- Tropane : Hyoscyamus, Datura & Aswagandha.
- Quinoline & Isoquinoline : Cinchona, Ipecac, Opium.
- Indole : Ergot, Rauwolfia, Vinca, Nux-vomica.
- Steroid : Kurchi.
- Alkaloidal amine : Ephedra & Colchicum.

UNIT III

Study of Tannins & Tannin containing drugs: Gambir, Black caraway, Myrobalan & Arjuna.

UNIT IV

Definination & study of drugs containing resin & resin combination: Benzoin, Asafoetida, Balsam of Tolu, Podophyllum.

UNIT-V Biological sources, preparations, identification tests and properties of the following enzymes: Diastase, Papain, Pepsin, Trypsin, Pancreatin.

UNIT-VI

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

UNIT – VII

Natural dyes and their applications in pharmacy.

UNIT – VIII

Study of mineral drugs: Bentonite, Kaolin, Keisulghur and Talc.

TEXT BOOKS

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

REFERENCES

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

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III Year B. Pharm I-Sem

T P

4+1* 0

(R9404) PHARMACEUTICAL TECHNOLOGY - I

UNIT-I

Preformulation:

- Introduction and objectives of preformulation study and development of dosage forms, Physical and Chemical aspects.
- Stability and bioavailability study of prodrugs in solving problems related to stability bio availability in formulations.
- Stability testing of finished products as per ICH guidelines.

UNIT-II

Liquid dosage forms:

- Introduction, types of additives used in formulations, vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colors, flavours and others.
- Dry Syrups, Formulation, Preparation, Evaluation and special applications, examples.

UNIT-III

Semisolid dosage forms:

- Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semi solids, clear gels manufacturing procedure, evaluation and packaging.
- Dispersed Systems : Suspensions –suspension formation, formulation and evaluation. Emulsions – Formulation, study of mechanical equipment for emulsification, Chemical parameters, stability testing and assessment of shelf life.

UNIT-IV

Pharmaceutical aerosols: Definition, propellants general formulation, manufacturing and packaging methods, pharmaceutical applications and evaluation.

UNIT-V

Ophthalmic Preparations: Requirements, formulation, methods of preparation, containers and evaluation.

UNIT-VI

Cosmetology and Cosmetic Preparations –I: Fundamentals of cosmetic science, structure and functions of skin and hair. Formulation, preparation and packaging of cosmetics for skin, hair.

UNIT-VII

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

UNIT-VIII

Suppositories: Ideal requirements of bases, Different types of bases, manufacturing procedure packing and evaluation.

TEXT BOOKS

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

REFERENCES

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

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(R9405) 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, Metabolism and excretion of drugs, principles of drug discovery and phases of drug development. Adverse drug reactions and Adverse drug events.

UNIT II

Pharmacology of Peripheral Nervous System:

- Neurohumoral transmission (autonomic and Somatic)
- Parasympathomimetics, parasympatholytics, sympathomimetics, sympatholytics

UNIT III

Adrenergic Receptor and neuron blocking agents, Ganglion stimulants and blocking agents.

- Neuromuscular blocking agents
- Local anesthetic agents.

UNIT IV

Pharmacology of Central Nervous System: I

- Neurohumoral transmission in the C.N.S.
- General anesthetics.
- Alcohols and disulfiram.

UNIT V

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

UNIT VI

Psychopharmacological agents (antipsychotics) Antidepressants, antimaniacs and hallucinogens)

UNIT VII

Pharmacology of Anti epileptic drugs, Anti Parkinsonian Drugs

UNIT VIII

Analgesics, Antipyretics, Anti inflammatory and Anti gout drugs.

- Narcotic analgesics and antagonists.

- C.N.S. stimulants

Drug Addiction and Drug Abuse

TEXT BOOKS

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

REFERENCE BOOKS

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

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(R9406) PHARMACEUTICAL BIOCHEMISTRY LAB

Experiments:

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

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(R9407) PHARMACEUTICAL MICROBIOLOGY LAB

1. Introduction to equipment and glassware used in microbiology laboratory.
2. Study of morphology of different microbes
3. Preparation of various culture media and cultivation of microbes and observation of colony characteristics.
4. Sterilization techniques (moist and dry heat) and their validations.
5. Aseptic transfer of culture into different types of media.
6. Characterisation of microbes by staining techniques (simple, gram's, acid fast and negative staining).
7. Study of motility of bacteria by hanging drop method.
8. Characterisation of microbes through Bio chemical reactions:
 - i) Indole test.
 - ii) Methyl red test.
 - iii) Voges proskauer test.
 - iv) Starch hydrolysis test.
 - v) Fermentation of carbohydrates.
9. Enumeration of bacteria by pour plate/spread plate technique.
10. Enumeration of bacteria by direct microscopic count.
11. Isolation of pure cultures by streak plate, spread plate, pour plate.
12. Evaluation of disinfectant by phenol – coefficient test
13. Study of Oligodynamic action (of metals on bacteria)
14. Preservation of microorganisms (slant and stab cultures)
15. Microbiological Analysis of Water.

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(R9408) PHARMACOGNOSY II LAB

1. Macroscopy, Microscopy and Chemical Evaluation of any four glycoside containing crude drugs and study of their powder characters given in theory.
2. Macroscopy, Microscopy and Chemical Evaluation of any four alkaloid containing crude drugs and study of their powder characters given in theory.
3. Physical and Chemical method of evaluation of any three tannins containing crude drugs and study of their powder characters given in theory.
4. Physical and Chemical method of evaluation of any three resins containing crude drugs and study of their powder characters given in theory.
5. Organoleptic study of crude drugs mentioned in theory.

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(R9409) PHARMACEUTICAL TECHNOLOGY - I LAB

Preparation, evaluation and packaging of solutions, suspensions and emulsions, ointments, Suppositories, aerosols, eye drops and eye ointments. Minimum of two experiments in each category.

2. Formulation of various types of cosmetics for skin, hair, dentrifrices and manicure preparations. Minimum of two experiments in each category.

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(R9501) MEDICINAL CHEMISTRY - I

UNIT - I

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

UNIT - II

Drug metabolism and inactivation: Introduction, Phase-I and Phase-II reactions.

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

UNIT - III

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

Hypnotics and Anxiolytics – Phenobarbital, diazepam, alprazolam, glutethimide

Anti-psychotics – Chlorpromazine, haloperidol, clozapine, oxypentidine.

Anti-epileptics – Phenytoin, valproic acid, carbamazepine, ethosuximide, Anti-depressants – Imipramine, fluoxetine, doxepine,

UNIT - IV

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

UNIT - V

Adrenergic agenys and adrenergic blockers. Isoproterenol, atenolol,

phenoxybenzamine, Amphetamine, ephedrine, salbutamol.

UNIT - VI

Cholinergic agents and acetyl cholinesterase inhibitors

Cholinergics - Carbachol, bethanichol Anticholinesterase - Neostigmine, pyridostigmine Neuromuscular blockers -succinyl choline.

UNIT - VII

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

UNIT - VIII

Prostaglandins. Introduction, nomenclature, functions, bio synthesis of prostaglandin E1, Structures of clinically useful prostaglandins.

TEXT BOOKS :

1. William O. Foye, Textbook of Medicinal Chemistry, Lea Febiger, Philadelphia.
2. JH Block & JM Beale (Eds), Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th Ed, Lippcott, Raven, Philadelphia, 2004.
3. Medicinal Chemistry by Korol Kavas.

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. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, Oxford
4. Daniel lednicer, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y. 1998.
5. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.
6. Kadam, Textbook of Medicinal Chemistry Vol. 1 & 2.
7. T Nogrady, Medicinal Chemistry – A Biochemical Approach. Oxford University Press, New York, Oxford.

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(R9502) PHARMACEUTICAL TECHNOLOGY - II

UNIT-I

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-II

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

UNIT-III

Capsules: Advantage and disadvantages of capsule dosage forms, material for production of hard and soft gelatin capsules, sizes of capsules, capsule filling, 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-IV

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

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

Aseptic techniques, sources of contamination and method of prevention. Design of aseptic area, laminar flow benches, services and maintenance.

UNIT-VII

Packaging of Pharmaceutical products: Packaging components, types, specifications and methods of evaluation as per I.P. Factors influencing choice of containers, package testing, legal and other official requirements for containers, packing testing.

