



Geethanjali

Phone : +91 9959390412  
Fax : +91-40-24220320  
Website : www.geethanjaliinstitutions.com

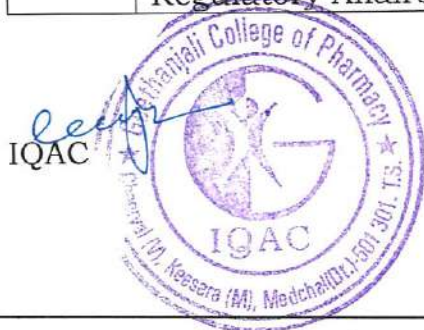
## Geethanjali College of Pharmacy

Approved By AICTE, PCI New Delhi, Permanently Affiliated to JNTUH & Accredited by NBA (B. Pharmacy)  
Recognized Under UGC Section 2F & 12B of UGC Act, 1956, by DSIR-SIRO & HI/BI of MSME Certified by ISO 9001:2015  
Cheeryal (V), Keesara (M), Medchal-Malkajgiri District, Telangana State - 501 301.

### INDEX

#### Syllabus Copies of B. Pharmacy, Pharm D, Pharm D (PB), and M. Pharmacy Programs for the Academic Year 2018-19

S.No.	Program	Year of Study	Academic Year	University Regulation followed for Syllabus
1.	B. Pharmacy	I Year	2018-19	R17
		II Year		R17
		III Year		R16
		IV Year		R15
2.	Pharm D	I Year	2018-19	R08
		II Year		R08
		III Year		R08
		IV Year		R08
		V Year		R08
		VI Year		R08
3.	Pharm D (PB)	I Year	2018-19	R08
		II Year		R08
		III Year		R08
4.	M. Pharmacy (Pharmaceutics)	I Year	2018-19	R17
		II Year		R17
5.	M. Pharmacy (Pharmaceutical Analysis)	I Year	2018-19	R17
		II Year		R17
6.	M. Pharmacy (Pharmaceutical Regulatory Affairs)	I Year	2018-19	R17
		II Year		R17



*Signature of Principal*  
PRINCIPAL

PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

Sponsored by : **TEJA EDUCATIONAL SOCIETY, HYDERABAD.**

Office : Sy. No. 33 & 34, Cheeryal (V), Keesara (M), Medchal-Malkajgiri (District), Telangana State - 501 301.

Mobile : 9866308259

[Type text]

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

### B. PHARMACY I YEAR COURSE STRUCTURE AND SYLLABUS

Effective from Academic Year 2017-18 Admitted Batch

#### I Year I semester

S. No	Course Code	Subject	L	T	P	Credits
1	PS101	Human Anatomy and Physiology I	3	1	-	3
2	PS102	Pharmaceutical Analysis I	3	1	-	3
3	PS103	Pharmaceutics I	3	1	-	3
4	PS104	Pharmaceutical Inorganic Chemistry-I	3	1	-	3
5	HS105	Communication skills	2	-	-	2
6	BS106/BS107	Remedial Biology <sup>#</sup> / Remedial Mathematics <sup>§</sup>	2 <sup>#</sup> /3 <sup>§</sup>	-	-	2 <sup>#</sup> /3 <sup>§</sup>
7	PS108	Human Anatomy and Physiology-I lab	-	-	4	2
8	PS109	Pharmaceutical Analysis-I lab	-	-	4	2
9	PS110	Pharmaceutics I lab	-	-	4	2
10	PS111	Pharmaceutical Inorganic Chemistry-I lab	-	-	4	2
11	HS112	Communication skills lab	-	-	2	1
12	BS113	Remedial Biology lab	-	-	2	1
<b>Total</b>			<b>16/17</b>	<b>4</b>	<b>20</b>	<b>26<sup>#</sup>/26<sup>§</sup></b>

<sup>#</sup>Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB) course.

<sup>§</sup>Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM) course.

#### I Year II semester

S. No	Course Code	Subject	L	T	P	Credits
1	PS201	Human Anatomy and Physiology II	3	1	-	3
2	PS202	Pharmaceutical Organic Chemistry I	4	1	-	4
3	BS203	Biochemistry	3	1	-	3
4	BS204	Pathophysiology	3	1	-	3
5	CS205	Computer Applications in Pharmacy	3	-	-	3
6	PS206	Human Anatomy and Physiology II lab	-	-	4	2
7	PS207	Pharmaceutical Organic Chemistry I lab	-	-	4	2
8	BS208	Biochemistry lab	-	-	4	2
9	CS209	Computer Applications in Pharmacy lab	-	-	2	1
10	*MC200	NSS	-	-	-	-
<b>Total</b>			<b>16</b>	<b>4</b>	<b>14</b>	<b>23</b>

\*MC - Mandatory Course - Satisfactory/ Unsatisfactory.

[Type text]

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

## PS101: HUMAN ANATOMY AND PHYSIOLOGY- I

B. Pharm. I Year I Sem

L T P C  
3 1 0 3

**Scope:** This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

**Course Objectives:** Upon completion of this course the student should be able to

- Explain the gross morphology, structure, and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and their imbalances.
- Identify the various tissues and organs of different systems of human body.
- Perform the various experiments related to special senses and nervous system.
- Appreciate coordinated working pattern of different organs of each system

### Unit – I 10 hours

#### Introduction to human body

Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

#### Cellular level of organization

Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine

#### Tissue level of organization

Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

### Unit – II 10 hours

**Integumentary system** Structure and functions of skin

#### Skeletal system

Divisions of skeletal system, types of bone, salient features, and functions of bones of axial and appendicular skeletal system

Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction

#### Joints

Structural and functional classification, types of joints movements and its articulation

### Unit – III 10 hours

#### Nervous system

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)

### Unit – IV 08 hours

#### Peripheral nervous system:

Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves.

#### Special senses

Structure and functions of eye, ear, nose and tongue and their disorders.

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. 501301.

[Type text]

**Unit – V 07 hours**

**Endocrine system**

Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.


