

**T471 Pharmaceutical Technology II (Theory)**  
(3Hrs/week)

**Section- I**

Sr.No	TOPICS	Hrs
1.	<p><b>Parenteral preparations:</b> Definition, Introduction, Ideal Requirements, Advantages, Disadvantages, Classification, Routes of Administration, Pyrogenicity, Isotonicity. Types and their formulation with reference to powder for reconstitution solution, suspensions, emulsions and depot preparations, preparation of water for injection. Pharmacopoeial evaluation of sterile water for injection and water for injection.</p> <p>Containers and closures (glass, plastic and rubber) and their evaluation, Design of facilities and environmental control, Personnel factors. Processing of parenteral products by terminal sterilization, filtration sterilization.</p> <p>Quality control and Quality Assurance: - evaluation of Parenteral.</p>	10
2.	<p><b>Ophthalmic products:</b> anatomy and physiology of the eye, general requirement / safety consideration, formulation, isotonicity adjustment. Isotonicity calculation, manufacture, package, and quality control,</p> <p>Brief introduction to ophthalmics.</p>	05
3.	<p><b>Stability testing of Pharmaceuticals as per ICH guidelines</b> Mechanism of drug instability: Hydrolysis, oxidation, isomerization, photochemical decomposition of physical instability and polymerization. A revision of review of mechanism of physical instability in dosage forms. Interaction with containers and closures and their evaluation- compatibility testing. Calculation of expiry date of formulations.</p>	08

**Section- II**

Sr.No	TOPICS	Hrs
4.	<p><b>Sustained and controlled drug delivery:</b> Definition – Historical development, advantages and disadvantages. Classification – details of matrix and diffusion control systems. Model drug selection criteria for SR &amp; CR drug delivery system.</p> <p>Biopharmaceutical aspects – steady state concept and concept of maintenance dose &amp; loading dose.</p> <p>Steady state diffusion, lag time, diffusion cells. Dissolution: The diffusion later model, drug release, drug in polymer matrices, membrane control, reservoir type devices.</p> <p>Evaluation of SR &amp; CR Tablets only.</p> <p>Brief introduction to polymers:-Introduction, classification, properties, characterization.</p>	08
5.	<p><b>Microencapsulation:</b> Types of microcapsules, importance of microencapsulation in pharmacy, Formulation of microcapsules by coacervation- phase separation, spray drying and spray congealing, air suspension technique, multiorifice centrifugal process, evaluation of microcapsules.</p>	06
6.	<p><b>Introduction to Novel Drug delivery:</b> Mucosal, transdermal, parenteral implants, osmotic pumps, IUD's, Liposomes, Nanoparticles, Resealed Erythrocytes (No details to be taught)</p>	06
7.	<p><b>Optimization of manufacturing processes of tablet dosage forms.</b></p>	02

**Total Hours: 45**

## Book Recommended

1. Lachman et al. Industrial pharmacy
2. Ansel-- Pharmaceutical dosage forms
3. Dittert-- American Pharmacy
4. Alfonso R. Gennaro-- Remington's Pharmaceutical Sciences
5. Rawling-- Bentley's T.B. of pharmaceuticals
6. Frisler- - Fundamentals of microbiology
7. Lockhart-- Packaging of Pharmaceuticals and healthcare products
8. D A Dean, E R Evans --Pharmaceutical packaging Technology
9. Swarbrick & Boyan -- Encyclopedia of Pharm. Tech,
10. Banker & Boylan-- Modern pharmaceuticals-
11. S J Turco-- Sterile dosage forms Pharmaceutical dosage forms- Tablets, Capsules and Parenteral
12. Nielloud -- Pharmaceutical emulsion and suspensions- Vol. 105-(Dekker)
13. \Niazi- -Handbook of Pharmaceutical manufacturing formulations- (Vol. 1-6)
14. Podozeck & Jones-- Pharmaceutical Capsules

**P471 Pharmaceutical Technology II (Practicals)**  
(3Hrs/week)

- Note: 1) Products may be assayed to evaluate accuracy in regular practical. Assays are not to be given to students in University examinations.
- 2) Formulation of different dosage forms should give stress on raw material specifications, preformulation, process controls, and documentation.
- 3) Pharmacopoeial evaluation of containers for parenteral\*\*
- 4) Formulation and evaluation of the following dosage forms:
- i) SVPs\*\*
    - Ascorbic acid injection I.P.
    - Calcium gluconate injection I.P.
    - An injection containing demonstrating co-solvent phenomenon.
    - An injection containing colloidal calcium with vitamin D.
  - ii) LVPs\*\*
    - Sodium chloride and dextrose infusion I.P.
    - An injection containing fat emulsion
  - iii) Ophthalmic Preparations:
    - Sulphacetamide eye drop B.P.C. \*
    - Tetracycline eye ointment I.P. \*
    - Chloramphenicol eye ointment I.P. \*
    - Zinc sulphate eye drop B.P.C \*
  - iv) Accelerated stability testing of an injection
  - vi) Microcapsules. \*\*
  - vii) Formulation and Evaluation of one controlled release/ sustained release formulation\*\*

Major Expt. \*\*

Minor Expt. \*(All preparations may act as minor experiments)

**Books Recommended:**

- 1 Industrial pharmacy- Lachman etal
- 2 Pharmaceutical dosage forms – Ansel
- 3 Dittert, sprowl American Pharmacy (J.B. lipincott)
- 4 Martin, Remingtons Pharmaceutical sciences. (Mack)
- 5 Harikishan Singn, Pharmacopoeias and Formularies, vallabh Prakashan, Dehli)
- 6 M.L. Shroff General pharmacy Series
- 7 Mittal, Pharmaceutical Formulations
- 8 I.P., B.P., B.P.C., U.S.P.
- 9 Handbook of Pharmaceutical manufacturing formulations- Niazi- (Vol. 1-6)
- 10 Microencapsulation and related drug processes- DEASY.

Examination Pattern is as follows

Sr. No.	Types of Question	Sessional	University
	Duration	3 Hrs	4 Hrs
1	Synopsis	5	10
2	Viva Voce	5	10

3	Exp. Major	-	30
	Minor	10	20
4	Journal Marks	10	-
	Total Marks	30	70

**T472 Pharmaceutical Medicinal chemistry –III (Theory)**  
**(3 hrs /week)**

**Section I**

**The following topics should be covered with the points listed below**

1. Introduction
2. Classification
3. Mechanism of action
4. Structure-activity relationship
5. Pharmacokinetics (Metabolism) and
6. Therapeutic uses
7. Synthesis of drugs official in IP (Listed in respective classes)

<b>Sr.No.</b>	<b>Topic</b>	<b>Hours</b>
<b>1</b>	<b>Drugs Acting on Central Nervous System</b>	
<b>2</b>	<b>General Anesthetics</b> Ketamine hydrochloride, Diazepam	<b>04</b>
<b>3</b>	<b>Hypnotics and Sedatives</b> Nitrazepam, Pentobarbitone, Paraldehyde, Phenobarbitone	<b>07</b>
<b>4</b>	<b>Drugs acting as anticonvulsants</b> Carbamazepine, Ethosuximide, Phenytoin Sodium, Sodium Valproate	<b>05</b>
<b>5</b>	<b>Psychotherapeutic Agents</b> Chlorpromazine hydrochloride, Haloperidol, Prochlorperazine Maleate, Fluphenazine Hydrochloride, Triflupromazine	<b>06</b>

**Section II**

**The following topics should be covered with the points listed below**

1. Introduction
2. Classification
3. Mechanism of action
4. Structure-activity relationship
5. Pharmacokinetics (Metabolism) and
6. Therapeutic uses
7. Synthesis of drugs official in IP (Listed in respective classes)