UNIT-VIII

Methods of packing of solid, liquid and semi-solid dosage forms, Factors influencing packing material and stability aspects of packaging.

TEXT BOOKS

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

REFERENCES

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

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(R9503) PHARMACOLOGY - II

UNIT-I

Pharmacology of Cardiovascular System - Hypertension & congestive heart failure

- a. Digitalis and cardiac glycosides
- b. Antihypertensive drugs.
- c. Drugs used in shock.

UNIT-II Pharmacology of Drugs used in coronary artery disease and lipid – lowering drugs.

UNIT-III Pharmacology of drugs used arrhythmias

UNIT-IV

Drugs acting on hematopoietic system and urinary system

- a. Anti-coagulants, Anti-platelets & Thrombolytics.
- b. Hematinics.
- c. Fluid and electrolyte balance
- d. Diuretics

UNIT-V

Drugs acting on Endocrine system

- a. Insulin, Oral hypoglycaemic agents
- b. Adrenal steroids
- c. Drugs used in diseases of thyroid

UNIT-VI

Autacoids

- a. Histamine, 5 HT and their antagonists.
- b. Prostaglandins, thromboxanes and leukotrienes
- c. Pentagastrin, cholecystokinin, angiotensin, Bradykinin and substance P.

UNIT-VII

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

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

UNIT-VIII

Drugs Acting on the Respiratory System.

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

TEXT BOOKS

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

REFERENCES

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

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(R9504) CHEMISTRY OF NATURAL DRUGS (Phytochemistry)

UNIT – I**Alkaloids:** Definition, General methods of extraction of 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.**Tropane alkaloids:** Structural elucidation of Atropine, Pharmacological actions and uses of tropane alkaloids.**Rauwolfia alkaloids:** Structures and uses of Reserpine, Rescinnamine, Deserpidine, ajmaline, Hydrolysis of reserpine and rescinnamine. Mechanism of action of reserpine.**UNIT – II****Terpenoids:** Volatile oils: Definition of terpenoids, Classification, Isoprene, special isoprene and gem-dialkyl rules.**Citrals:** Sources and structures, isomerism in citral, citral-a (Geranal), citral-b (Neral). Reduction of citral to citronellal, citronellol, geraniol and nerol. Oxidation of citral to geranic acid. Cyclodehydration of citral to p-cymene. Synthesis of Vitamin – A1 from citral.**UNIT – III****Carvone:** Sources and structure. Conversion into Carvacrol. Reduction of Carvone with different reagents. Synthesis from Limonene/Dipentene and alfa – Terpineol.**Menthol and menthone:** Sources, structures and uses. Oxidation of menthol to menthone. Conversion of menthol into thymol.**Chemistry and structural elucidation of menthol.****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 – IV**Steroids:** Introduction & Nomenclature of steroids, structures, stereochemistry and numbering of ring system in cholesterol, ergosterol and stigmasterol.**Bile acids:** Names, structures and functions.**UNIT – V****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.**UNIT – VI****Adrenal Cortex Hormones:****Mineralocorticoids:** Aldosterone, Deoxycorticosterone,**Fludrocortisone** – structures, biological activity and uses. Aldosterone antagonist Spiranolactone.**Glucocorticoids:** Cortisone & Hydrocortisone – Structure, biological actions, uses.**UNIT – VII****Water soluble vitamins:** Nomenclature, deficiency diseases, structure elucidation of thiamine and riboflavin.**UNIT – VIII****Fat soluble vitamins** Nomenclature, deficiency diseases, structure elucidation of Vitamin D2 and Vitamin E riboflavin.

TEXT BOOKS

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

REFERENCES

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY**HYDERABAD****III Year B. Pharm II-Sem**

T	P	C
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(R9505) PHARMACEUTICAL JURISPRUDENCE**UNIT-I****Introduction**

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

An elaborate study of the following**UNIT-II**

Pharmacy Act 1948

UNIT-III

Drugs and Cosmetics Act 1940 and Rules 1945

UNIT-IV

Medicinal & Toilet Preparations (Excise Duties) Act 1955

UNIT-V

Narcotic Drugs & Psychotropic Substances Act 1985 & A.P. N. D. P.S Rules 1986

UNIT-VI

Drugs (Prices Control) Order 1995.

UNIT-VII

Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 and Rules 1955.

UNIT-VIII

A study of the salient features of the following.

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

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

TEXT BOOKS

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

REFERENCE BOOK

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

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(R9506) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

1. Introduction

The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context. The proposed course should be an integrated theory and lab course to enable students to use 'good' English and perform the following:

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

2. Objectives:

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

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.

3. Syllabus:

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

UNIT – I

Fundamentals of Interpersonal Communication – starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations- Public Speaking – designing documents – using visuals.

UNIT – II

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

UNIT – III

Group Discussion – How to conduct and participate - dynamics of group discussion, intervention, summarizing, and modulation of voice, body language, relevance, fluency and coherence.

UNIT – IV

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

UNIT – V

E-Mail – content, formats – formal/informal structure, etiquette, structure and presentation—effective googling.

UNIT – VI

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

UNIT – VII

Reading Comprehension – General Vs Local comprehension -reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, and critical reading.

UNIT – VIII

Technical Report Writing – Types of formats and styles - Feasible, analytical reports - subject matter – organization, clarity, coherence and style; planning, data-collection, tools, analysis- Portfolios – Mini projects.

Suggested Topics for Mini Project:

1. Construction of Reading Room in a house
2. Construction of a Sports Complex in the University

3. Construction of Augmentation of water Supplies in twin cities
 4. Construction of Road Safety Measures in twin cities
 5. Application of new Technology in Pharmacy
 6. Establishment of English laboratories in Engineering Colleges
- * Teachers may use their discretion to choose topics relevant and suitable to the work place.
- * Not more than two students to work on each mini project.
- * Students may be assessed by 'portfolios'.

4. Minimum Requirement

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

5. Suggested Software

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

6. Books Recommended:

1. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw-Hill Publishing Company Ltd
2. A Course in English Communication by Madhavi Apte, Prentice-Hall of India, 2007
3. Communication Skills by Leena Sen, Prentice-Hall of India, 2005
4. Academic Writing- A Practical guide for students by Stephen Bailey, Routledge Falmer, London & New York, 2004
5. Body Language- Your Success Mantra by Dr. Shalini Verma, S. Chand, 2006
6. Books on TOEFL/GRE/GMAT/CAT by Barron's/cup
7. IELTS series with CDs by Cambridge University Press
8. Technical Report Writing Today by Daniel G. Riordan & Steven E. Pauley, Biztantra Publishers, 2005
9. Basic Communication Skills for Technology by Andra J. Rutherford, 2nd Edition, Pearson Education, 2007
10. Communication Skills for Engineers by Sunita Mishra & C. Muralikrishna, Pearson Education, 2007
11. Objective English by Edgar Thorpe & Showick Thorpe, 2nd edition, Pearson Education, 2007

12. Objective IELTS by Michael Black & Wendy Sharp, Cambridge University Press
13. Objective IELTS by Michael Black & Annette Capel, Cambridge University Press
14. Cambridge Preparation for the TOEFL Test by Jolene Gear & Robert Gear, 4th Edition
15. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press

TEXT BOOKS

1. Strengthen Your English, Bhaskaran & Horsburgh, Oxford University Press
2. English for Technical Communication, K R Lakshminarayana, SCITECH
3. Strategies for Engineering Communication, Susan Stevenson & Steve Whitmore (John Wiley and sons)
4. English for Engineers: With CD, Sirish Chaudhary, Vikas Publishing House Pvt. Ltd. With CD
5. Basic Communication Skills for Technology, Andrea J Rutherford, Pearson Education Asia
6. Murphy's English Grammar with CD, Murphy, Cambridge University Press
7. English Skills for Technical Students by Orient Longman
8. English for Professional Students, by S S Prabhakara Rao
9. The Oxford Guide to Writing and Speaking, John Seely, Oxford
10. Grammar Games, Renvoluci Mario, Cambridge University Press
11. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006
12. English Technical Communication, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications
13. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP English Pronouncing Dictionary Daniel Jones Current Edition with CD
14. Spoken English- R. K. Bansal, J. B. Marrison and Orient Longman 2006 Edition
15. A Practical Course in English Pronunciation, (with two Audio

- cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi
16. Pronunciation Practice Activities: A resource book for teaching English pronunciation by Martin Hewings, Cambridge University Press, 2004
17. English Pronunciation in use by Mark Hancock (with 4 CD)- Cambridge University Press, 2005
18. A Textbook of English Phonetics for Indian Students by T.Balasubramanian (Macmillan)
19. English Skills for Technical Students, WBSCTE with British Council, OL
20. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw-Hill Publishing Company Ltd
21. Professional Presentations- A Video based course by Malcolm Goodale, Cambridge University Press, 2005
22. A Course in English Communication by Madhavi Apte, Prentice-Hall of India, 2007
23. Communication Skills by Leena Sen, Prentice-Hall of India, 2005
24. Academic Writing- A Practical guide for students by Stephen Bailey, Rontledge Falmer, London & New York, 2004
25. Body Language- Your Success Mantra by Dr. Shalini Verma, S. Chand, 2006
26. Books on TOEFL/GRE/GMAT/CAT by Barron's/cup
27. IELTS series with CDs by Cambridge University Press
28. Anderson, Technical Communication-Thompson publications
29. Delta's Key to the Next Generation TOEFL Test, Nancy Gallagher
30. Technical Report Writing Today by Daniel G. Riordan & Steven E. Pauley, Biztantra Publishers, 2005
31. Basic Communication Skills for Technology by Andra J. Rutherford, 2nd Edition, Pearson Education, 2007
32. Communication Skills for Engineers by Sunita Mishra & C. Muralikrishna, Pearson Education, 2007
33. Objective English by Edgar Thorpe & Showick Thorpe, 2nd edition, Pearson Education, 2007

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(R9507) MEDICINAL CHEMISTRY – I LAB

- I. **Synthesis of some medicinal compounds and their analogues.**
 - i. Barbituric acid from Diethyl Malonate.
 - ii. Phenylton from Benzoin or Benzil.
 - iii. Paracetomol from *para*- nitro phenol or *para*- aminophenol.
 - iv. 1,4- di hydro pyridine from ethyl aceto acetate.
 - v. Quinazolinone from anthranilic acid via benzoxazinone.
 - vi. Sulfanilamide from acetanilide.
 - vii. Isoniazid from γ -picoline.
 - viii. Antipyrine from ethyl aceto acetate.
 - ix. Benzocaine from *para*- nitro benzoic acid.
- II. **Qualitative estimation of some functional groups.**
 - i. Halogens (Strepheno's method).
 - ii. Hydroxyl groups (acetylation method)
 - iii. Methoxyl groups (Zeissel's method)
 - iv. Carboxyl groups (silver salt method).

* Not to be given in End Examinations

REFERENCES

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

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T	P	C
0	3	2

(R9508) PHARMACEUTICAL TECHNOLOGY – II LAB

1. Experiments to illustrate preparation, stabilization, physical, chemical and biological evaluation of pharmaceutical products like capsules, tablets, parenterals, microcapsules etc. (Minimum of two dosage forms in each category.)
2. Evaluation of materials used in pharmaceutical packaging such as Glass, Plastic, Cottons (Hydrolytic resistance test of Glass and light absorption test of rubber closures).

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(R9509) 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,
- To study the effect of autonomic drugs on rabbit's eye
- To study the effects of various agonists and antagonists and their characterisation using isolated preparations like frog's rectus abdominus muscle and isolated ileum preparation of rat & guinea pig.

Experiments on Isolated Preparations:

- i. a. To record the concentration response curve (CRC) of acetylcholine using rectus abdominus muscle preparation of frog.
 - b. To study the effects of physostigmine and d tubocurarine on the crc of acetylcholine using frog rectus abdominus muscle preparation of frog.
 - c. To record the CRC of 5 HT on rat fundus preparation.
 - d. To record the CRC of histamine on guineapig ileum preparation.
 - ii. a. To study the inotropic and chronotropic effects of drugs on isolated frog heart.
 - b. To study the effects of drugs on normal and hypodynamic frog heart.
 - 6. Experiments pertaining to analgesia, anti-convulsant activity, anti-inflammatory activity (*Only demonstration*).
- Experimental Pharmacology, M.C. Prabhakar.

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(R9510) 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 and examination of alkaloids, steroids, steroidal glycosides and cardiac glycosides.
6. Identification of natural products.
7. Extraction of caffeine from tea leaves.
8. Extraction of lactose from milk.
9. Extraction of nicotine from tobacco.
10. Extraction of piperine from black pepper.
11. Extraction of lycopene from tomatoes.
12. Extraction of beta - carotene from carrots.
13. Volatile oil production by steam distillation (*Demonstration only*).

TEXT BOOKS

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

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T	P	C
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(R9601) PHARMACEUTICAL ANALYSIS - II

UNIT - I

UV & Visible Spectrophotometry : Introduction to Spectroscopy, Basic terminology – Chromophore, Auxochrome, Bathochromic shift, Hypsochromic shift, hyperchromic and hypochromic shift. UV & Visible Spectrophotometry : Principle, Theory, Beer-Lambers Law & Deviations, Instrumentation – Single Beam and Double Beam Spectrophotometers, Applications, Woodward –Feiser rule.

UNIT - II

Fluorimetry : Principle, Theory, Quenching, Instrumentation and applications.

Atomic Absorption Spectroscopy : Principle, Theory, Instrumentation and applications.

UNIT - III

Infrared Spectrophotometry (IR) : Introduction, Principle, Theory, types of vibrations, Instrumentation, Single and double beam spectrophotometer, sampling techniques, applications, basic principles in the interpretation of IR Spectra.

UNIT - IV

Nuclear Magnetic Resonance Spectrophotometry (NMR) : Basic Principle, Theory, Instrumentation, Chemical shift, Shielding and Deshielding, Relaxation processes, spin-spin splitting, applications, basic principles in the interpretation of NMR spectra.

UNIT - V

Mass Spectrometry: Basic Principle, Theory, Instrumentation and Applications, basic principles in the interpretation of Mass Spectra.

UNIT - VI

Basic Principles and applications of differential thermal analysis (DTA) and differential scanning calorimetry (DSC). Basic Principles and applications of X-ray Diffraction Analysis (XRD).

UNIT - VII

Optical rotatory dispersion (ORD) and Circular dichroism: General Principles, instrumentation and Applications. Radio Immuno Assay & Enzyme Linked Immuno Sorbent Assay (ELISA).

UNIT - VIII

Gas Chromatography, High Performance Liquid Chromatography (HPLC) and High Performance Thin Layer Chromatography (HPTLC).

Electrophoresis: Scope, Different types of Electrophoresis and applications.

TEXT BOOKS

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

REFERENCES

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

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	3+1*	0	3

(R9602) BIOPHARMACEUTICS AND PHARMACOKINETICS

UNIT-I

Introduction: Definitions of Biopharmaceutics, Pharmacokinetics and Pharmacodynamics.

UNIT-II

Drug Absorption. Mechanisms of GI absorption, physico-chemical, biological and dosage form factors influencing absorption.

UNIT-III

Drug distribution. Factors drug distribution, volume of distribution, protein binding – factors affecting and significance and kinetics of protein binding.

UNIT-IV

Drug Metabolism: Pathways of drug metabolism. Phase-I (oxidative, reductive and hydrolytic reactions). Phase II reactions (conjugation) Enzyme induction and inhibition

UNIT-V

Drug excretion: Glomerular filtration, tubular secretion and reabsorption, effect of pH and other drugs. Clearance concept; excretion through bile, feces, lungs and skin in brief.

UNIT-VI

Bioavailability and bioequivalence

Definitions , concept of equivalents, Definitions of various types of equivalents, types of Bioavailability studies, measurement of Bioavailability, plasma level and urinary excretion studies. Bioequivalence study design. Bioavailability testing procedure and protocol.

UNIT-VII

Pharmacokinetics. Basic considerations; compartment modeling, one compartment open model - i.v. bolus and extra vascular administration, urinary excretion studies. Calculation of pharmacokinetic parameters, brief over view of nonlinear kinetics, noncompartmental models

UNIT-VIII

Biostatistics: Theory of probability, Histogram, standard error, t-test, regression analysis, coefficient of correlation, curve fitting. Analysis of variance (ANOVA), non parametric tests.