**TEXTBOOKS: (Latest Editions)**

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, River view, MI USA
4. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

**REFERENCE BOOKS: (Latest Editions)**

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterje ,Academic Publishers Kolkata

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

## PS102: PHARMACEUTICAL ANALYSIS - I

B. Pharm. I Year I Sem

L T P C  
3 1 0 3

**Scope:** This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

**Course Objectives:** Upon completion of the course student shall be able to

- understand the principles of volumetric and electro chemical analysis
- carryout various volumetric and electrochemical titrations
- develop analytical skills

### UNIT- I 10 Hours

(a) **Pharmaceutical analysis-** Definition and scope

- i) Different techniques of analysis
- ii) Methods of expressing concentration
  - iii) Primary and secondary standards.
  - iv) Preparation and standardization of various molar and normal solutions-Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate

(b) **Errors:** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

### UNIT- II 10 Hours

**Acid base titration:** Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves

**Non aqueous titration:** Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

### UNIT- III 10 Hours

**Precipitation titrations:** Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.

**Complexometric titration:** Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.

**Gravimetry:** Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.

### UNIT - IV 08 Hours

**Redox titrations:**

(a) Concepts of oxidation and reduction

(b) Types of redox titrations (Principles and applications)

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

### UNIT - V 7 Hours

**Electrochemical methods of analysis:**

**Conductometry** - Introduction, Conductivity cell, Conductometric titrations, applications.

**Potentiometry** - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.

**Polarography** - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications

[Type text]

*Sanjiv K*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeraj(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

**TEXTBOOKS: (Latest Editions)**

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. GunduRao, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

*Geethanjali*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

[Type text]

## PS103: PHARMACEUTICS - I

B. Pharm. I Year I Sem

L T P C  
3 1 0 3

**Scope:** This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

**Course Objectives:** Upon completion of this course the student should be able to:

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage forms

### UNIT – I 10 Hours

**Historical background and development of profession of pharmacy:** History of profession of Pharmacy in India in relation to pharmacy education, industry, and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.

**Dosage forms:** Introduction to dosage forms, classification and definitions

**Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription.

**Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

### UNIT – II 10 Hours

**Pharmaceutical calculations:** Weights and measures—Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.

**Powders:** Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

**Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

### UNIT – III 08 Hours

**Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.

**Biphasic liquids:**

**Suspensions:** Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.

**Emulsions:** Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

### UNIT – IV 08 Hours

**Suppositories:** Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.

**Pharmaceutical incompatibilities:** Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

[Type text]

*Geethanjali*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

**UNIV – V 07 Hours**

**Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms

**TEXTBOOKS: (Latest Editions)**

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science & Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

[Type text]

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



[Type text]

## PS104: PHARMACEUTICAL INORGANIC CHEMISTRY - I

B. Pharm. I Year I Sem

L	T	P	C
3	1	0	3

**Scope:** This subject deals with the monographs of inorganic drugs and pharmaceuticals.

**Course Objectives:** Upon completion of course student shall be able to

- know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
- understand the medicinal and pharmaceutical importance of inorganic compounds

### UNIT – I 10 Hours

**Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate

**General methods of preparation,** assay for the compounds superscripted with asterisk (\*), properties and medicinal uses of inorganic compounds belonging to the following classes

### UNIT – II 10 Hours

**Acids, Bases and Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

**Major extra and intracellular electrolytes:** Functions of major Physiological ions, Electrolytes used in the replacement therapy: Sodium chloride\*, Potassium chloride, Calcium gluconate\* and Oral Rehydration Salt (ORS), Physiological acid base balance.

**Dental products:** Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

### UNIT – III 10 Hours

#### Gastrointestinal agents

**Acidifiers:** Ammonium chloride\* and Dil. HCl

**Antacid:** Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate\*, Aluminum hydroxide gel, Magnesium hydroxide mixture

**Cathartics:** Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

**Antimicrobials:** Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide\*, Chlorinated lime\*, Iodine and its preparations

### UNIT – IV 08 Hours

#### Miscellaneous compounds

**Expectorants:** Potassium iodide, Ammonium chloride\*.

**Emetics:** Copper sulphate\*, Sodium potassium tartarate

**Haematinics:** Ferrous sulphate\*, Ferrous gluconate

**Poison and Antidote:** Sodium thiosulphate\*, Activated charcoal, Sodiumnitrite 333

**Astringents:** Zinc Sulphate, Potash Alum

### UNIT – V 07 Hours

**Radiopharmaceuticals:** Radio activity, Measurement of radioactivity, Properties of  $\alpha$ ,  $\beta$ ,  $\gamma$  radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide  $I^{131}$ , Storage conditions, precautions & pharmaceutical application of radioactive substances.

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. 502201

[Type text]

**TEXTBOOKS: (Latest Editions)**

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4<sup>th</sup> edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. GunduRao, Inorganic Pharmaceutical Chemistry, 3<sup>rd</sup> Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

## HS105: COMMUNICATION SKILLS

B. Pharm. I Year I Sem

L	T	P	C
2	0	0	2

**Scope:** This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

**Course Objectives:** Upon completion of the course the student shall be able to

- Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
- Communicate effectively (Verbal and Non Verbal)
- Effectively manage the team as a team player
- Develop interview skills
- Develop Leadership qualities and essentials

### UNIT – I 07 Hours

**Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context

**Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers

**Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

### UNIT – II 07 Hours

**Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication

**Communication Styles:** Introduction, The Communication Styles Matrix with example for each - Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

### UNIT – III 07 Hours

**Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations

**Effective Written Communication:** Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication

**Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

### UNIT – IV 05 Hours

**Interview Skills:** Purpose of an interview, Do's and Dont's of an interview

**Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

### UNIT – V 04 Hours

**Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

**Recommended Books: (Latest Edition)**

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2<sup>nd</sup> Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1<sup>st</sup> Edition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1<sup>st</sup> Edition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1<sup>st</sup> Edition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5<sup>th</sup> Edition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konarnira, 2<sup>nd</sup> Edition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1<sup>st</sup> Edition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning India pvt. Ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1<sup>st</sup> Edition, McGraw Hill Education, 2011
11. Effective communication, John Adair, 4<sup>th</sup> Edition, Pan Mac Millan, 2009
12. Bringing out the best in people, Aubrey Daniels, 2<sup>nd</sup> Edition, McGraw Hill, 1999