<b>Sr.No.</b>	<b>Topic</b>	<b>Hours</b>
<b>6</b>	<b>Drugs used in Parkinsonism</b>	<b>04</b>
<b>7</b>	<b>Drugs for Alzheimer's Diseases</b>	<b>04</b>
<b>8</b>	<b>CNS Stimulants:</b> Doxepin hydrochloride, Imipramine hydrochloride, Amitriptyline hydrochloride, Nortriptyline hydrochloride	<b>04</b>
<b>9</b>	<b>Anti Virals</b> Amantadine hydrochloride, Idoxuridine	<b>07</b>

<b>10</b>	<b>Vitamins and Related Compounds</b> Water soluble & lipid soluble vitamins	<b>04</b>
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**Total Hrs-45**

**Books Recommended**

- 1) Principles of Medicinal Chemistry, Foye, Lemke and Williams, Indian Ed. B. I. Waverly, Pvt. Ltd. New Delhi
- 2) Wilson and Gisvold, Textbook of Organic Medicinal and Pharmaceutical Chemistry, J. N. Delgado, W.A. Remers, Lipincott Raven 10th Ed., 1998
- 3) Essentials of Medicinal Chemistry by Koralkovas, 2nd edition, Wiley Inter science Pub. 1988
- 4) The Organic Chemistry of Drug Synthesis: Daniel Lednicer, John Wiley and Sons. Inc. Vols 1-6
- 5) Profiles in Drug Synthesis : V.N. Gogte
- 6) Burger's Medicinal Chemistry and Drug Discovery (Vol. 1-5) Wiley Inter science Publication
- 7) Textbook of Pharmaceutical Chemistry by Harkishansing & Kapoor
- 8) Principle of Medicinal Chemistry ( Volume I & II ) by Kadam, Mahadik and Bothara
- 9) Text Book of Practical Organic Chemistry - A.I. Vogels
- 10) Practical Organic Chemistry - Mann and Sanders
- 11) Systematic Identification of Organic Composition, Shriner and Fuson

**P472 Pharmaceutical Medicinal chemistry –III (Practical)**

**(3 hours/week)**

Sr. No.	Experiments
<b>1</b>	<p><b>Laboratory scale preparation by conventional/microwave synthesis of the following compounds &amp; characterization by M.P/B.P/TLC/UV/IR</b></p> <ol style="list-style-type: none"> <li>1. Sulphanilamide</li> <li>2. Methyl Salicylate</li> <li>3. 2, 4- Dinitrophenylhydrazine</li> <li>4. Chloramine – T</li> <li>5. Benzimidazole</li> <li>6. Paracetamol</li> <li>7. Phenacetin</li> <li>8. Benzophenone</li> <li>9. Phenytoin</li> <li>10. Methyl orange</li> <li>11. Aspirin</li> <li>12. Benzamide (from methyl benzoate)</li> <li>13. <i>p</i>-Methylacetophenone</li> </ol>

**Minimum Twelve numbers of Experiments should be performed. Experiments requiring three steps should be classified as Minor-first two steps, and Major- last step**

### **Books Recommended**

- 1) Text Book of Practical Organic Chemistry – A.I. Vogel
- 2) Practical Organic Chemistry – Mann and Sanders
- 3) Systematic identification of Organic Composition, Shriner and Fuson
- 4) Introduction to Spectroscopy, Donald L. Pavia, Third Edition, Harcourt College Publishers
- 5) Introduction to Spectroscopy, Silverstein, B.

Examination Pattern is as follows

Sr. No.	Types of Question	Sessional	University
	Duration	3 Hrs	4 Hrs
1	Synopsis	5	10
2	Viva Voce	5	10
3	Exp. Major	-	30
	Minor	10	20
4	Journal Marks	10	-
	Total Marks	30	70

**T473 Pharmacology III (Theory)**  
**(3hrs/Week)**

Sr.No.	Topics	No of Hrs
	Section-I	

1.	<b>Endocrine system</b> a) Thyroid and Anti Thyroid drugs b) Insulin, Insulin analogues and Oral Hypoglycemic agents c) Male and Female Sex hormones and oral contraceptives d) Oxytocin and other uterine stimulants and relaxants	01 02 03 03 01
2.	<b>Cardiovascular system</b> a) Anti-hypertensives b) Anti anginal drugs c) Anti arrhythmic drugs d) Drugs used for therapy of Congestive Cardiac Failure e) Drugs used in Hyperlipidemias	03 02 03 03 02
<b>Section-II</b>		
3.	<b>Gastro-intestinal system</b> a) Anti-Ulcer drugs and Antacids b) Laxative and purgatives c) Emetic and Anti emetic d) Appetizers and Digestants and carminatives	02 01 02 01
4.	<b>Diuretics</b> Pharmacology of drugs acting n Renal system ( Diuretic) and Anti-diuretics	02
5.	<b>Pharmacology of autacoids and their Antagonist</b> a) Histamine and Antihistaminic b) 5- Hydroxytryptamine and its antagonists c) Lipid derived autacoids and platelet activating factor d) Non Steroidal Anti-inflammatory Drugs	02 02 02 02
6.	<b>Drug Acting on Blood and Blood Forming agent</b> a) Coagulants and anti-coagulants b) Haemopoietics c) Thrombolytics and antiplatelet	02 02 02
Total Hrs.		45

### Books Recommended

- 1) Satoskar R.S, Bhandarkar S.D, Rage N.N. Pharmacology and Pharmcotherapeutics. Popular Prakashan Mumbai 19<sup>th</sup> edition.
- 2) Barar F.S.K. Essentials of Pharmacotherapeutics, S.Chand & Company Ltd. New Delhi
- 3) Tripathi K.D. Essentials of medical Pharmacology ,Jaypee New Delhi 2004 5<sup>th</sup> edition
- 4) Rang H.P., Dale M.M. *et.al.* Pharmacology. Churchill Livingstone, New Delhi 2005 5<sup>th</sup> edition
- 5) Katzung B.G .Basic & Clinical Pharmacology Mc-graw Hill, New Delhi 2001. 8<sup>th</sup> edition.
- 6) Lewis's Pharmacology. Churchill Livingstone London, 1980 5<sup>th</sup> edition
- 7) Goodman Gilman, The pharmacological basis of therapeutics. Mc-graw Hill New Delhi 2001 10<sup>th</sup> edition
- 8) Seth S.D. Textbook of Pharmacology Elsevier, New Delhi 2004 2<sup>nd</sup> Edition



- 9) Harvey R.A., Champe P.C. Lippincott's Illustrated Reviews-Pharmacology. Lippincott Williams & Wilkins, Pennsylvania. 2000 2<sup>nd</sup> edition.
- 10) Grahame-Smith D.G. & Aronson J.K. Oxford textbook of clinical Pharmacology and drug therapy . Oxford University press London. 2002 3<sup>rd</sup> edition
- 11) Foster R.W. Basic Pharmacology, Arnold ,New Delhi 2001 ,4<sup>th</sup> edition
- 12) Stahl S.M.. Essential Psychopharmacology Cambridge University Press New Delhi 2003 2<sup>nd</sup> edition
- 13) Dipiro J.L. Pharmacotherapy Handbook. Tata McGraw Hill New Delhi.2004 5<sup>th</sup> edition.
- 14) Official books - Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia

## P473 Pharmacology III (Practical)

(3hrs/Week)