TEXT BOOKS

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

REFERENCES

1. Remington's pharmaceutical sciences, Mac Pub. Co., Easton Pennsylvania.
2. Modern pharmaceutics by banker Marcel Dekker Inc., NY
3. L. Iachman, H.A.Lieberman, JL. Kanig, the theory and practice of industrial pharmacy, Varghese publ house, Mumbai.
4. AR. Gennorio Remington: the science andpractice of pharmacy, vol 1 &2 Lippincott Williams & wilkins, Philadelphia, 2004.
5. Robert E notary, Biopharmaceutics and pharmacokinetics – an introduction, arcel dekker inc., NY
6. L. Shargel and ABC Yu, textbook of applied biopharmaceutics & pharmacokinetics, 4th edn, Appleton – centuary – crofts, Connecticut, 2004.

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	T	P	C
	4+1*	0	4

(R9603) PHARMACOLOGY - III

UNIT-I**Drugs Acting on the Gastrointestinal Tract**

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

UNIT-II**Chemotherapeutic agents and their applications:**

- General principles of chemotherapy
- Sulphonamides and co trimoxazole
- 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.

UNIT-VIII

Drugs used for contraception.

Heavy metals and heavy metals antagonists. Diagnostic Agents.

TEXT BOOKS

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

REFERENCE BOOKS

- J.G. Hardman and Lee E. Limbard, Good Mann & Gilmann: The Pharmacological basis of therapeutics, Mc Graw hill, Health Professions Dvn.
- H.P Rang, M. M. Dale & J.M. Ritter, Pharmacology, Churchill Living stone, 4th Ed.
- J. Crossland, Lewis 's Pharmacology, Church living stone.
- P. Jagadish Prasad, Conceptual Pharmacology – Universities Press.
- Screening Methods in Pharmacology | Vol.set TURNER, Elrevier.

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T	P	C
3+1*	0	3

(R9604) MEDICINAL CHEMISTRY - II

UNIT - I

Drug discovery and drug design.

Introduction to discovery of lead molecule, lead optimization, pharmacophore identification, General structure activity relationship studies;

UNIT - II

Computer aided drug design: Introduction to CADD, Parameters in QSAR, Applications of Hansch analysis, Free Wilson analysis

UNIT - III

Antibiotics: Brief historical background, definition, classification of antibiotics.

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

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

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

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

UNIT - IV

Cephalosporins: 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 - V

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

UNIT - VI

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 and its synthesis, macrolide and polypeptide antibiotics and Rifampicin (Structures not included).

UNIT - VII

Immunosuppressive agents : Brief introduction to therapeutic agents developed from recombinant DNA technology

UNIT - VIII

Diagnostic agents and radioprotective agents.

Brief introduction to combinatorial synthesis in solid phase and liquid phase.

TEXT BOOKS

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

REFERENCES

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

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(R9605) PHARMACY ADMINISTRATION

UNIT – I

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

UNIT – II

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

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

UNIT – III

Social Pharmacy : a. Social uses of drugs : Abuse of prescription drugs.

Behavioral Pharmacy : Compliants / Adherence to medications.

Introduction to Pharmacoeconomics : Definitions of Efficacy ; Comparative cost effectiveness ratios; Comparative Clinical Effectiveness and cost Benefit ratios.

Pharmaceutical Outcomes (Quality of life concepts)

History of Pharmaceutical outcomes movements in India and abroad.

Pharmacovigilence / Pharmacoepidemiology :

Present status in India ; State and Central initiatives ; Reporting of Adverse Drug Reactions ; Prescribed format for reporting Adverse Drug Reactions; Irrational Drug Combinations; List of Drugs banned by Government of India and other State Governments.

UNIT – IV

Organisation of Distribution and Marketing: Functions of Marketing,

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

UNIT – V

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

UNIT – VI

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

UNIT – VII

Pharmaceutical Associations and Societies, statutory councils governing the profession. General Principles of medical detailing.

UNIT – VIII

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

TEXT BOOK

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

REFERENCES

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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(R9606) INDUSTRIAL TRAINING AND SEMINAR

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

Industrial Training and Seminar is an integral part of the curriculum. It is intended to provide the students with practical exposure to the pharmaceutical industry and its various facets. The students will be placed in different pharmaceutical companies for a period of three months. The seminar will be conducted during the last week of the training period. The seminar topics will be selected by the students based on their interest and relevance to the pharmaceutical industry. The seminar will be evaluated based on the presentation, participation and overall performance of the student.

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(R9607) PHARMACEUTICAL ANALYSIS - II LAB

Experiments

1. Interpretation of IR Spectra of any two compounds.
2. Determination of λ_{max} of a drug.
3. Assay of any two drugs by UV-spectro photometry.
4. Assay of any two drugs by Colorimetric method.
5. Assay of Quinine Sulphate by Flourimetry.
6. Ascending paper chromatography.
7. Radial paper chromatography.
8. Two dimension chromatography.
9. Thin layer chromatography.
10. Column chromatography.
11. Paper electrophoresis of amino acids.
12. Gel electrophoresis (**Demonstration Only**).
13. HPLC (**Demonstration Only**).

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(R9608) BIOPHARMACEUTICS & PHARMACOKINETICS LAB

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

Reference book

Dr. D. Dhachinamoothi- Biopharmaceutical and Pharmacokinetic - A Practical Manual

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T	P	C
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(R9609) PHARMACOLOGY – III LAB

1. Experiments on Isolated Preparations:
 - a. To calculate the PA_2 value of atropine using acetylcholine as an agonist on rat ileum preparation.
 - b. To calculate the PA_2 value of mepyramine or chlorampheniramine 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, Oxytocin etc.) Using a suitable isolated muscle preparation by
2. Matching Assay :
 - i. Two point Assay,
 - ii. Three point Assay
3. Pharmacology of the Gastrointestinal Tract
To study the anti secretory and anti ulcer activity using pylorus ligated rats.

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(R9610) MEDICINAL CHEMISTRY - II LAB

Estimations of the following.

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

REFERENCES

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

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T	P	C
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(R9701) NOVEL DRUG DELIVERY SYSTEMS
& REGULATORY AFFAIRS

UNIT-I Oral Controlled Drug Delivery Systems:

Fundamental study of different types of Oral Controlled drug delivery systems. Dissolution Controlled, Diffusion Controlled, Ion Exchange Resins, Osmotic based systems, pH Independent Systems and altered density systems. Detailed study of Matrix systems.

UNIT-II Transdermal Drug Delivery Systems:

Fundamentals, types of TDDS, Materials Employed and Evaluation of TDDS.

UNIT-III Mucoadhesive Delivery Systems:

Mechanism of bioadhesion, mucoadhesive materials, formulation and development of mucoadhesive-based systems.

UNIT-IV Targeted Drug Delivery Systems:

Fundamentals and applications, formulation and evaluation of liposomes, resealed erythrocytes and nano particles.

UNIT-V Introduction Drug Regulatory Agencies:

Indian CDSCO, US FDA, Canadian HPFBI, and Australian TGA. Introduction to NDA & ANDA Submissions of USFDA

UNIT-VI

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

UNIT-VII

Introduction to Good Manufacturing Practices: Salient features of Schedule – M (India).

UNIT-VII Introduction to Validations:

Process validation (prospective, retrospective & concurrent), analytical method validation (accuracy, precision, specificity, linearity, range, robustness etc.), cleaning validation (sampling procedure and acceptance criteria)

TEXT BOOKS

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

REFERENCES

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

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T	P	C
3+1*	0	3

(R9702) PHARMACEUTICAL BIOTECHNOLOGY**UNIT - I**

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

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

UNIT - VI

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

UNIT - VII

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

UNIT - VIII

Introductory study & applications of bioinformatics, proteomics and genomics.