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

[Type text]

## BS106: REMEDIAL BIOLOGY

B. Pharm. I Year I Sem

L T P C  
2 0 0 2

**Scope:** To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

**Course Objectives:** Upon completion of the course, the student shall be able to

- know the classification and salient features of five kingdoms of life
- understand the basic components of anatomy & physiology of plant
- know understand the basic components of anatomy & physiology animal with special reference to human

### UNIT - I 07 Hours

#### Living world:

- Definition and characters of living organisms
- Diversity in the living world
- Binomial nomenclature
- Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus,

#### Morphology of Flowering plants

Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed. General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledones.

### UNIT – II 07 Hours

#### Body fluids and circulation

Composition of blood, blood groups, coagulation of blood, Composition and functions of lymph Human circulatory system, Structure of human heart and blood vessels, Cardiac cycle, cardiac output and ECG

#### Digestion and Absorption

Human alimentary canal and digestive glands, Role of digestive enzymes, Digestion, absorption and assimilation of digested food

#### Breathing and respiration

Human respiratory system, Mechanism of breathing and its regulation, Exchange of gases, transport of gases and regulation of respiration, Respiratory volumes

### UNIT – III 07 Hours

#### Excretory products and their elimination

Modes of excretion, Human excretory system- structure and function, Urine formation, Renin angiotensin system

#### Neural control and coordination

Definition and classification of nervous system, Structure of a neuron, Generation, and conduction of nerve impulse, Structure of brain and spinal cord, Functions of cerebrum, cerebellum, hypothalamus, and medulla oblongata

#### Chemical coordination and regulation

Endocrine glands and their secretions, Functions of hormones secreted by endocrine glands

#### Human reproduction

Parts of female reproductive system, Parts of male reproductive system, Spermatogenesis and Oogenesis, Menstrual cycle

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

**UNIT – IV 05 Hours**

**Plants and mineral nutrition:**

Essential mineral, macro and micronutrients, Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

**Photosynthesis:**

Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

**UNIT – V 04 Hours**

**Plant respiration:** Respiration, glycolysis, fermentation (anaerobic).

**Plant growth and development**

Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators

**Cell - The unit of life**

Structure and functions of cell and cell organelles. Cell division

**Tissues**

Definition, types of tissues, location and functions.

**TEXT BOOKS:**

1. Text book of Biology by S. B. Gokhale
2. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

**REFERENCE BOOKS:**

1. Text book of Biology by B. V. Sreenivasa Naidu
2. A Text book of Biology by Naidu and Murthy
3. Botany for Degree students By A.C.Dutta.
4. Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Anantha krishnan.
5. A manual for pharmaceutical biology practical by S. B. Gokhale and C. K. Kokate

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

## BS107: REMEDIAL MATHEMATICS

B. Pharm. I Year I Sem

L T P C  
3 0 0 3

**Scope:** This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

**Course Objectives:** Upon completion of the course the student shall be able to:-

- Know the theory and their application in Pharmacy
- Solve the different types of problems by applying theory
- Appreciate the important application of mathematics in Pharmacy

### UNIT – I 06 Hours

#### Partial fraction

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics

#### Logarithms

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

#### Function:

Real Valued function, Classification of real valued functions,

#### Limits and continuity:

Introduction, Limit of a function,

$$x^n \approx a^n$$

Definition of limit of a function ( $\square - \square$ )

$$\sin \square$$

definition),  $\lim_{x \rightarrow a}$

$$\frac{\square}{x \square a} \approx na^{n-1}$$

$$\lim_{\square \rightarrow 0} \square \approx 1,$$

$\square$

### UNIT- II 06 Hours

#### Matrices and Determinant:

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations

### UNIT – III 06 Hours

#### Calculus

**Differentiation :** Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of  $x^n$  w.r.t  $x$ , where  $n$  is any rational number, Derivative of  $e^x$ , Derivative of  $\log_e x$ , Derivative of  $a^x$ , Derivative of trigonometric functions from first principles (**without Proof**), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application

[Type text]

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

#### UNIT – IV 06 Hours

##### Analytical Geometry

**Introduction:** Signs of the Coordinates, Distance formula,

**Straight Line :** Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line

##### **Integration:**

Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

#### UNIT – V 06 Hours

**Differential Equations :** Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations

**Laplace Transform :** Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations

#### TEXTBOOKS: (Latest Edition)

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr. B.S. Grewal

[Type text]

*Sanjiv K.*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. 501301.



[Type text]

PS108: HUMAN ANATOMY AND PHYSIOLOGY - I Lab

B. Pharm. I Year I Sem

L T P C  
0 0 4 2

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals, or normal human beings. This is helpful for developing an insight on the subject.

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. To study the integumentary and special senses using specimen, models, etc.,
7. To study the nervous system using specimen, models, etc.,
8. To study the endocrine system using specimen, models, etc
9. To demonstrate the general neurological examination
10. To demonstrate the function of olfactory nerve
11. To examine the different types of taste.
12. To demonstrate the visual acuity
13. To demonstrate the reflex activity
14. Recording of body temperature
15. To demonstrate positive and negative feedback mechanism.