- 1) To perform **Bio-assays** antagonists like Atropine, d-tubocurarine using suitable biological preparations\*\*
- 2) To determine **PA2** value of Atropine using suitable isolated tissue preparation. \*\*
- 3) **Minor Experiment**
  1. Measurement of Na<sup>+</sup>, K<sup>+</sup> content of urine by flame photometry\*.
  2. To study Local anesthetic activity\*
  3. To study laxative and anti diarrhoeal effects\*
  4. To study mydriatic and miotic activity\*
  5. To study Anti-inflammatory property of any NSAIDS against Carrageenan-induced acute paw oedema in Rat.
  - 6 To study the various effects of drugs using In-silico model (Effects of drug on B.P) (Ex- Pharm Software, X-cology)\*

NOTES:-

### 1. Minor \* Major\*\*

2. Suitable animal preparation- Any experiment suitable to demonstrate the concept- It could be either in-vivo or in-vitro, The animal selected may be mice, rat, rabbit, guinea pig as admissible as per prevailing Government/CPCSEA guidelines. In case of in-vitro preparations- any tissue preparation from above animals or various tissues from goat may be obtained from slaughter house/ abattoir /butcher shop

Examination Pattern is as follows

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1	Synopsis	5	10
2	Viva Voce	5	10
3	Exp. Major	-	30
	Minor	10	20
4	Journal Marks	10	-
	Total Marks	30	70

### Books Recommended

1. Ghosh M.N. Fundamentals of Experimental pharmacology. Hilton & Company Kolkata 2005 3<sup>rd</sup> edition
2. Vogel G.H. Drug discovery and evaluation. Springer Germany 2002 2<sup>nd</sup> edition
3. Goyal R.K. Practicals in pharmacology. B.S. Shah Prakashan Ahmedabad 2005 5<sup>th</sup> edition
4. Kulkarni S.K. Handbook of Experimental Pharmacology. Vallabh Prakashan. New Delhi, 5<sup>th</sup> edition
5. Perry W. L. M. Pharmacological Experiments on Isolated preparations. E.&S. Livingstone London 1970, 2<sup>nd</sup> edition
6. Kasture S.B. Text book of Experimental Pharmacology, Career Publication Nashik. 1<sup>st</sup> edition, 2006
7. Official books - Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia



**T474 Pharmacognosy and Ayurvedic Pharmacy (Theory)**  
**(3hrs/Week)**  
**Section I**

Sr.No.	Topic	Hrs.
1.	<b>Complementary/ alternative medicine :</b> Basic principles involved in alternative systems of medicines like Ayurveda, Siddha, Unani, Chinese Medicine, Homeopathy and Aromatherapy	5
2.	<b>General Introduction to Glycosides;</b> Classification, Physical & Chemical properties, occurrence/distribution, General extraction methodology of glycoside. Biological source, collection, , morphology ,diagnostic features, chemical constituents, chemical tests, uses, adulterants and substituents of following: <b>1) Saponins:</b> Liquorice, * Ginseng, Dioscorea, Shatavari*, Solanum and Brahmi. <b>2) Cardioactive Sterols:</b> Digitalis*, Squill and Thevetia <b>3) Anthraquinone cathartics:</b> Aloe*, Senna*, Rhubarb and Cascara <b>4) coumarins: Others:</b> Psoralea, Ammi visnaga <b>5) Cyanogenetic :</b> Bitter almond, wild cherry bark <b>6) Bitter and miscellegenous:</b> Gentian, Andrographis, Chirata ,picrorrhiza, quassia <b>Note: * cultivation. morphology &amp; microscopy</b>	16

**Section II**

3.	<b>Study of traditional drugs:</b> Common/Vernacular names, B.S., morphology, chemical nature, pharmacology, traditional uses, marketed formulations of the following: Kantkari, Tylophora, Kalijiri, Rasna, Punarnava, Chitrak, Aparnarg, Gokhru, Sankhapushpi, Tulsi, Methi, Palash, Gymnema, Shilajit, Nagarmotha, Tinospora, Neem, and Bhringraj.	7
4.	<b>General introduction to Alkaloids;</b> Classification, Collection, Physical & Chemical properties, occurrence/distribution, General extraction methodology of alkaloids. Biological source, collection, morphology, diagnostic features, chemical constituents, chemical tests, uses, adulterants and substituents of following: <b>Indole:</b> Ergot, Rauwolfia, Catharanthus, Nux-vomica, Physostigma, <b>Quinoline and Isoquinoline:</b> Ipecac, Opium, Cinchona <b>Pyridine &amp; Piperidine:</b> Areca, Tobacco <b>Tropane:</b> Belladonna, Datura, stramonium, Coca leaves <b>Imidazole:</b> Pilocarpus <b>Quinazoline:</b> Vasaka <b>Steroidal:</b> Kurchi, Ashwagandha <b>Terpenoidal:</b> Aconite <b>Purine:</b> Coffee, Tea, Cola <b>Amino Alkaloids:</b> Ephedra, Colchicum <b>Note: * cultivation. Morphology &amp; microscopy</b>	12
5	<b>Biosynthetic pathway for-</b> Atropine, morphine, Quinine, Indole alkaloid, Digitoxin, sennoside.	5

Total Hrs 45

**Books Recommended**

1. Ayurvedic Pharmacopoeia of India, All Volumes.
2. Ayurvedic Formulary of India, Govt. of India, New Delhi
3. British Herbal Pharmacopoeia
4. Henry T. A., The plant alkaloids, McGraw Hill, New York
5. Herbal Pharmacopoeia, IDMA, Mumbai
6. Harborne J. B. Phytochemical methods, Chapman and Hall, International Edition, London
7. Iyengar M.A., Study of Crude Drugs, Manipal Power Press, Manipal
8. Kokate C. K. Purohit A. P. and Gokhale S. B. , Pharmacognosy (degree ) Nirali Prakashan
9. Manitto P. The biosynthesis of natural products, Ellis Harwood, Chichester

10. Manske RHF, The alkaloids Academic press, New York
11. Peach K, and Tracey M. V., Modern methods of plant analysis, 1-4, Narosa Publishing house, New Delhi
12. Pharmacopoeia of India, 1985,1996, Govt. of India, Ministry of Health and Family Welfare
13. Pulok Mukharji, Quality control of Herbal drugs
14. Robinson, T., The biochemistry of alkaloids, Springer- Verlag, New York
15. Stahl, E., Thin Layer Chromatography- A Laboratory handbook, Springer-Verlag, Berlin
16. Trease, G.E. and Evans, W.C. Pharmacognosy, 12th Edition, Bailliere Tindall, Eastbourne, U.K
17. Tyler, V.E., Brady, R., Pharmacognosy
18. V.D.Rangari, Pharmacognosy and Phytochemistry Volume I & II
19. Wagner, S.B., Zgainsky, Plant drug Analysis
20. Wallis, Textbook of Pharmacognosy,

### **P474 Pharmacognosy and Ayurvedic Pharmacy (Practicals)**

**(3hrs/Week)**

1. Study of morphology and microscopical characteristics of following:  
Senna, digitalis, cascara, liquorice, cinchona, rauwolfia, kurchi, ephedra, Nux Vomica, Ashwagandha \*\*
2. General Chemicals tests for Alkaloids, Glycosides, Steroids, flavonoids, tannins<sup>8</sup>
3. Extraction of total alkaloids and Qualitative chemical tests by different alkaloidal reagents. (Any One)\*\*
4. TLC Profile of extract obtained in 3\*\*
5. Identification of crude drugs on basis of gross organoleptic characters of glycoside and alkaloidal drugs Mentioned in theory.\* ex: shatavari, kantakari, punarnava, Gokharu, Tulsi, Gulvel, Kalijiri.
6. Extraction and estimation of caffeine from tea leaves/ powder.