TEXT BOOKS

1. Wulf Crueger and Annemarie Crueger, Biotechnology, 2nd Ed, Paniima publication co-operation, New Delhi.
2. P. F. Stanbury & A. Whitaker, Principles of fermentation technology, Pergamon Press
3. Sambamurthy, K, Text Book of Pharmaceutical Biotechnology.
4. S. S. Kori, Pharmaceutical biotechnology.
5. S.P. Vyas and V.K. Dixit CBS Publisher, Delhi, Pharmaceutical Biotechnology
6. S.J.Carter, Cooper and Gunn's Tutorial Pharmacy 6th ed CBS Publisher, Delhi
7. U. Satyanarayana, Text book of Biotechnology

REFERENCES

1. Prescott and Dunne, "Industrial Microbiology" MC Caraw Hill Book Company
2. Peppier "Microbial Technology" Vol. 1 & 2
3. K. Kielschled "Biotechnology" Vol 6; Verlegchemie, Switzerland.
4. OP Ward" Fermentation Technology; Principles, Processes products" Open University press, Milton Keynes, UK.
5. A. M. Campbell, Monoclonal antibody technology.
6. A. Wiseman, Handbook of enzyme biotechnology.
7. J. D. Watson, Recombinant DNA technology.
8. Smith and Hood, Molecular biology and biotechnology.
9. E.A. Rawlins, Bentley's, A text book of pharmaceutics, 8th Ed, 1982 Bailler Tindall & Co.
10. Alexander N. Glazer & Hiroshi Nikaido, Microbial biotechnology, W. H. Freeman Co.
11. Ahwood.T.K, Introduction to Bio Informatics.
12. Cassida, Industrial microbiology.
13. H.K. Das, Textbook of Biochemistry.

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3+1*	0	3

(R9703) MEDICINAL CHEMISTRY – III**Note:**

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

UNIT – I**Drugs acting on Cardio-vascular diseases:****General account of cardiovascular diseases**

Antihypertensives – Methyldopa, amlodipine, enalapril, losartan.

UNIT – II

Anti-arrhythmics – Procainamide

Diuretics – Acetazolamide, hydrochlorothiazide, furosemide

Anticoagulants, Anti-anginals and Coronary vasodilators – Isosorbide dinitrate, verapamil, diltiazem

UNIT – III

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

General account on pancreatic and thyroid hormonal malfunctions:

Antidiabetics – Phenformin, Glipizide including a brief account on PPAR inhibitors, Meglitinide analogues,

α -Glucosidase inhibitors – Acarbose, Miglitol

Drugs affecting Thyroid Function: Methimazole, Propylthiouracil; insulin preparations

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

i. Introduction and types of pain and inflammation

ii. Classification and systematic development of analgesics of

- morphine, mild analgesics and strong analgesics: Meperidine and Methadone
- iii. NSAIDS – Aspirin, paracetamol, oxyphenbutazone, ibuprofen, indomethacin, diclofenac and meloxicam
 - iv. A brief account on Cox-2 inhibitors and Nimsulide.

UNIT – V

Chemotherapeutic Agents:

Sulpha drugs - Sulphadiazine, Suphasalizine, Trimethoprim, Sulphamethoxazole, Sulphamer

Anti viral Drugs - Acyclovir, Zidovudine

Antifungal Agents - Fluconazole and Itraconazole

UNIT – VI

Anti tubercular agents : Isonicotinic acid hydrazide and ethambutol,

Anti leprotic agents : Dapsone, clofazemine

Antiamoebics : Metronidazole, diloxanide furoate

UNIT - VII

Anthelmintics : Diethylcarbamazine citrate, pyrantel pamoate, mebendazole, Ibendazole

Antimalarial drugs : Chloroquine, primaquine and pyrimethamine, norflaxacin and ciprofloxacin

UNIT – VIII

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

TEXT BOOKS

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

REFERENCES

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

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T	P	C
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(R9704) PHARMACOGNOSY - III

UNIT - I

Evaluation of crude drugs.

Adulteration of crude drugs and their detection by

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

UNIT - II

a. Qualitative Phytochemical screening of various groups of phyto constituents.

b. Identification and Isolation of the following constituents.

- (i) Sennosides from Senna
- (ii). Quinine from Cinchona
- (iii). Curcumin from Turmeric.
- (iv). Lycopene from Tomato
- (v). Glycyrrhizine from Glycyrrhiza

c. Identificatin and estimation of Degoxin, Atropin, Podophylotoxin, Vitamin-A, Berberin

UNIT - III

Introduction, Classification and study of following chromatographic methods and their applications in evaluation of Phytoconstituents.

- (a). Paper Chromatography
- (b). TLC
- (c). HPTLC
- (d). Column Chromatography
- (e). HPLC

UNIT - IV

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

UNIT - V

Study of traditional drugs: Common and vernacular names, sources, chemical constituents and uses of kantakari, shatavari, sankhapushphi, tylophora, bilva, rasna, apamarga, gokhru, gudhuchi, methi, guggul, punarnava and brahmi.

UNIT - VI

Herbal Formulations

- a. General introduction to alternative systems of medicine like Ayurveda, Siddha, Unani and Homoeopathy.

- b. Concept of Tridosha, Methods of preparation of formulations in Ayurveda like chernas, lehyas, tailas, bhasmas, asavas and arishta.

UNIT - VII

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 - VIII

- a. Role of medicinal plants, Phytoconstituents in discovery of new chemical entities.
- b. Status of herbal drug industry and herbal drug research in India.

TEXT BOOKS

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

REFERENCES

1. Arya Vaidyasala Vol. 1-5, Indian Medicinal Plants – Universities Press
2. Atal C.R & Kapur B.M Cultivation & Utilization of Medicinal Plants.
3. Ayurvedic Pharmacopoeia of India, Pub by Govt. of India.
4. Pharmacognosy and Phytotherapy Research: Chapter contributed by Subhash C. Mandal & S.Mohana Lakshmi in the book Biodiversity and Environmental Biotechnology by P.Dwivedi etal, Scientific Publisher, Jodhpur.
6. Handa & Kapoor, Text book of Pharmacognosy.
6. S.S. Agarwal & M. Paridhavi, Herbal Drug Technology, University Press, Hyderabad.
7. Timir Baran Jha & Biswajit Gosh, Plant Tissue Culture, University Press, Hyderabad.
8. P. Dwivedi, Tissue Culture and Plant Science, Scientific Publisher, Jodhpur.
9. M. K. Razdan, An Introduction To Plant Tissue Culture, Oxford & IBH Publishing Co., New Delhi.
10. Organic Chemistry of Natural products. Vol-I & II R.Chatwal of Arora Publishing House Pvt. Ltd.

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(R9705) CLINICAL PHARMACY AND THERAPEUTICS

UNIT – I : Introduction to Clinical Pharmacy

UNIT – II : Basic concepts of Pharmacotherapy

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

UNIT – III

Important Disorders of Organ Systems and their Management:

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

UNIT – IV

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

UNIT – V

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

UNIT – VI

Upper Respiratory Infections.

- a. **Hematopoietic Disorders:** Anemias and drug induced blood disorders
- b. **Joint and Connective Tissue Disorders:** rheumatic diseases, gout and Hyperuricemia.

c. **Neoplastic Diseases:** Acute leukaemias, Hodgkin's disease

UNIT – VII

Therapeutic Drug Monitoring

UNIT – VIII

Concept of Essential Drugs. Drug and poison information.

TEXT BOOKS

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

REFERENCES

1. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences, 20th Edition.
2. Hamsten, Drug interaction, Kven Stockley.
3. J.K. Mehra, Drug interaction, Basic Bussiness Publ, Bombay.
4. Grahame smith and Aronson, Clinical pharmacology and drug therapy
5. Richard A Helms, Text Book of Therapeutics Drug and Disease Management Hardbound.
6. Herfindal E T and Hirschman JL, Williams and Wilkins, Clinical Pharmacy and therapeutics
7. Applied Therapeutics, The clinical uses of Drugs applied therapeutics INC
8. Dr. A.R. Paradkar, Hospital and Clinical Pharmacy, Nirali Prakashan.
9. G. Parthasarathi / Karin Nyfort-Hansu A text book of Clinical Pharmacy practice – Universities Press
9. D. Sudheer Kumar. Fundamentals of Clinical Pharmacy Practice- Pharm Med Press

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(PROJECT WORK (100 MARKS))

1. Industrial Pharmacy / Technology
2. Clinical Pharmacy / Pharmacology
3. Pharmacognosy / Medical Chemistry
4. Pharmaceutical Analysis / Quality Assurance
5. Pharmaceutical Marketing
6. Herbal Drugs
7. Pharmainformatics
8. Computer aided drug design
9. Neutraceuticals
10. Nano Technology
11. Bio Technology
12. Pharmaco economics

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(R9707) NOVEL DRUG DELIVERY SYSTEMS AND REGULATORY AFFAIRS LAB

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

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(R9708) PHARMACEUTICAL BIOTECHNOLOGY LAB

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

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T	P	C
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(R9709) MEDICINAL CHEMISTRY – III LAB

Assay of some drugs from their formulations:

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

REFERENCES

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

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(R9710) PHARMACOGNOSY – III LAB

1. Measurement of phloem fibres of any two powdered crude drugs.
2. Determination of quality and purity of powdered crude drugs by lycopodium spore method (Ginger, Cardamomum, etc.)
3. Determination of Leaf Constants
 - a. Stomatal number and stomatal index of Senna and Datura
 - b. Vein islet number and veinlet termination number of Datura
4. Isolation of volatile oil from clove and eucalyptus.
5. Aspetic seed germination of Trigonella
6. Establishment of callus cultures of Catheranthus roseus.