*Signature of*

**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheerla(V), Keasara(M), Medchal Dist. T.S. - 501301.

[Type text]

[Type text]

PS109: PHARMACEUTICAL ANALYSIS - I lab

B. Pharm. I Year I Sem

L T P C  
0 0 4 2

1. **Preparation and standardization of**
  - 1) Sodium hydroxide
  - 2) Sulphuric acid
  - 3) Sodium thiosulfate
  - 4) Potassium permanganate
  - 5) Ceric ammonium sulphate
  
2. **Assay of the following compounds along with Standardization of Titrant**
  - 1) Ammonium chloride by acid base titration
  - 2) Ferrous sulphate by Cerimetry
  - 3) Copper sulphate by Iodometry
  - 4) Calcium gluconate by complexometry
  - 5) Hydrogen peroxide by Permanganometry
  - 6) Sodium benzoate by non-aqueous titration
  - 7) Sodium Chloride by precipitation titration
  
3. **Determination of Normality by electro-analytical methods**
  - 1) Conductometric titration of strong acid against strong base
  - 2) Conductometric titration of strong acid and weak acid against strong base
  - 3) Potentiometric titration of strong acid against strong base

[Type text]

  
**PRINCIPAL**  
Gothanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

PS110: PHARMACEUTICS - I LAB

B. Pharm. I Year I Sem

L T P C  
0 0 4 2

1. **Syrups**
  - a) Syrup IP
  - b) Paracetamol pediatric syrup
2. **Elixirs**
  - a) Piperazine citrate elixir
  - b) Paracetamol pediatric elixir
3. **Linctus** a) Simple Linctus BPC
4. **Solutions**
  - a) Strong solution of ammonium acetate
  - b) Cresol with soap solution
5. **Suspensions**
  - a) Calamine lotion
  - b) Magnesium Hydroxide mixture
5. **Emulsions**
  - a) Turpentine Liniment
  - b) Liquid paraffin emulsion
6. **Powders and Granules**
  - a) ORS powder (WHO)
  - b) Effervescent granules c) Dusting powder
7. **Suppositories**
  - a) Glycerol gelatin suppository
  - b) Soap glycerin suppository
8. **Semisolids**
  - a) Sulphur ointment
  - b) Non staining iodine ointment with methyl salicylate
  - c) Bentonite gel
9. **Gargles and Mouthwashes**
  - a) Potassium chlorate gargle
  - b) Chlorhexidine mouthwash

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

PS111: PHARMACEUTICAL INORGANIC CHEMISTRY - LAB

B. Pharm. I Year I Sem

L T P C  
0 0 4 2

**Limit tests for following ions**

Limit test for Chlorides and Sulphates Modified limit test for Chlorides and Sulphates Limit test for Iron  
Limit test for Heavy metals Limit test for Lead  
Limit test for Arsenic

**Identification test** Magnesium hydroxide Ferrous sulphate Sodium bicarbonate Calcium gluconate  
Copper sulphate

**Test for purity**

Swelling power of Bentonite  
Neutralizing capacity of aluminum hydroxide gel  
Determination of potassium iodate and iodine in potassium iodide

**Preparation of inorganic pharmaceuticals**

Boric acid  
Potash alum  
Ferrous sulphate

[Type text]

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(N), Medchal Dist. T.S. - 501301.

[Type text]

## HS112: COMMUNICATION SKILLS - LAB

B. Pharm. I Year I Sem

L	T	P	C
0	0	2	1

The following learning modules are to be conducted using wordsworth® English language lab software

### Basic communication covering the following topics

Meeting People  
Asking Questions  
Making Friends  
What did you do?  
Do's and Dont's

### Pronunciations covering the following topics

Pronunciation (Consonant Sounds)  
Pronunciation and Nouns  
Pronunciation (Vowel Sounds)

### Advanced Learning

Listening Comprehension / Direct and Indirect Speech  
Figures of Speech  
Effective Communication  
Writing Skills  
Effective Writing  
Interview Handling Skills  
E-Mail etiquette  
Presentation Skills

[Type text]

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

### BS113: REMEDIAL BIOLOGY LAB

B. Pharm. I Year I Sem

L T P C  
0 0 2 1

1. Introduction to experiments in biology
  - a) Study of Microscope
  - b) Section cutting techniques
  - c) Mounting and staining
  - d) Permanent slide preparation
2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf and its modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

#### REFERENCE BOOKS:

1. Practical human anatomy and physiology. By S.R. Kale and R.R. Kale.
2. A Manual of pharmaceutical biology practical by S. B. Gokhale, C. K. Kokate and S. P. Shrivastava.
3. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M. J. H. Shafi

[Type text]

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeraj(V), Reesara(H), Medchal Dist. T.S.-501301.

[Type text]

## PS201: HUMAN ANATOMY AND PHYSIOLOGY - II

B. Pharm. I Year II Sem

L T P C  
3 1 0 3

**Scope:** This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

**Course Objectives:** Upon completion of this course the student should be able to:

- Explain the gross morphology, structure, and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and their imbalances.
- Identify the various tissues and organs of different systems of human body.
- Perform the hematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
- Appreciate coordinated working pattern of different organs of each system
- Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

### Unit – I 10 hours

#### Body fluids and blood

Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.

#### Lymphatic system

Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

### Unit – II 10 hours

#### Cardiovascular system

Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

### Unit – III 06 hours

#### Digestive system

Anatomy of GI Tract with special reference to anatomy and functions of stomach, ( Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

#### Respiratory system

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration

### Unit – IV 10 hours

#### Respiratory system

Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

[Type text]

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

### **Urinary system**

Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

### **Unit – V 09 hours**

#### **Reproductive system**

Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition

#### **Introduction to genetics**

Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance

### **TEXTBOOKS: (Latest Editions)**

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Taylor. Williams & Wilkins Co, Riverview, MI USA
4. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

### **REFERENCE BOOKS:**

1. Physiological basis of Medical Practice-Best and Taylor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterje ,Academic Publishers Kolkata

[Type text]

*nanuie*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



[Type text]

## PS202: PHARMACEUTICAL ORGANIC CHEMISTRY – I

B. Pharm. I Year II Sem

L	T	P	C
4	1	0	4

**Scope:** This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

**Course Objectives:** Upon completion of the course the student shall be able to

- write the structure, name and the type of isomerism of the organic compound
- write the reaction, name the reaction and orientation of reactions
- account for reactivity/stability of compounds,
- identify/confirm the identification of organic compound

General methods of preparation and reactions of compounds superscripted with asterisk (\*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

### UNIT-I 07 Hours

**Classification, nomenclature, and isomerism** Classification of Organic Compounds, Common and IUPAC systems of nomenclature of organic compounds, (up to 10 Carbons open chain and carbocyclic compounds), Structural isomerisms in organic compounds

### UNIT-II 10 Hours

#### Alkanes\*, Alkenes\* and Conjugated dienes\*

SP<sup>3</sup> hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP<sup>2</sup> hybridization in alkenes

E<sub>1</sub> and E<sub>2</sub> reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E<sub>1</sub> versus E<sub>2</sub> reactions, Factors affecting E<sub>1</sub> and E<sub>2</sub> reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

### UNIT-III 10 Hours

#### Alkyl halides\*

SN<sub>1</sub> and SN<sub>2</sub> reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.