\* Minor and \*\* Major experiment

Examination Pattern is as follows

Sr. No.	Types of Question	Sessional	University
	Duration	3 Hrs	4 Hrs
1	Synopsis	5	10
2	Viva Voce	5	10
3	Exp. Major	-	30
	Minor	10	20
4	Journal Marks	10	-
	Total Marks	30	70

#### **Books Recommended**

1. Ayurvedic Pharmacopoeia of India, All Volumes.

2. Herbal Pharmacopoeia, IDMA, Mumbai
3. Herbal Product Volume I & II, NISCAIR, New Delhi
4. Horborn J. B. Phytochemical methods, Chapman and Hall, International Edition, London
5. Kokate C. K. Practical Pharmacognosy, Vallabh Prakashan, Delhi
6. Kokate C. K. Purohit A. P. and Gokhale S. B. , Pharmacognosy (degree ) Nirali Prakashan
7. Modern Methods Of Plant Analysis, 1-4, Narosa Publishing House, N.Delhi
8. Pharmacopoeia Of India, 1985,1996, Govt. Of India, Ministry Of Health And Family Welfare
9. Pulok Mukharji, Quality Control Of Herbal Drugs
10. Resonthaler, L. The Chemical Investigation Of Plants, G.Bell And Sons Limited, London
11. Ross, M.S.F. And Brain, K.R., An Introduction To Phytopharmacy, Pitman Medical Rent
12. Stahl, E., Thin Layer Chromatography- A Laboratory Handbook, Springer-Verlag, Berlin
13. Trease, G.E. And Evans, W.C. Pharmacognosy, 12th Edition, Bailliere Tindall, Eastbourne, U.K.
14. Tyler, V.E., Brady, R., Pharmacognosy
15. V.D.Rangari, Pharmacognosy And Phytochemistry Volume I & II
16. Wallis, T.E. Textbook Of Pharmacognosy, J.A. Churchill Limited, London
17. Quality Control Of Crude Drug B ICAR, New Delhi.
18. Quality Control Of Crude Drug By WHO
19. Wagner, Plant Drug analysis.

### T475 PHARMACEUTICAL ANALYSIS –V (Theory)

3hours/week

Sr.no.	Topic	Hours
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<b>Section –I</b>		
<b>1</b>	<b>X- ray diffraction</b> Laue photographic method , Bragg's X-ray spectrophotometry, Rotating crystal methods , Powder method	<b>05</b>
<b>2</b>	<b>NMR spectroscopy:</b> - Introduction to NMR, basic principles involved, instrumentation, chemical shift, Factors affecting Chemical shift spin-spin coupling, applications, quantitative analysis.	<b>06</b>
<b>3</b>	<b>Mass spectroscopy:-</b> Principles & theory, instrumentation, application of mass spectroscopy. Mass spectroscopy-mass spectroscopy (MS-MS).	<b>06</b>
<b>4</b>	Literature collection, data handling & expression of analytical results, documentation & record keeping	<b>04</b>
<b>Section II</b>		
<b>5</b>	<b>Quality Assurance:</b> <b>Statistics &amp; statistical quality control:-</b> Statistics in Q.C., definition of terms, normal distribution, <i>t</i> -test, <i>f</i> -test, linear regression, correlation coefficient. Methods of statistical analysis as applied to sampling & interpretation of results, regression lines, sampling procedures.	<b>04</b>
<b>6</b>	GMP, CGMP, GLP, TQM, Quality review and quality documentation.	<b>05</b>
<b>7</b>	Introdocution to various agencies imparting Quality standards, ISO 9000, WHO etc.	<b>05</b>
<b>8</b>	Regulatory control, regulatory drug analysis and interpretation of analytical data.	<b>05</b>
<b>9</b>	Validation, quality audit: quality of equipments, validation of equipments and validation of analytical procedure. ICH guidelines. ( Need in particular)	<b>05</b>
<b>Total Hrs.</b>		<b>45</b>

**Books Recommended:**

1. IP, USP,BP, European Pharmacopoeia, International pharmacopoeia
2. Principles of instrumental analysis- Skoog
3. Vogel textbook of quantitative chemical analysis
4. Instrumental methods of analysis- Willard, Dean
5. Instrumental methods of analysis-Ewing.
6. Chromatography- Haftmann.
7. Chromatography-Browning
8. Calculation of analytical chemistry- Hamilton, simpson and ellis
9. Quality assurance Guide- OPPI
10. Quality control handbook-Juran
11. Practical pharmaceutical chemistry, part- II by Beckett and Stenlake
12. ICH Web site

**T476 Forensic Pharmacy (Theory)**  
(3hr/week)

Sr. no.	Topics	Hours
<b>Section –I</b>		
1	Pharmaceutical Legislation in India : A brief review	02
2.	<b>Pharmacy Act – 1948</b> <ul style="list-style-type: none"> <li>▪ Pharmacy council of India : constitution, functions and power ,</li> <li>▪ Education regulation ;</li> <li>▪ The central register of pharmacist ; Registration in central register</li> </ul>	05
3	<b>Drug and Cosmetics Act ,1940 and Rules In 1945</b> <ul style="list-style-type: none"> <li>▪ Definition</li> <li>▪ Drugs Technical Advisory board , Drug consultative committee central drug laboratory – composition and functions</li> <li>▪ Import of Drugs and cosmetics</li> <li>▪ Manufacturing, sales and distribution of drugs and cosmetics</li> <li>▪ Prohibition relating to Ayurvedic , Siddha and Unani drugs</li> </ul>	11
4	<b>Drug and magic remedies act 1954</b> Definition , official duties and penalties	05
<b>Section-II</b>		
5	<b>Narcotic and Psychotropic Substance Act 1985</b> Historical background of opium act and dangerous drug act. Prohibition and penalties <i>under NDPS Act 1985</i>	<b>05</b>
6	<b>Prevention of Food Adulteration Act 1954 And Rules 1955</b> <ul style="list-style-type: none"> <li>▪ Definition</li> <li>▪ Central board of food standard</li> <li>▪ Central food laboratory</li> <li>▪ Composition and functions</li> <li>▪ Public analyst –qualification duties</li> <li>▪ Food inspector –qualification ,powers , duties ,sampling</li> </ul>	<b>05</b>



	procedures	
7	<b>Medicinal and Toilet Preparation ( Excise Duties ) Act 1955 , and Rules 1956</b> Definition ;Bonded Manufactory ; Non-bonded manufactory	<b>04</b>
8	<b>The Industries ( Development And Regulations) Act,1952</b> Aim and salient features of act	<b>02</b>
9	<b>Drug Price control Order 1995</b> Historical background ; essential commodities act ; relevant provisions ;; applicability to imported drugs and indigenously manufactured drugs; definition; prizes to Wholesale and retailer , Maximum allowable post manufacturing expenses MAP, Penal provision <u>Calculation of Retail price</u>	<b>03</b>
10	<b>Consumer Protection Act ,1986</b> Definition; Consumer protection councils ; Consumer disputes redressal agencies	<b>03</b>
<b>Total Hrs-</b>		<b>45</b>