BOOKS RECOMMENDED FOR REFERENCE:

PHARMACEUTICS

1. Cooper and Gunn's "Tutorial Pharmacy" ed. S.J Carter, 6th edition, CBS Publisher, Delhi.
2. A N Martin, Arthur Cammarata, James Swarbrick, "Physical Pharmacy", 3rd edition, K M Varghese & Co., Bombay.
3. E Shotton and K Ridgway, "Physical Pharmaceutics" Oxford University Press, London.
4. "Remington's Pharmaceutical Sciences", ed. A R Gennaro, 18th ed, Mack Publishing Co., P.A.
5. Leon Lachmen, H A Lieberman and J L Kanig, "The Theory and Practice of Industrial Pharmacy, 3rd ed. Lea & Febiger Philadelphia.
6. H C Ansel "Introduction to Pharmaceutical Dosage Forms", 3rd (Indian ed) K M Varghese & Co. Bombay.
7. Cooper and Gunn's "Dispensing for Pharmaceutical Students" ed S J Carter, 12th ed., CBS Publishers, Delhi.
8. "Sprowl's American Pharmacy" ed L W Dittert, 7th ed J & B Lippincott Co., Philadelphia.
9. "Bentley's Textbook of Pharmaceutics" ed EA Rawlinson, 8th ed ELBS Bacilliere Tindall.
10. "Dispensing of Medication", ed J E Hoover, 8th ed Mack Publishing Co., Easton PA.

11. William E Hassan, "Hospital Pharmacy", 5th ed Lea & Febiger, Philadelphia.
12. "Modern Pharmaceutics" ed G S Banker and C T Rhodes, 2nd ed Marcel Dekker Inc., NY.
13. "Pharmaceutical Dosage, Forms and Drug Delivery Systems", 5th ed Lea and Febiger, Philadelphia.
14. S.Turco and R.E.King, "Sterile Dosage Forms" 3rd ed Lea and Febiger, Philadelphia.
15. H M Chitton and R L Witcofski, "Nuclear Pharmacy", Lea and Febiger, Philadelphia.
16. K A Connors, G L Amidon and V J Stella, "Chemical Stability of Pharmaceuticals", 2nd ed John Wiley & Sons NY 1986.
17. "Pharmaceutics The Science of Dosage Form Design", ed M E Aulton, ELBS/Churchill Livingstone
18. J T Carstensen, "Drug Stability", Marcel Dekker Inc NY.
19. "Cosmetic Science and Technology" ed Sagarian and M S Balsam, Vol 1 3, 2nd ed John Wiley & Sons, NY
20. J S Jellinek, "Formulation and Function of Cosmetics", John Wiley & Sons, NY.
21. S G Thomsen, "Modern Cosmetics" Universal Publishing Corporation, Bombay.
22. "Advance in Pharmaceutical Sciences", ed H S Hean, A H Beckett, and J E Carless, Vol 1 4 Academic Press, London.
23. W L Macbe and J C Smith, "Unit Operation of Chemical Engineering" 4th ed McGraw Hill International Book Co., London.
24. C G Brown etal, "Unit Operations" (Indian ed) Asia Publishing House, Bombay.
25. W L Badger and J T Banchero, "Introduction to Chemical Engineering" McGraw Hill International Book Co., London.
26. B T Loftus and Robert Nash, "Pharmaceutical Process Validation", Marcel Dekker Inc. NY.
27. M L Schroff, "Professional Pharmacy", Five Star Enterprises, Calcutta
28. "Dispensing of Medication", Ed, E W Martin, 7th ed Mack Publishing Co., Eastern PA.
29. M J Stocklose, "Pharmaceutical Calculation", 6th ed Lea & Febiger, Philadelphia.

30. Joel L Zatz, "Pharmaceutical Calculations" John Wiley & Sons, NY.
31. J G Wagner, "Fundamentals of Clinical Pharmacokinetics", Drug Intelligence Publications, Hamilton.
32. R L Juliano, "Drug Delivery System", Oxford University Press, Oxford.
33. R E Notari, "Biopharmaceutics and Pharmacokinetics an Introduction" 2nd ed Marcel Dekker Inc NY.
34. M Rowland and T N Tozer, "Clinical Pharmacokinetics" 2nd ed Lea & Febiger, NY.
35. M Gibaldi & D Perrier, "Pharmacokinetics", 2nd ed Marcel Dekker Inc NY.
36. J G Wagner, "Pharmacokinetics for the Pharmaceutical Scientist", Technomic Publishing A G Basel, Switzerland.
37. "Milo Gibaldi, "Biopharmaceutics & Clinical Pharmacokinetics" 3rd ed. Lea & Fibiger, Philadelphia .
38. "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.
39. "Pharmaceutical Dosage Forms; Disperse Systems", Vols. 1&2 ed H A Liberman, N M Rieger and G S Bunker, Marcel Dekker Inc. NY.
40. J R Robinson & Vincent Lee, "Controlled Drug Delivery Fundamentals & Applications" 2nd ed Marcel Dekker Inc..
41. M C Winter, "Basic Clinical Pharmacokinetics", Applied Therapeutics, Inc San Fransisco
42. "Pharmacokinetics" eds A Pecile and A Rescigno, Plenum Press, NY.
43. S H Willing, IV, "Good Manufacturing Practices for Pharmaceuticals" 2nd ed Marcel Dekker Inc NY.
44. "Hard Capsules", ed K Ridgwey, The Pharmaceutical Press, London.
45. "Textbook of Hospital Pharmacy", ed M C Allwood and J T Fell, Blackwell Scientific Publications, Oxford.
46. A Owunwonne, "Handbook of Radiopharmaceuticals", Narosa Publishing House, New Delhi.
47. Peter G Welling and Francis L S Tse, "Pharmacokinetics", 2nd ed Marcel Dekker Inc NY.
48. H K Bharati, "Drugs and Pharmacy Laws in India", Sadhana Mandir, Indore

49. Sanford Bolton, "Pharmaceutical Statistics" 2nd ed Marcel Dekker Inc NY.
50. "Chemical Engineers" Handbook ed R H Parry & C H Chilton, 5th ed McGraw Kogakusha Ltd.
51. J C KacChenney "Packaging of Cosmetics and Toiletries, Newness Butterworth, London.
52. W A Ritschel, "Handbook of Basic Pharmacokinetics", Drug Intelligence Publications, Hamilton .
53. Pharmacopoeias of India, published by the Controller of Publications, Delhi, 1st ed 1966 3rd ed .
54. British Pharmacopoeias, Her Majesty's Staionery office, University Press, Cambridge.
55. The United States Pharmacopoeias, 22nd revision. The United States Pharmacopoeial Convention, Mack Pub Co. Easton, PA.
56. The British Pharmaceutical Codex, 12th ed. The Pharmaceutical Press, London.
57. Martindale: The Extra Pharmacopoeias, ed J E F Reynolds, 28th ed. The Pharmaceutical Press, London.
58. British National Formulary, No.15 Pub jointly by British Medical Association and Royal Pharmaceutical Society of Great Britain.
59. The Merck Index 9th ed, Merck & Co., Inc NJ.
60. R Y Stanier, Ingraham, "General Microbiology" 5th ed, Wheellis and Painter.
61. Rugu and Russel, "Pharmaceutical Microbiology; Blackwell Scientific Publication, Oxford.
62. A J Salle, "Fundamental Principles of Bacteriology".
63. Bergy's Manual of Determinative Bacteriology.
64. G Sykes, "Disinfection and sterilization, II ed.
65. Davis, Dulbertro, Eisen "Microbiology".
66. Benjamin Lewis, Gene V "Microbiology"
67. Prescott and Dunn, "Industrial Microbiology" , 2nd ed McGraw Hill Book Company Inc.
68. Peppler, "Microbial Technology", Vol I & II
69. Suichi Aiba Humphrey and Millis, "Biochemical Engineering" University of Tokyo
70. K Kielslich Ed "Biotechnology" Vol 6a, Verleg Chemie, Switzerland.