SN<sub>1</sub> versus SN<sub>2</sub> reactions, Factors affecting SN<sub>1</sub> and SN<sub>2</sub> reactions

Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

**Alcohols\***- Qualitative tests, Structure and uses of Ethyl alcohol, chlorobutanol, Cetosterylalcohol, Benzyl alcohol, Glycerol, Propylene glycol

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

#### UNIT-IV 10 Hours

##### Carbonyl compounds\* (Aldehydes and ketones)

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

#### UNIT-V 08 Hours

##### Carboxylic acids\*

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester

Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

**Aliphatic amines\*** - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

#### TEXTBOOKS: (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I. L. Finar, Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P. L. Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K. Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwaliah / Chatwal.

[Type text]

*Sambhu Ch*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

## BS203: BIOCHEMISTRY

B. Pharm. I Year II Sem

L T P C  
3 1 0 3

**Scope:** Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

**Course Objectives:** Upon completion of course student shall able to

- Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
- Understand the metabolism of nutrient molecules in physiological and pathological conditions.
- Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

### UNIT – I 10 Hours

#### Carbohydrate metabolism

Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance

HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency

Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance

Hormonal regulation of blood glucose level and Diabetes mellitus

#### Biological oxidation

Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate level phosphorylation, Inhibitors ETC and oxidative phosphorylation/Uncouplers

### UNIT - II 10 Hours

#### Lipid metabolism

β-Oxidation of saturated fatty acid (Palmitic acid)

Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid)

Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

#### Amino acid metabolism

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders

Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, alpeptonuria, tyrosinemia)

Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline

Catabolism of heme; hyperbilirubinemia and jaundice

### UNIT – III 10 Hours

**Nucleic acid metabolism and genetic information transfer** Biosynthesis of purine and pyrimidine nucleotides

Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome

[Type text]

*Sanjiv S. J.*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Energypet(V), Kitesara(M), Medchal Dist. T.S.R.

[Type text]

Structure of DNA and RNA and their functions DNA replication (semi conservative model)  
Transcription or RNA synthesis  
Genetic code, Translation or Protein synthesis and inhibitors

#### **UNIT – IV 08 Hours**

##### **Biomolecules**

Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

##### **Bioenergetics**

Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

Energy rich compounds; classification; biological significances of ATP and cyclic AMP

#### **UNIT – V 07 Hours**

##### **Enzymes**

Introduction, properties, nomenclature, and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)

Enzyme inhibitors with examples

Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation

Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes –Structure and biochemical functions

#### **TEXTBOOKS: (Latest Editions)**

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

## BS204: PATHOPHYSIOLOGY

B. Pharm. I Year II Sem

L T P C  
3 1 0 3

**Scope:** Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

**Course Objectives:** Upon completion of the subject student shall be able to–

- Describe the etiology and pathogenesis of the selected disease states;
- Name the signs and symptoms of the diseases; and
- Mention the complications of the diseases.

### Unit – I 10 Hours

#### **Basic principles of Cell injury and Adaptation:**

Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance

#### **Basic mechanism involved in the process of inflammation and repair:**

Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis

### Unit – II 10 Hours

#### **Cardiovascular System:**

Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis, and arteriosclerosis)

**Respiratory system:** Asthma, Chronic obstructive airways diseases.

**Renal system:** Acute and chronic renal failure

### Unit - III 10 Hours

#### **Haematological Diseases:**

Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia

**Endocrine system:** Diabetes, thyroid diseases, disorders of sex hormones

**Nervous system:** Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.

**Gastrointestinal system:** Peptic Ulcer

### Unit – IV 8 Hours

Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease.

**Disease of bones and joints:** Rheumatoid arthritis, osteoporosis, and gout

**Principles of cancer:** classification, etiology and pathogenesis of cancer

**Diseases of bones and joints:** Rheumatoid Arthritis, Osteoporosis, Gout

**Principles of Cancer:** Classification, etiology and pathogenesis of Cancer

[Type text]

*Handwritten signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeraj(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

**Unit – V 7 Hours**

**Infectious diseases:** Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tract infections

**Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhoea

**TEXTBOOKS: (Latest Editions)**

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6<sup>th</sup> edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12<sup>th</sup> edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states;
5. William and Wilkins, Baltimore; 1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21<sup>st</sup> edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12<sup>th</sup> edition; WB Saunders Company; 2010.
8. Joseph Di Piro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9<sup>th</sup> edition; London; McGraw-Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6<sup>th</sup> edition; Philadelphia; WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3<sup>rd</sup> edition; London; Churchill Livingstone publication; 2003.

**RECOMMENDED JOURNALS:**

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

[Type text]

*Signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

## CS205: COMPUTER APPLICATIONS IN PHARMACY

B. Pharm. I Year II Sem

L	T	P	C
3	0	0	3

**Scope:** This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

**Course Objectives:** Upon completion of the course the student shall be able to

- know the various types of application of computers in pharmacy
- know the various types of databases
- know the various applications of databases in pharmacy

### UNIT – I 06 hours

**Number system:** Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division

**Concept of Information Systems and Software:** Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

### UNIT –II 06 Hours

**Web technologies:** Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

### UNIT – III 06 Hours

**Application of computers in Pharmacy** –Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology, and adherence monitoring

Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

### UNIT – IV 06 hours

**Bioinformatics:** Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

### UNIT-V 06 hours

**Computers as data analysis in Preclinical development:** Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMs)

### TEXTBOOKS: (Latest edition):

1. Computer Application in Pharmacy – William E. Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C. Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)

*Handwritten Signature*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheerayal(V), Keesara(M), Mednjal Dist. T.S. -501301

[Type text]

[Type text]

4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

[Type text]

*Subhash*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.