#### Books Recommended:

- 1 Drugs and Cosmetic Act and rules, 3<sup>rd</sup> Edition, by S.W. Deshpande and Nilesh Gandhi, Sumit Publishers, Mumabai,2004
- 2 Drugs and Cosmetic Act, 1940 by Vijay malik, Eastern Book Company, Lucknow, 2002
- 3 Text Book of Forensic Pharmacy by C.K. Kokate and S.B. Gokhale, Pharma Book Syndicate, 2006
- 4 Forensic Pharmacy, 4<sup>th</sup> Edition, by B. S. Kuchekar, A.M. Khadatare and S.C. Itkar, Nirali Prakashan, Pune,2004
- 5 Hand Book of Drug Laws, 10<sup>th</sup> Edition by M.L. Mehra, Universal Law Publishing Company, Delhi, 2005

**T481 Biopharmaceutics and Pharmacokinetics (Theory)**  
(3 hrs/week)

**Section- I**

Sr.No	TOPICS	Hrs
1.	<b>Introduction to Biopharmaceutics and Pharmacokinetics and their role in formulation development and clinical setting.</b>	02
2.	<b>Absorption of drug:</b> Gastrointestinal absorption of drugs, Structure and Physiology of cell membrane, Mechanism of drug absorption, Factors affecting drug absorption (Pharmaceutical and patient related), Theories of drug dissolution, Factors affecting drug dissolution and dissolution rate, pH -Partition hypothesis, Absorption of drug from extra vascular routes.	08
3.	<b>Bioavailability and Bioequivalence:</b> Objectives, measurement of bioavailability, In vitro drug dissolution testing models, In vitro- In vivo correlation, Bioequivalence studies, methods of enhancement of bioavailability.	04
4.	<b>Distribution:</b> - Physicochemical properties of drug, organ/tissue size, blood flow to the organ, physiological barriers to the diffusion of drugs, drug binding in blood and tissue, Apparent volume of distribution.	06
5.	<b>Elimination :-</b> Renal excretion, Renal blood flow, Renal clearance, Hepatic elimination of drug, organ clearance concept, Hepatic clearance, hepatic extraction ratio, Drug metabolism, phase I and Phase II reaction , Effect of enzyme induction, enzyme inhibition, first pass effect, Biliary excretion, Enterohepatic circulation, Extrahepatic metabolism and minor pathways of drug excretion.	05

**Section – II**

Sr.No.	TOPICS	Hrs.
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6.	<b>Concepts of compartment models:-</b> Pharmacokinetic basic consideration, Pharmacokinetic of one compartment model drug, mathematical treatment to pharmacokinetic upon I.V.bolus dosing, I.V.infusion.Urinary excretion data, Multicompartment model behavior (excluding derivation or mathematical treatment), Central & peripheral compartments, distribution phase & pseudo distribution equilibrium phase.Plasma concentration & therapeutic response. An introduction to pharmacodynamics.	<b>12</b>
7.	<b>Non- linear pharmacokinetic: -</b> Non-linearities in absorption & elimination. Examples of drug showing non- linear absorption or elimination's, individualization of dosage regimens & non- linear pharmacokinetics.	<b>03</b>
8.	<b>Dosage regimens :-</b> Factors affecting dosage regimens, utility curve & therapeutic window, multiple dose pharmacokinetics, Fluctuation, accumulation index, steady state concept, time to reach steady state, loading dose, maintenance dose, drugs requiring individualization of dosage regimens - a discussion.	<b>05</b>

**Total Hrs: - 45**

**Books Recommended:**

1. Leon Shargel, Applied Biopharmaceutics and Pharmacokinetics - McGraw Hill
2. V.Venkateshwarlu, Biopharmaceutics and pharmacokinetics- Pharma Book Syndicate
3. Gibaldi M, Biopharmaceutics and clinical pharmacokinetics-. Pharma Book Syndicate
4. Rowland M. & Tozer, Clinical pharmacokinetics: Concept and application- B.I. Waverly Pvt. Ltd.
5. Notari R.E., Biopharmaceutics and clinical pharamacokinetics- Marcel Dekker, Inc.
6. S.B.Jaiswal & D.M.Brahmankar, Biopharmaceutics & Pharmacokinetics A Treatise–Vallabh Pub.Delhi

**P481 Biopharmaceutics and Pharmacokinetics. (Practical)**  
**(3hrs/Week)**

- 1) Determination of disintegration time of Tablet\*
- 2) Dissolution Studies: Ointment\* Marketed enteric coated Tablet\*
- 3) To study the effect of enzymes / surfactant on dissolution of Tablet\*\*
- 4) To study the effect of pH on dissolution of Tablet. \*\*
- 5) In vitro diffusion study of drugs through one biological and two synthetic Membrane\*\*.
- 6) Equilibrium dialysis method- demonstration of protein binding
- 7) Equilibrium dialysis method- demonstration of drug-drug interaction at protein bind sites.

Major Expt. \*\*

Minor Expt. \*

**Books Recommended:**

1. Leon Shargel, Applied Biopharmaceutics and Pharmacokinetics - McGraw Hill
2. V.Venkateshwarlu, Biopharmaceutics and pharmacokinetics- Pharma Book Syndicate
3. Gibaldi M ,Biopharmaceutics and clinical pharmacokinetics-. Pharma Book Syndicate
4. Rowland M. & Tozer , Clinical pharmacokinetics: Concept and application- B.I. Waverly Pvt. Ltd.
5. Notari R.E., Biopharmaceutics and clinical pharamacokinetics- Marcel Dekker, Inc.
6. S.B. Jaiswal and D.M.Brahmankar, Biopharmaceutics and Pharmacokinetics A Treatise – Vallabh Publication Delhi..

Examination Pattern is as follows

Sr. No.	Types of Question	Sessional	University
	Duration	3 Hrs	4 Hrs
1	Synopsis	5	10
2	Viva Voce	5	10
3	Exp. Major	-	30
	Minor	10	20
4	Journal Marks	10	-
	Total Marks	30	70



**T482 Pharmaceutical Medicinal chemistry –IV(Theory)**

**(3hrs /week)**

**The following topics should be covered with the points listed below**

1. Introduction
2. Classification
3. Mechanism of action
4. Structure-activity relationship
5. Pharmacokinetics (Metabolism) and
6. Therapeutic use
7. Synthesis of drugs official in IP (Listed in respective classes)

<b>Section I</b>		
<b>Sr.No.</b>	<b>Topic</b>	<b>Hour</b>
<b>1</b>	<i>Quantitative approaches to structure–activity Relationships</i> Introduction, Descriptors: Biological and physicochemical descriptors; Topliss tree and Craig plot, Determining relationships between chemical and biological data (QSAR methods): The Hansch approach, Free-Wilson analysis and related methods, Partial least squares (PLS), Linear discriminant analysis (LDA) Principal component analysis (PCA), Cluster analysis. Introduction to CADD	<b>05</b>
<b>2</b>	<b>Designing Prodrugs And Bioprecursors</b> General Introduction, The Carrier-Prodrug Principle, The Bioprecursor-Prodrug Principle, Practical Applications of Prodrug Design, Carrier Prodrugs: Improvement of the bioavailability and the biomembrane passage, Site-specific delivery, Prolonged duration of action, Use of Cascade Prodrugs and Soft Drugs Bioprecursor Prodrugs: Oxidative Bioactivations, Reductive Bioactivations, Mixed Bioactivation Mechanisms.	<b>05</b>
<b>3</b>	<b>Steroids</b> Spironolactone, Triamcinolone, Prednisone, Diethylstilbesterol, Chlortriancine, Ethinyl estradiol	<b>12</b>
<b>Section-II</b>		
<b>4</b>	<b>Analgesics, Antipyretics and Anti-inflammatory agents:</b> Paracetamol, Aspirin, Indomethacin, Ibuprofen, Diclofenac sodium, Mefenamic acid, Phenylbutazone. <b>Narcotic Analgesic Agents:</b> Methadone, Meperidine, Pentazocine, Pethidine	<b>08</b>
<b>5</b>	<b>Antihistaminics, Antiemetics and antiulcer drugs</b> Chlorpheniramine maleate, Diphenhydramine hydrochloride, Cyclizine hydrochloride, Cyproheptadine hydrochloride, Ranitidine hydrochloride, Omeprazole	<b>06</b>
<b>6</b>	<b>Thyroid Function and Thyroid Drugs</b> Thyroid Hormone, Methimazole, Propyl Thiouracil, Thyroid	<b>04</b>