71. P F Standury & A Whitaker, "Principles of Fermentation Technology" Pergamon Press, Oxford, 1987.
72. P Ward "Fermentation Technology, Principles, Processes & Products" Open University Press, Milton Keynes, UK 1989.
73. G Reeves, "Lecture Notes on Immunology", Blackwell Scientific Publications, Oxford 1987.
74. L M Prescott, G P Jarley, D A Klein, "Microbiology", 2nd Ed., Wm. Brown Publishers, Oxford 1993.
75. T D Brock, M T Madigan "Biology of Micro organism" 5th ed Prentice Hall, New Jersey USA 1988.
76. Biopharmaceutics and clinical pharmacokinetics 4/Edn.- Milo Gibaldi-Pharma Book Syndicate.Hyderabad.
77. Pharmaceutical Industrial Management – SAGAR - Pharma Book Syndicate.
78. Biopharmaceutics and Pharmacokinetics – Venkatesulu - Pharma Book Syndicate.

BOOKS RECOMMENDED (PHARMACOGNOSY)

1. Atal, C Kssssss and Kapur, B M, Cultivation and utilization of Medicinal plants, RRL, Jammu
2. Barz, W, Reinhard, E and Zenk, M H, Plant Tissue Culture and its Biotechnological Application, Springer, Berlin.
3. Brain, K R and Turner, T D The Practical Evaluation of Phytopharmaceuticals, Wright Scientechnics, Bristol.
4. Bullock, J D. The Biosynthesis of Natural Products, McGraw & Hill.
5. Chadha, K L and Gupta, R, "Advance in Horticulture, Medicinal and Aromatic Plants Vol XI Malhotra Publishing, New Delhi.
6. Chopra, R N, Nayar S L and Chopra, I C Glossary of Indian Medicinal Plants, CSIR, New Delhi.
7. Clarke, ECG, Isolation and Identification of Drugs, The Pharmaceutical Press, London.
8. De Mayo, P The Chemistry of Natural Products, 2 3, Interscience, New York.
9. Export Potential of Selected Medicinal Plants, prepared by a Basic Chemicals, Pharmaceuticals and Cosmetic Export Promotion Council, Bombay, and other reports.
10. Fahn, A, Plant Anatomy, 3rd Ed., Pergamon Press, Oxford.

11. Faulkner, D J and Fenical, W H, Marine Natural Products a Chemistry (NATCO Conference Series 4). Plenum Press, New York.
12. Gamborg, G L and Wetter, L R. Plant Tissue Culture Methods, National Research Council of Canada, Saskatchewan.
13. Gibbs, R Darneley, Chemotaxonomy of Flowering Plants, 4 volumes McGill University Press.
14. Guenther, E. The Essential Oils 4D, Van Nostrand Co Inc New York.
15. Harborne, JB, Biochemistry of Phenolic Compounds Academic Press, New York.
16. Barbone JB, Phytochemical Methods, Champan, and Hall, International Edition, London.
17. Henry TA, The Plant Alkaloids, 5th Ed, EcGrwd Hill, New York.
18. Kokate C K. Practical Pharmacognosy, Vallabh Prakashan, Delhi.
19. Kokate C K, Purohit A P and Gokhale S B. The Pharmacognosy (Degree) Nirali Prakashan, Pune
20. Manitto P. The Biosynthesis of Natural Products, Ellis ahonwood, Chichester.
21. Manske RHF. The Alkaloids Academic Press, New York.
22. Martindale, The Extra Pharmacopoeia, Pharmaceutical Society of Great Britain, London
23. Medicinal Plants of India, 1.Indian Council of Medical Research New Delhi.
24. Medicinal Plants of India, Zafar, R.,C.B.S.Publisher, New Delhi
25. Miller, L.P.,Phytochemistry, 1 3 Van Nostrand Reinhold Co.,
26. Nadkarni, A K, Indian Materia Medica, 1 2, Popular Prakashan Pvt.Ltd.,Bombay
27. Official methods of analysis, Association of official analytical chemists publications, Washington.
28. Peach, K and Tracey M V, Modern methods of plant analysis, 1 4, Narose Publishing house, New Delhi
29. Pharmacopoeia of India, Govt.of India, Ministry of Health.7
30. Pridham, J B, and Swain, T., Biosynthesis pathways in higher plants, Academic press, New York.
31. Pridham, J.B.,Terpenoids in plants, Academic press, New York.
32. Reinetrt, J and Bajaj Y P S, Applied and fundamental aspects of plant cell, Tissue and organ culture, Berlin.

33. Robinson, T., The Biochemistry of alkaloids, Springer Verlag, New York.
34. Rosenthaler, L., The chemical investigations of plants, G.Bell and sons Limited, London
35. Ross, M S F and Brain K R., An Introduction to Phytopharmacy, pitman medical, Kent
36. Schellard, E J., Practical plant chemistry for pharmacy students, pitman medical London.
37. Scheuer, P.J., Marine natural products, Academic press, London
38. Sinnott, E W., Dunn L C., and Dobzhansky, T., Principles of Genetics, Tata McGraw Hill Publishing Co., Limited, New Delhi
39. Staba, E J., Plant tissue culture as a source of Biomedicinals, CRC Press, Florida
40. Stahl, E., Thin Layer Chromatography A Laboratory handbook, Springer verlag, Berlin
41. Street, H E., Tissue Culture and plant science, Academic press, London
42. Stumpf, P K and Conn, E E., The Biochemistry of Plants ; A Comprehensive treatise, 1 8, Academic press.
43. Swain, T., Chemical plant Taxonomy, Academic press, London
44. Swain, T.,Comparative Phytochemistry, Academic press, London
45. The Merck Index, Merck and Company, Rahway, New Jersey, USA
46. The National Formulary, United States Pharmacopoeial convention Inc., Rockville, Meddison, USA
47. The Wealth of India, Raw Materials (all Volumes) Council of Scientific and Industrial Research, New Delhi
48. Trease, G E and Evans, W C, Pharmacognosy, 12th Ed., Bailliers Tindall, Easbourne UK
49. Tyler, V C., Brady, L R and Roberts, J E Pharmacognosy, Lea and Febiger, Philadelphia
50. United States Pharmacopoeia, United States Pharmacopoeal Convention Inc., Rockville Meddison.
51. Wallis, T E, Analytical microscopy, J&A Churchill limited, London.
52. Wallis, T E Textbook of Pharmacognosy, J&A Churchill Limited London

BOOKS RECOMMENDED ON PHYSIOLOGY AND ANATOMY

1. Guyton, Textbook of Medical Physiology, AC Guyton WB Sannders Company, 1995
2. Human Physiology C.C. Chatterjee
3. Medical Allied Agency, Calcutta 1991
4. Human Physiology, Subhash Shalya
5. CBS Publishers & Distributors, 1994
6. Samson Wright's Applied Physiology, Keele, C.A., Neil, E. and Joels, N. Oxford University Press
7. Review of Medical Physiology, Ganong, W.F. Prentice Hall International
8. Principles of Anatomy and Physiology Tortora, G.J. and Anagnodokos, N.P., Harper & Row Publishers N.Y.
9. Human Physiology, Vander, A.J., Sherman, J.H and Luciano, D.S. Tata Mcgraw Hill Publishing Co., New Delhi/
10. Best and Taylor's Physiological Basis of Medical Practice.
11. Willam & Wilkins, Baltimore
12. Illustrated Physiology, McNaught, A.B. and Callander, R., Churchill Livingstone.
13. B.D.Chaurasia's Human Anatomy, Regional & Applied, Part I, II & III, CBS Publishers and Distributors, New Delhi.
14. Textbook of Practical Physiology, Ranade, V.G., Pune Vidyarthi Griha Prakashan, Pune.
15. Atlas of Normal Histology, Difore Marionon S.H. Lea and Febiger, Philadelphia
16. Basic Pathology, Robbins, S.L. and Kumar, V.,W.B. Sanders Company
17. Davidson's Principles and Practice of Medicine, ELBS/Churchill Living Stone.
18. Goodman and Gilman's The Pharmacological basis of Therapeutics Editors : A Goodman Gilman, T.W. Rail, A.S.Nies, P.Taylor, pergamon Press,
19. Modern Pharmacology, C.R.Craig and R.E.Stitzel,Little brown and Company
20. Modern Pharmacology, C.R.Craig and R.E. Stitzel, Little brown and Company
21. Paul, L., Principles of Pharmacology, Chapman and Hall,