[Type text]

PS206: HUMAN ANATOMY AND PHYSIOLOGY – II LAB

B. Pharm. I Year II Sem

L T P C  
0 0 4 2

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. Introduction to hemocytometry.
2. Enumeration of white blood cell (WBC) count
3. Enumeration of total red blood corpuscles (RBC) count
4. Determination of bleeding time
5. Determination of clotting time
6. Estimation of hemoglobin content
7. Determination of blood group.
8. Determination of erythrocyte sedimentation rate (ESR).
9. Determination of heart rate and pulse rate.
10. Recording of blood pressure.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

[Type text]

*Handwritten signature*  
**PRINCIPAL**  
Gaekwad College of Pharmacy  
Cheeraj(V), Keerasa(V), Medical Dist. T.S. - 501 001.

[Type text]

PS207: PHARMACEUTICAL ORGANIC CHEMISTRY - I LAB

B. Pharm. I Year II Sem

L T P C  
0 0 4 2

1. Systematic qualitative analysis of unknown organic compounds like
  1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
  2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
  3. Solubility test
  4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
  5. Melting point/Boiling point of organic compounds
  6. Identification of the unknown compound from the literature using melting point/ boiling point.
  7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
  8. Minimum 5 unknown organic compounds to be analysed systematically.
2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

[Type text]

*Santhi*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501302.

[Type text]

**BS208: BIOCHEMISTRY LAB**

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

**L T P C**  
**0 0 4 2**

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

[Type text]

*Sambit*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerpal(V), Keesara(M), Medchal Dist. T.S.-501301.

[Type text]

CS209: COMPUTER APPLICATIONS IN PHARMACY LAB

B. Pharm. I Year II Sem

L T P C  
0 0 2 1

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MS WORD
5. Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

[Type text]

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerjal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. PHARMACY II YEAR SYLLABUS (R17)

Effective from Academic Year 2017-18 Admitted Batch

II YEAR I SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	PS301	Pharmaceutical Organic Chemistry-II	3	1	0	4
2	PS302	Physical Pharmaceutics-I	3	1	0	4
3	BS303	Pharmaceutical Microbiology	3	1	0	4
4	PC304	Pharmaceutical Engineering	3	1	0	4
5	PS305	Pharmaceutical Organic Chemistry-II Lab	0	0	4	2
6	PS306	Physical Pharmaceutics-I Lab	0	0	4	2
7	BS307	Pharmaceutical Microbiology Lab	0	0	4	2
8	PC308	Pharmaceutical Engineering Lab	0	0	4	2
9	*MC300	NSO	0	0	0	0
		<b>Total Credits</b>	<b>12</b>	<b>04</b>	<b>17</b>	<b>24</b>

II YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	PS401	Pharmaceutical Organic Chemistry-III	3	1	0	4
2	PC402	Medicinal Chemistry-I	3	1	0	4
3	PS403	Physical Pharmaceutics-II	3	1	0	4
4	PC404	Pharmacology-I	3	1	0	4
5	PC405	Pharmacognosy and Phytochemistry-I	3	1	0	4
6	PC406	Medicinal Chemistry-I Lab	0	0	4	2
7	PS407	Physical Pharmaceutics-II Lab	0	0	4	2
8	PC408	Pharmacology-I Lab	0	0	4	2
9	PC409	Pharmacognosy and Phytochemistry-I Lab	0	0	4	2
10	*MC400	Gender Sensitization Lab	1	0	0	0
		<b>Total Credits</b>	<b>16</b>	<b>05</b>	<b>16</b>	<b>28</b>

\*MC-Satisfactory/Dissatisfactory

*Signature of*  
PRINCIPAL

Goethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## PS301: PHARMACEUTICAL ORGANIC CHEMISTRY –II

B. Pharm. II Year I Sem

L T P C  
3 1 0 4

**Course Objectives:** This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

**Course Outcomes:** Upon completion of the course the student shall be able to

- write the structure, name and the type of isomerism of the organic compound
- write the reaction, name the reaction and orientation of reactions
- account for reactivity/stability of compounds,
- prepare organic compounds

### UNIT I

10 Hours

#### Benzene and its derivatives

- A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule
- B. Reactions of benzene - nitration, sulphonation, halogenation-reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.
- C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction
- D. Structure and uses of DDT, Saccharin, BHC and Chloramine

### UNIT-II

10 Hours

**Phenols\*** - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols

**Aromatic Amines\*** - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts

### UNIT-III

10 Hours

#### Fats and Oils

- a. Fatty acids – reactions.
- b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
- c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

### UNIT-IV

08 Hours

#### Polynuclear hydrocarbons:

- a. Synthesis, reactions

*Geethanjali*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeraj(V), Keesara(M), Medchal Dist. T.S.-501301.

- b. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives

**UNIT-V**

**07 Hours**

**Cyclo alkanes\***

Stabilities – Baeyer’s strain theory, limitation of Baeyer’s strain theory, Coulson and Moffitt’s modification, Sachse Mohr’s theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

**Recommended Books (Latest Editions)**

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel’s text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeraj(V), Keesara(M), Medchal Dist. T.S.-501301

## PS302: PHYSICAL PHARMACEUTICS - I

B. Pharm. II Year I Sem

L T P C  
3 1 0 4

### Course Objectives:

The course deals with the various physical, physicochemical properties and principle involved in dosage forms, formulations. Theory and practical components of the subject help the student to get a better insight in to various areas of formulation research and development and stability studies of pharmaceuticals.