	Analogs.	
7	<b>Oral Hypoglycemics</b> Tolbutamide, Chlorpropamide, Metformin, Glibenclamide	<b>05</b>

**Total Hrs-45**

### Books Recommended

1. Principles of Medicinal Chemistry, Foye, Lemke and Williams, Indian Ed. B. I. Waverly, Pvt. Ltd. New Delhi 1995.
2. Wilson and Gisvold, Textbook of Organic Medicinal and Pharmaceutical Chemistry, J. N. Delgado, W.A. Remers, Lipincott- Raven 10th Ed., 1998.
3. Essentials of Medicinal Chemistry by Koralkovas, 2nd edition, Wiley- Interscience Pub. 1988.
4. The Organic Chemistry of Drug Synthesis: Daniel Lednicer, John Wiley and Sons. Inc. Vol 1-6.
5. Profiles in Drug Synthesis: V.N. Gogte
6. Burger's Medicinal Chemistry and Drug Discovery (Vol. 1-5) Wiley Interscience Publication.
7. Textbook of Pharmaceutical Chemistry by Harkishansing & Kapoor.
8. Principle of Medicinal Chemistry (Volume I & II) by Kadam, Mahadik and Bothara
9. Text Book of Practical Organic Chemistry - A.I. Vogel

### P482 Pharmaceutical Medicinal chemistry –IV (Practical)

(3 hours/week)

Sr.No.	Synthesis (conventional/microwave) and Characterization(M.P/B.P/TLC)
1	Hydantoin a.Synthesis of benzil from benzoin* b.Synthesis hydantoin from benzyl*
2	Reaction involving the following operation – Oxidation, Reduction*
3	Preparation of Iso-Nicotinic acid (oxidation of picoline with potassium permanganate)*
4	Cyclization reactions: 2-Phenylindole**
5	Benzophenone** (Friedal craft acylation)
6	Acetoacetanilide*
7	1, 2, 4-triazole**
8	Anthraquinone (oxidation of anthracene with chromium oxide)*
9	Determination of partition coefficient, dissociation constant, molar refractivity of compound from QSAR analysis (DEMONSTRATION)

**Minimum Twelve number of Experiments should be performed**

**\*Minor \*\*Major Experiments**

### Recommended books

- 1) Textbook of Practical Organic Chemistry - A.I. Vogel; ELBS
- 2) Practical Organic Chemistry - Mann and Saunders
- 3) Organic Synthesis Special techniques V. K. Ahluwalia, Renu Aggrawal, Nerosa Publishing House, p no. 90 - 114

Examination Pattern is as follows

Sr. No.	Types of Question	Sessional	University
	Duration	3 Hrs	4 Hrs
1	Synopsis	5	10
2	Viva Voce	5	10
3	Exp. Major	-	30
	Minor	10	20
4	Journal Marks	10	-
	Total Marks	30	70



**T483 Clinical Pharmacology and Pharmacy (Theory)**

<b>Sr. No.</b>	<b>Topics</b>	<b>No of Hrs</b>
	<b>Section-I</b>	
1.	<b>Toxicology</b> a) Acute, Sub acute and Chronic toxicity b) Poison, Types and Classification and General treatment of Poisoning, c) Signs, Symptoms and treatment of acute and chronic poisoning due to i) Barbiturates   ii) Alcohol   iii)Morphine iv) Insecticides   vi) Snake bites   vii) Heavy metals ( Lead, Arsenic, Mercury) d) Drug and Poison information center	02 02 08  01
2.	Drug interactions, Role of Pharmacist in minimizing Drug interactions	07
3.	Drug induced diseases	04
	<b>Section-II</b>	
4.	Therapeutic Drug Monitoring	03
5.	Adverse Drug Reaction Monitoring	03
6.	Ambulatory Patient Care, Institutional Patient Care, Role of pharmacist in long term care	01
7.	Medication Errors & Role of Pharmacist in safe use of medicines, Use of medicines in	02

**(3hrs/Week)**

	pregnancy.	
8	Drug Utilization Evaluation -Introduction, Utilization, Evaluation	04
9.	Essential Drug Use & Rational Drug Use	04
10.	Pharmacoeconomics	02
11.	Pharmacoepidemiology	02

**Total Hrs-45**

**Books Recommended:**

1. Bennett P.N, Brown M.J. Clinical Pharmacology Churchill living stone New Delhi 2003 9<sup>th</sup> edition
2. Melmon & Morrelli's Clinical Pharmacology. Mc-Graw Hill. New Delhi 2000 4<sup>th</sup> edition
3. Craig C.R, Stitzel R.E. Modern Pharmacology with Clinical application, Lippincott Williams & Wilkins, New York 2004 6<sup>th</sup> edition
4. Raymond J.M. Niesink, John de vries. Hollinger M.A. Toxicology- Principle and applications, CRC, Florida
5. Klaassen C.D, Casarett & Doull's. Toxicology. The basic science of poison Mc-Graw Hill, New Delhi 6<sup>th</sup> ed
6. Remington's Pharmaceutical Science and practice pharmacy .Lippincott Williams and Wilkins, New Delhi 2004, 20<sup>th</sup> edition
7. Katzung B.G. Basic & Clinical Pharmacology. Mc-Graw Hill, New Delhi 2001 8<sup>th</sup> edition
8. Clinical pharmacy practice - C. W. Blissit
9. Therapeutic drug monitoring - B. Widdop
10. TDM & Clinical biochemistry – Mike Hallworth
11. Textbook of therapeutics, Drug & disease management - 7<sup>th</sup> edition - Eric T. Herfindel, Dick. R. Gourley
12. Recent developments in TDM & Clinical toxicology – I. Sunshine - Marcel – Dekker 1992
13. Handbook of TDM. – Simkin
14. Parrtharhi G, Hansen Kavin Nytor & Nahata Milap C. A Textbook of Clinical Practice: Essential Concepts & skills, Orient Longman.
15. Roger walker, Clive Edwards, Clinical Pharmacy & therapeutics, 3<sup>rd</sup> International Edition, Churchill Livingstone.
16. Dr. Tipnis H. P, Dr. Bajaj Amrita, Clinical Pharmacy, Career Publication.

**P483 Clinical Pharmacology and Pharmacy (Practical)  
(3hrs/Week)**

- 1) Paracetamol/ Carbon tetra Chloride induced hepatotoxicity in rats-Changes in markers like SGOT, SGPT, and Bilirubin, LDH etc. \*\*.
- 2) Determination and interpretation of biochemical Data by Urine analysis. \*\*.
  - a) Urine microscopy.
  - b) Determination of normal constituent.
  - c) Determination of Abnormal constituent like albumin, blood, ketone bodies, uric acid, casts, microorganisms.
- 3) Comment on the given prescriptions with reference to case report mentioning possible therapeutic uses, and contraindications, with dose, route of administration, justification of inclusion of each ingredient, and possible Drug interactions. ( **At least one case of important diseases should be discussed on basis of available evidences from literature and if possible from Hospitals.** ) \*.
- 4) Patient Counseling-Interview techniques and advice on some theoretical conditions. \*..
- 5) ADR reporting according to the Blue letter of AADRC, Australia, Yellow form of CSM, UK.  
ADR reporting form developed by KEM, Mumbai. \*.
- 6) Calculating Cost of prescription. \*.
- 7) Histological studies in biopsies.(Human permanent slide) \*.
- 9) Preparation of information material for educating patients about drug usage. \*.