22. T.C.Theoharides, Pharmacology, Little Brown and Co.,
23. M.P.Rang, M.N.Dale, J M Riter, Pharmacology, 3rd edition, Churchill Livingstone
24. M.J Mycek, S.B Gerther and M M perper, Pharmacology: Lippincott's illustrated Reviews, J B Lippincott company
25. Crossland, J and Thomson, J H., Essentials of pharmacology, Harper and Row
26. Katzung, B.G., Basic and clinical pharmacology, prentice hall, International.
27. Laurence, D R and Bennet P N., Clinical Pharmacology, Scientific book agency, calcutta.
28. Berar F S K., Text book of pharmacology, Interprint, New Delhi.
29. P S R K Harnath, Synopsis of Pharmacology, Bombay.
30. Clinical Pharmacy and therapeutics, Herfindal E T, and Hirschman J L., Williams and Wilkins.
31. Applied Therapeutics : The clinical use of Drugs, Applied therapeutics INC.,
32. Pharmacotherapy: A pathophysiological approach, dipro, J L Elsevier.

**BOOKS RECOMMENDED (PHARMACEUTICAL ANALYSIS,
PHARMACEUTICAL CHEMISTRY BIOCHEMISTRY)**

1. J Bassett, R C Denny, G H Jeffery, J Mendham, Vogel's Text book of quantitative Inorganic analysis, ELBS/Longman, London.
2. L M Atherden, Benteley and Driver's Text book of Pharmaceutical Chemistry, oxford university Press , London
3. L M Kothoff and V A Stenger, Volumetric analysis, Vol.II Titration methods, Interscience Publishers, INC., new York
4. Pharmacopoeia of India, Government of India, Ministry of Health
5. L G Chatten, A Text book of Pharmaceutical Chemistry, Voll and II, Marcel Dekker, New York.
6. A H Beckett and J B Stenlake, Practical Pharmaceutical Chemistry Vol. I and II. The athlone press of the university of London.
7. A M Knevel and FE Digani, Jenkins Quantitative Pharmaceutical Chemistry, McGraw Hill Book Co., New York.
8. J H Block, F Roche, I O Soine and C O Wilson, Inorganic Medicinal and Pharmaceutical Chemistry, Lea and Febiger, Philadelphia, P A.

9. L A Disheher, Modern Inorganic Pharmaceutical Chemistry
10. W S Brey, Physical Chemistry and its biological applications Academic Press.
11. K J Laidler, Physical Chemistry with Biological applications, Benjamin
12. V R Williams and H S Williams, basic Physical Chemistry for the life sciences, W H Freeman
13. S R Pali and S K D E Prabartak, practical Physical Chemistry, Haltone Limited, Calcutta.
14. D P Shoemaker, C W Garland, Experiments in Physical Chemistry, McGraw Hill Book Co., New York.
15. J A Ritchener, Findley's physical chemistry, (Ed) Green & Co., London
16. A N Acheson, An Introduction to the chemistry of heterocyclic compounds, Interscience Publication, New Delhi.
17. P Sykes, A guidebook to mechanism in organic chemistry, Orient Longman, New Delhi.
18. J D Roberts and M C Caserio, Basic principles of Organic Chemistry, W A Benjamin, Inc ., New York.
19. I L Finar, Organic Chemistry, Vol. I., The Fundamentals of Principles, ELBS/Longman
20. F C Mann, and B C Saundes, practical organic chemistry. The English language book society and long man group limited, London.
21. A I Vogel, A text book of practical organic chemistry. The English language society and longman group limited, London.
22. E L Eliel, Stereochemistry of carbon compounds, Mc Graw Hill book company, Inc., New York
23. 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
24. D T Plumer, An Introduction to practical biochemistry, Tata McGraw Hill, New Delhi
25. J Jayaraman, laboratory manual in Biochemistry, Willey Estern Limited, New Delhi
26. D W Martin, P A Mys and V. M Redwell, Harpers Review of Biochemistry, lange Medical Publications.

27. E E Conn and P K Stumpf, Outlines of biochemistry, John Wiley and Sons, New York.
28. A L Lehninger, Biochemistry, Worth Publisher, Inc.,
29. A L Lehninger, Principles of Biochemistry, CBS Publishers and Distributors
30. L Stryer, Biochemistry, W H Freeman and Company, Sanfransisco
31. B Harrow and A Mazur, Text Book of Biochemistry, W B Saunders Co., Philadelphia.
32. C Hanch, Comprehensive medicinal chemistry, Vol. IV, quantitative Drug Design, Pergamon Press, Oxford
33. V.C. Martin, quantitative Drug Design – Critical Introduction (Medicinal Research Monographah, Vol. 8 Marcel Dekker, Inc. New York
34. Exploring QSAR : Vol. I Fundamentals and applications in chemistry and biology and C Hanch, A Leo and D Hockman ACS Book Catalog.
35. P C Jurs, Computer software application in chemistry, John Wiley & Sons, New York.
36. M E Wolff, Ed. Burger's Medicinal Chemistry, John Wiley & New York
37. J N Delagado and W A R Remers, Eds., Wilson and Gisworld's Text book of Organic Medicinal and pharmaceutical chemistry, J Lipponcott Co., Philadelphia.
38. W C Foye, principles of Medicinal Chemistry, Lea & Febiger, Philadelphia 1955
39. T Nogrady, Medicinal Chemistry – A Biochemical Approach. Oxford University Press, New York, Oxford
40. 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
41. J E F Reynolds, Martindale, The Extra Pharmacopoeia, The pharmaceutical press, London
42. J E F REYNOLDS, Martindale, The Extra Pharmacopoeia, The Pharmaceutical Press London
43. Analytical Chemistry – Y. ANJANEYULU - Pharma Book Syndicate.Hyderabad.
44. T Nogrady, Medicinal Chemistry – A Biochemical Approach.- Pharma Book Syndicate. Hyderabad.

OTHER BOOKS RECOMMENDED

1. Popst and Perrum "Computer Aided Drug Design". Academic Press, New York.
2. Computer Programming in pascal – V Ragaraman, Prentice – hall of India New Delhi, 1983.
3. Computers and Commonsense – N Hunt and J Shelley, prentics – Hall of India, New Delhi, 1981.
4. PASCAL USER MANUAL AND Report – K Jensen and N Wirth., Narosa Pub. House, New Delhi, 1983.
5. Systematic programming in Introduction – N Wirth, Prentice Hall Englewood cliff's New Jersey, 1973.
6. Programming in Pascal – P Grogona, Adeison Wesley, Reading, M.A., 1980.
7. Text Book of Drug design and discovery 3/Edn.- LARSEN.- Pharma Book Syndicate.
8. Name Reaction: LI - Pharma Book Syndicate. Hyderabad.
9. Organic Reaction Mechanisms – GALLEGOS- Pharma Book Syndicate.Hyderabad
10. Text book of Forensic Pharmacy – KOKATE - Pharma Book Syndicate.Hyderabad.
11. The art of writing Reason. Organic REAC.MECH – GROSS MAN - Pharma Book Syndicate.Hyderabad.
12. Hand Book of Instrumental Techniques for Analytical Chemistry – SETTLE - Pharma Book Syndicate. Hyderabad.
13. Quality Assurance and Quality Management in Pharma Industry –Y. ANJANEYULU, R. MARRAYA, - Pharma Book Syndicate.
14. What Everyone should know about PATENTS.- SUBBARAM-Pharma Book Syndicate.
15. Elementary Bioinformatics – KHAN - Pharma Book Syndicate.
16. Analytical Chemistry – Y. ANJANEYULU – Pharma Book Syndicate.Hyderabad.
17. Phytochemical Methods by HARBONE, Published by Chapman & Hall.