**Course Outcomes:** Upon the completion of the course student shall be able to

- Understand various physicochemical properties of drug molecules in the designing the dosage form
- Know the principles of chemical kinetics & to use them in assigning expiry date for formulation
- Demonstrate use of physicochemical properties in evaluation of dosage forms.
- Appreciate physicochemical properties of drug molecules in formulation research and development

### UNIT-I

10 Hours

**States of Matter and properties of matter:** State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols-inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism.

**Physicochemical properties of drug molecules:** Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

### UNIT-II

10 Hours

**Solubility of drugs:** Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, Dissolution & drug release, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions, azeotropic mixtures, fractional distillation. Partially miscible liquids, Critical solution temperature(CST) and applications. Distribution law, its limitations and applications

### UNIT-III

10 Hours

**Micromeretics:** Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle size by (different methods), counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

*Handwritten Signature*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301



#### UNIT-IV

08 Hours

**Complexation and protein binding:** Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

#### UNIT-V

07 Hours

**pH, buffers and Isotonic solutions:** Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions. Isotonicity, Colligative properties and determination of tonicity of a system.

#### Recommended Books: (Latest Editions)

1. Physical pharmacy by Alfred Martin
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee

## BS303: PHARMACEUTICAL MICROBIOLOGY

B. Pharm. II Year I Sem

L T P C  
3 1 0 4

### Course Objectives:

In the broadest sense, scope of microbiology is the study of all organisms that are invisible to the naked eye- that is the study of microorganisms.

Microorganisms are necessary for the production of bread, cheese, beer, antibiotics, vaccines, vitamins, enzymes etc.

Microbiology has an impact on medicine, agriculture, food science, ecology, genetics, biochemistry, immunology etc.

**Course Outcomes:** Upon completion of the subject student shall be able to;

- Understand methods of identification, cultivation and preservation of various microorganisms
- Importance of sterilization in microbiology. and pharmaceutical industry
- Learn sterility testing of pharmaceutical products.
- Microbiological standardization of Pharmaceuticals.
- Understand the cell culture technology and its applications in pharmaceutical industries.

### UNIT-I

10 Hours

Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes. Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.

### UNIT-II

10 Hours

Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC). Study of principle, procedure, merits, demerits and applications of Physical, chemical and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators.

### UNIT-III

10 Hours

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Virus. Classification and mode of action of disinfectants. Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions. Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

#### UNIT-IV

08 Hours

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic and testing of antimicrobial activity of a new substance. General aspects-environmental cleanliness.

#### UNIT-V

07 Hours

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.

#### Recommended Books (Latest edition)

1. Rafi MD, Text book of biochemistry for undergraduates, 3<sup>rd</sup> edition, Universities press, 2017.
2. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
3. Prescott and Dunn, Industrial Microbiology, 4<sup>th</sup> edition, CBS Publishers & Distributors, Delhi.
4. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
5. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
6. Rose: Industrial Microbiology.
7. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
8. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
9. Pepler: Microbial Technology.
10. I.P., B.P., U.S.P.- latest editions.
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
14. Ananthanarayan and Paniker's textbook of Microbiology tenth edition

## PC304: PHARMACEUTICAL ENGINEERING

B. Pharm. II Year I Sem

L	T	P	C
3	1	0	4

### Course Objectives:

This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

**Course Outcomes:** Upon completion of the course student shall be able:

- To know various unit operations used in Pharmaceutical industries.
- To understand the material handling techniques.
- To perform various processes involved in pharmaceutical manufacturing process.
- To carry out various test to prevent environmental pollution.
- To appreciate and comprehend significance of plant lay out design for optimum use of resources.
- To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

### UNIT-I

10 Hours

**Flow of fluids:** Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.

**Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

**Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

**Mixing:** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

### UNIT-II

10 Hours

**Crystallization:** Objectives, applications, & theory of crystallization. Solubility curves, principles, construction, working, uses, merits and demerits of Agitated batch crystallizer, Swenson Walker Crystallizer, Krystal crystallizer, Vacuum crystallizer. Caking of crystals, factors affecting caking & prevention of caking.

**Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporator.

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerjal(V), Keasara(M), Medchal Dist. T.S.-501301.

**Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers. List of equipment by name and their functions.

### UNIT- III

10 Hours

**Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

**Distillation:** Objectives, applications & types of distillation. principles, construction, working, uses, merits and demerits of (lab scale and industrial scale) Simple distillation, preparation of purified water and water for injection BP by distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

### UNIT-IV

08 Hours

**Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seitz filter. HEPA filters for controlled pollution.

**Centrifugation:** Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

### UNIT- V

07 Hours

**Plant location, industrial hazards and plant safety:** Plant Layout, utilities and services, Mechanical hazards, Chemical hazards, Fire hazards, explosive hazards and their safety.

**Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals.

**Material handling systems:** Objectives & applications of Material handling systems, different types of conveyors such as belt, screw and pneumatic conveyors.

### Recommended Books: (Latest Editions)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – McCabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.

PS305: PHARMACEUTICAL ORGANIC CHEMISTRY - II LAB

B. Pharm. II Year I Sem

L T P C  
0 0 4 2

- I Experiments involving laboratory techniques  
Recrystallization  
Steam distillation
- II Determination of following oil values (including standardization of reagents)  
Acid value  
Saponification value  
Iodine value
- III Preparation of compounds
- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
  - 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ Acetanilide by halogenation (Bromination) reaction.
  - 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
  - Benzoic acid from Benzyl chloride by oxidation reaction.
  - Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
  - 1-Phenyl azo-2-naphthol from Aniline by diazotization and coupling reactions.
  - Benzil from Benzoin by oxidation reaction.
  - Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction
  - Cinnamic acid from Benzaldehyde by Perkin reaction
  - *P*-Iodo benzoic acid from *P*-amino benzoic acid

**Recommended Books (Latest Editions)**

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

PS306: PHYSICAL PHARMACEUTICS – I LAB

B. Pharm. II Year I Sem

L T P C  
0 0 4 2

**List of Experiments**

1. Determination the solubility of drug at room temperature at different pH conditions
2. Determination of pKa value by Half Neutralization/ Henderson Hassel Balch equation
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl<sub>4</sub> and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of particle size, particle size distribution using sieving method
7. Determination of particle size, particle size distribution using Microscopic method
8. Determination of bulk density, true density and porosity
9. Determine the angle of repose and influence of lubricant on angle of repose
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

**Recommended Books: (Latest Editions)**

1. Physical pharmacy by Alfred Martin
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee

*Santhi S*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501301.