Sr. No.	Types of Question	Sessional	University
	Duration	3 Hrs	4 Hrs
1	Synopsis	5	10
2	Viva Voce	5	10
3	Exp. Major	-	30
	Minor	10	10+10
4	Journal Marks	10	-
	Total Marks	30	70

**Books Recommended:**

- 1) Bennett P.N, Brown M.J. Clinical Pharmacology Churchill living stone New Delhi 2003 9<sup>th</sup> edition
- 2) Melmon & Morrelli's Clinical Pharmacology. Mc-Graw Hill. New Delhi 2000 4<sup>th</sup> edition

- 3) Craig C.R, Stitzel R.E. Modern Pharmacology with Clinical application, Lippincott Williams & Wilkins, New York 2004 6<sup>th</sup> edition
- 4) Raymond J.M. Niesink, John de vries. Hollinger M.A. Toxicology- Principle and applications, CRC, Florida 96
- 5) Klaassen C.D, Casarett & Doull's. Toxicology. The basic science of poison Mc-Graw Hill, New Delhi 6<sup>th</sup> ed.
- 6) Remington's Pharmaceutical Science and practice pharmacy .Lippincott Williams and Wilkins, New Delhi 2004, 20<sup>th</sup> edition
- 7) Katzung B.G. Basic & Clinical Pharmacology. Mc-Graw Hill, New Delhi 2001 8<sup>th</sup> edition
- 8) Clinical pharmacy practice - C. W. Blissit
- 9) Therapeutic drug monitoring - B. Widdop
- 10) TDM & Clinical biochemistry – Mike Hallworth
- 11) Textbook of therapeutics, Drug & disease management - 7th edition - Eric T. Herfindel, Dick. R. Gourley
- 12) Recent developments in TDM & Clinical toxicology – I. Sunshine - Marcel – Dekker 1992
- 13) Handbook of TDM. – Simkin

**T484 Industrial Pharmacognosy (Theory)**  
**(3hrs/Week)**  
**Section I**

Sr.No.	Topic	Hrs.
1.	Importance and status herbal medicines.	2
2.	Brief account of plant based industry and institutions involved in work in medicinal and aromatic plants in India	2
3.	<b>Phytopharmaceuticals</b> Industrial methods of isolation and utilization of the following Phytopharmaceuticals: Quinine, Cardiac glycosides, Sennosides, Diosgenin, Glycyrrhizin, Andrographolides, Rutin, Guggul lipids.	10
4.	<b>Ayurvedic Pharmacy:</b> Basic principles involved in the preparation and standardization of formulation in Ayurveda like Arista's, Asava, Ghutika, Taila, Churna, Leha and Bhasma.	6
5.	Chemotaxonomy – introduction, merits& demerits and application with examples.	4

**Section II**

6.	<b>Herbal Cosmetics:</b> Brief study of Phytocosmetics of industrial significance and current status. Herbs used for different cosmetic preparations like Shampoos, Conditioners, Hair Darkeners and Skin Care. Study of following herbs used in different cosmetics formulations-- Soapnut, Amla, Henna, Hibiscus, Tea, Aloe vera, Glycyrrhiza, Turmeric, Sandalwood and others involved in the suitable formulation. Basic evaluation parameter for skin care and shampoos.	8
7.	<b>Herbal drug standardisation</b> Importance of standardization of raw material, extracts (Physical, chemical, spectral analysis) and formulations with examples. WHO guidelines for the assessment of Crude Drugs, Extracts and medicines. Study of different methods used for the standardization of Crude drugs with special reference to newer industrial methods with suitable examples. (HPTLC, HPLC) Study of method used to detect and estimate the amount of heavy metals in Herbal preparations.	10
8.	Regulatory requirements for herbal industry; Infrastructure, Quality Control and WHO Guidelines. Patenting of Natural Products.	4

Total Hrs-45

**Books Recommended**

1. Ayurvedic Pharmacopoeia of India, All Volumes.
2. Ayurvedic Formulary of India, Govt. of India, New Delhi
3. B.P./I.P.
4. Herbal Pharmacopoeia, IDMA, Mumbai
5. Herbal Product Volume I & II, NISCAIR, New Delhi
6. Horborn J. B. Phytochemical methods, Chapman and Hall, International Edition, London
7. Kokate C. K. Purohit A. P. and Gokhale S. B. , Pharmacognosy (degree ) Nirali Prakashan
8. Medicinal Plants of India, Indian Council of Medical Research, New Delhi
9. Peach K, And Tracey M. V., Modern Methods Of Plant Analysis, 1-4, Narosa Publishing House, N.Delhi
10. Pharmacopoeial Standards Of Ayurvedic Formulations
11. Pulok Mukharji, Quality Control Of Herbal Drugs
12. Swain T., Comparative Phytochemistry, Academic Press London
13. Trease, G.E. And Evans, W.C. Pharmacognosy, 12th Edition, Bailliere Tindall, Eastbourne, U.K.
14. Tyler, V.E., Brady, R., Pharmacognosy
15. V.D.Rangari, Pharmacognosy And Phytochemistry Volume I & II
16. Wallis, T.E. Textbook Of Pharmacognosy, J.A. Churchill Limited, London
17. Robert Verpoorte & Pulok Mukherjee, GMP For Botanicals, Business Horizons, New Delhi.
18. Quality Control Of Crude Drug B ICAR, New Delhi.

19. Quality Control Of Crude Drug By WHO
20. Balsam M S Cosmetics: Science And Technology All Vol New York: John Wiley And Sons, 1972.
21. Paye Marc, Handbook Of Cosmetics And Technology. New York: Taylor And Francis, 2006
22. Rieger Martin M Harry's Cosmeticology. New York: Chemical Publishing Co. Inc., 2000.
23. Thomssen E G Modern Cosmetics. Bombay: Universal Publishing Corporation, 2006.
24. Poucher W A Perfumes, Cosmetics and Soap Vol - 2.London: Chapman Hall, 1993
25. Gibbs R Darnely, Chemotaxonomy of Flowering Plants 4 volumes, McGill, University Press
26. Swain T., Chemical Plant Taxonomy, Academic Press London
27. Ross, M.S.F. and Brain, K.R., An Introduction to Phytopharmacy, Pitman Medical Rent

**P 484 Industrial Pharmacognosy (Practical)**  
(3hrs/Week)

- 1) Extraction\*\* & TLC study of Diosgenin. \*
- 2) Extraction\*\* and estimation\* of cardiac glycoside.
- 3) Standardization of marketed Ayurvedic formulations (Asava, arishta etc.)\*
- 4) Preparation of herbal cosmetics\*\* (any one from Skin care and shampoo)
- 5) HPTLC/HPLC Profile of few Drugs of Natural Origin\*\*
- 6) Standardization of crude drug and its extract (Andrographis OR Gokharu) \* &\*\*
- 7) Determination of heavy metals from herbal crude drugs (demonstration).

\* Minor and \*\* Major experiment

Sr. No.	Types of Question	Sessional	University
	Duration	3 Hrs	4 Hrs
1	Synopsis	5	10
2	Viva Voce	5	10
3	Exp. Major	-	30
	Minor	10	10+10
4	Journal Marks	10	-
	Total Marks	30	70

**Books Recommended**

1. Ayurvedic Formulary of India, Govt. of India, New Delhi
2. B.P./I.P.
3. Herbal Pharmacopoeia, IDMA, Mumbai

4. Herbal Product Volume I & II, NISCAIR, New Delhi
5. Horborn J. B. Phytochemical methods, Chapman and Hall, International Edition, London
6. Kokate C. K. Practical Pharmacognosy, Vallabh Prakashan, Delhi
7. Kokate C. K. Purohit A. P. and Gokhale S. B. , Pharmacognosy (degree ) Nirali Prakashan
8. Medicinal Plants of India, Indian Council of Medical Research, New Delhi
9. Peach K, and Tracey M. V., Modern methods of plant analysis, 1-4, Narosa Publishing house, New Delhi
10. Pharmacopoeial standards of Ayurvedic Formulations
11. Pulok Mukharji, Quality control of Herbal drugs
12. Stahl, E., Thin Layer Chromatography- A Laboratory handbook, Springer-Verlag, Berlin
13. Trease, G.E. and Evans, W.C. Pharmacognosy, 12th Edition, Bailliere Tindall, Eastbourne, U.K.
14. Tyler, V.E., Brady, R., Pharmacognosy
15. V.D.Rangari, Pharmacognosy and Phytochemistry Volume I & II
16. Quality control of crude drug b ICAR, New Delhi
17. Quality control of crude drug by WHO
18. Balsam m s cosmetics: science and technology all vol new yorkJohn wiley and sons, 1972
19. Wagner,plant Drug analysis

**T485. Pharmacology IV- (Theory)**  
(3hrs/Week)

Sr.No.	Topic	No of Hrs
	<b>Section-I</b>	
1.	<b>Chemotherapy</b> a) Introduction- Molecular basis of Chemotherapy, Resistance b) Sulfonamides and Co –trimoxazole c) Penicillins and Cephalosporins d) Tetracycline and Chloramphenicol e) Macrolides, Amino glycosides, Polyenes and Polypeptide antibiotics f) Quinolones and Fluoroquinolones g) Chemotherapy of Tuberculosis and Leprosy h) Antifungal antibiotics	04 03 04 03 03 03 03 02
	<b>Section-II</b>	
	<b>Chemotherapy- Continued</b> i) Antiviral agents and Treatment of AIDS j) Chemotherapy of Protozoal infections- Malaria k) Chemotherapy of remaining Protozoal infections - amoebiasis, giardiasis etc. l) Pharmacology of Anthelmintic drug m) Chemotherapy of Cancer (Neoplasms)	03 02 03 02 04
2.	<b>Immunopharmacology</b> Pharmacology of immunosuppressants and stimulants	03
3.	Antiseptics, Disinfectants	01
4.	Gene therapy	02

**Total Hrs-45**

**Books Recommended**

- 1) Satoskar R.S, Bhandarkar S.D, Rage N.N. Pharmacology and Pharmcotherapeutics. Popular Prakashan Mumbai 19<sup>th</sup> edition.
- 2) Barar F.S.K. Essentials of Pharmacotherapeutics, S.Chand & Company Ltd. New Delhi
- 1) Tripathi K.D. Essentials of medical Pharmacology ,Jaypee New Delhi 2004 5<sup>th</sup> edition
- 2) Rang H.P., Dale M.M. *et.al.* Pharmacology. Churchill Livingstone, New Delhi 2005 5<sup>th</sup> edition
- 3) Katzung B.G .Basic & Clinical Pharmacology Mc-graw Hill, New Delhi 2001. 8<sup>th</sup> edition.
- 4) Lewis's Pharmacology. Churchill Livingstone London, 1980 5<sup>th</sup> edition
- 5) Goodman Gilman, The pharmacological basis of therapeutics. Mc-graw Hill New Delhi 2001 10<sup>th</sup> edition
- 6) Seth S.D. Textbook of Pharmacology Elsevier, New Delhi 2004 2<sup>nd</sup> Edition
- 7) Harvey R.A., Champe P.C. Lippincott's Illustrated Reviews-Pharmacology. Lippincott Williams & Wilkins, Pennsylvania. 2000 2<sup>nd</sup> edition.
- 8) Grahame-Smith D.G. & Aronson J.K. Oxford textbook of clinical Pharmacology and drug therapy. Oxford University press London. 2002 3<sup>rd</sup> edition
- 9) Foster R.W. Basic Pharmacology, Arnold ,New Delhi 2001 ,4<sup>th</sup> edition
- 10) Stahl S.M. Essential Psychopharmacology Cambridge University Press New Delhi 2003 2<sup>nd</sup> edition
- 11) Dipiro J.L. Pharmacotherapy Handbook. Tata McGraw Hill New Delhi.2004 5<sup>th</sup> edition.
- 12) Official books - Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia



**T486 Pharmaceutical Management and Drug Regulatory Affairs (Theory)**

**3 hrs / week**

Sr.no.	Topic	Hours
Section -I		
1	<b>Introduction to Management</b> Types of management Basic concepts of management Management process , function and principles Levels of management Pharmaceutical Management –Art , science or profession Social responsibilities of management Functions of management	04
2	<b>Planning , and Forecasting</b> Planning Nature ,process and types of planning Steps in planning process Planning premises Advantages and limitations of planning Management by Objective Meaning ,objective ,features , advantages and limitations Forecasting Meaning , nature importance limitations Techniques of forecasting	06
3	<b>Organization</b> Definition , nature , Theories , functions Line and staff organization concepts	04
4	<b>Communication</b> Nature, Types of communication Process, channels and barriers of communication Importance in pharmaceutical industries Limitations of communications	04
5	Marketing research , New product selection , product management , advertising	04
Section –II		
6	<b>Leadership and Motivation</b> Leadership Meaning, nature , leadership styles , theories of leadership Motivation Meaning, nature , importance , theories of motivation	05
7	<b>Human Resource and Development (HRD)</b> Definition , HRD methods , HRD process , HRD in Indian industry	03
8	<b>GATT(( General Agreement on Tariff and Trade) and its impact on pharmaceutical industry:</b> GATT History of GATT, Its impact on pharmaceutical industry, Pharmaceutical market in India	05
9	<b>World Trade Organization (WTO) and Trade Related Intellectual Property Rights (TRIPS)</b> Introduction to WTO Types of intellectual property rights: Industrial property and copy rights	05

	Indian Patent Acts, 1970 with amendment -2002 Definition , types of patents	
10	<b>Standard Institutions and Regulatory Authorities</b> Bureau of Indian standards (BIS) International Organization for Standardization (ISO). United States of Food and Drug Administration (USFDA) Central Drug Standard Control Organization (CDSCO) International Conference on Harmonization (ICH); World Health Organization (WHO)	05
	Total number of lectures	45

**Books Recommended:**

- 1) Management a Global Perspective by Heinz Weihrich and Harold Koontz; 10th edition; Mc Graw Hills, New Jersey 1994.
- 2) Management Theory and Practice by C.B. Gupta ; 9th edition ; Sultan Chand and Sons Educational publishers , New Delhi 2006.
- 3) What every one should know about patents? by N. Subbaram ; 2nd edition Pharma Book syndicate , Hyderabad 2003
- 4) Human Resource management A contemporary Perspective by Ian Beardwell , len Holden ,1st edition Mac Millan Indian Ltd New Delhi 2001
- 5) Forensic Pharmacy by B.S. Kuchekar et.al; Nirali Prakashan, Pune 4th edition 2004.