## BS307: PHARMACEUTICAL MICROBIOLOGY LAB

B. Pharm. II Year I Sem

L T P C  
0 0 4 2

### List of Experiments:

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test (IMViC reactions)
11. Revision Practical Class

### Recommended Books (Latest edition)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4<sup>th</sup> edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

*Sanjiv K*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501217

## PC308: PHARMACEUTICAL ENGINEERING LAB

B. Pharm. II Year I Sem

L	T	P	C
0	0	4	2

### List of Experiments:

1. Determination of radiation constant of brass, iron, unpainted and painted glass.
2. Steam distillation – To calculate the efficiency of steam distillation.
3. To determine the overall heat transfer coefficient by heat exchanger.
4. Construction of drying curves (for calcium carbonate and starch).
5. Determination of moisture content and loss on drying.
6. Determination of humidity of air – i) from wet and dry bulb temperatures –use of Dew point method.
7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
8. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.
9. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity
12. To study the effect of time on the Rate of Crystallization.
13. To calculate the uniformity Index for given sample by using Double Cone Blender.

### Recommended Books (Latest edition)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchemo, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – McCabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceuticals- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

MC300: NATIONAL SPORTS ORGANIZATION

B. Pharm. II Year I Sem

L T P C  
0 0 0 0

The following is the List of Sports and Games:

- 1) Cricket
- 2) Volley Ball
- 3) Table Tennis
- 4) Foot Ball
- 5) Throw Ball (Only for Women)
- 6) Basket Ball
- 7) Athletics
  - 100 Meters Run
  - Long Jump
  - Shot Put

Rules and Skills of the above Sports and Games should be taught to the students.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## PS401: PHARMACEUTICAL ORGANIC CHEMISTRY – III

B. Pharm. II Year II Sem

L T P C  
3 1 0 4

**Course Objectives:** This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

**Course Outcomes:** At the end of the course, the student shall be able to

- understand the methods of preparation and properties of organic compounds
- explain the stereo chemical aspects of organic compounds and stereo chemical reactions
- know the medicinal uses and other applications of organic compounds

**Note:** To emphasize on definition, types, mechanisms, examples, uses/applications

### UNIT-I

10 Hours

#### Stereo isomerism \*

Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds  
Elements of symmetry, chiral and achiral molecules. DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers. Reactions of chiral molecules. Racemic modification and resolution of racemic mixture.

### UNIT-II

10 Hours

#### Geometrical isomerism

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems). Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity.

### UNIT-III

10 Hours

#### Heterocyclic compounds:

Nomenclature and classification

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene - Relative aromaticity, reactivity and Basicity of pyrrole

### UNIT-IV

8 Hours

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole.

Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

*Sanjiv Reddy*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## UNIT-V


07 Hours

### Reactions of synthetic importance

Metal hydride reduction ( $\text{NaBH}_4$  and  $\text{LiAlH}_4$ ), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation

### Recommended Books (Latest Editions)

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal
4. Organic Chemistry by Morrison and Boyd
5. Heterocyclic Chemistry by T.L. Gilchrist

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## PC402: MEDICINAL CHEMISTRY – I

B. Pharm. II Year II Sem

L T P C  
3 1 0 4

**Course Objectives:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Course Outcomes:** Upon completion of the course the student shall be able to

- understand the chemistry of drugs with respect to their pharmacological activity
- understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
- know the Structural Activity Relationship (SAR) of different class of drugs
- write the chemical synthesis of some drugs

**Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (\*)**

### UNIT- I

10 Hours

#### Introduction to Medicinal Chemistry

History and development of medicinal chemistry. Physicochemical properties in relation to biological action. Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

#### Drug metabolism

Drug metabolism principles- Phase I and Phase II. Factors affecting drug metabolism including stereo chemical aspects.

### UNIT- II

10 Hours

#### Drugs acting on Autonomic Nervous System

**Adrenergic Neurotransmitters:** Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution.

#### Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine\*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol\*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.

Agents with mixed mechanism: Ephedrine, Metaraminol.

#### Adrenergic Antagonists:

**Alpha adrenergic blockers:** Tolazoline\*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

*Principal*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.

**Beta adrenergic blockers:** SAR of beta blockers, Propranolol\*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

### UNIT-III

10 Hours

**Cholinergic neurotransmitters:** Biosynthesis and catabolism of acetylcholine.

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

**Parasympathomimetic agents: SAR of Parasympathomimetic agents**

**Direct acting agents:** Acetylcholine, Carbachol\*, Bethanechol, Methacholine, Pilocarpine.

**Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible):** Physostigmine, Neostigmine\*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isoflurophate, Echothiophate iodide, Parathione, Malathion.

**Cholinesterase reactivator:** Pralidoxime chloride.

**Cholinergic Blocking agents: SAR of cholinolytic agents**

**Solanaceous alkaloids and analogues:** Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide\*.

**Synthetic cholinergic blocking agents:** Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride\*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride\*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.

### UNIT- IV

08 Hours

**Drugs acting on Central Nervous System**

**A. Sedatives and Hypnotics:**

**Benzodiazepines:** SAR of Benzodiazepines, Chlordiazepoxide, Diazepam\*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

**Barbiturtes:** SAR of barbiturates, Barbitol\*, Phenobarbital, Mephobarbital, Amobarbital, Butobarbital, Pentobarbital, Secobarbital

**Miscellaneous:**

Amides & imides: Glutethimide.

Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol.

Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

**B. Antipsychotics**

**Phenothiazines:** SAR of Phenothiazines Promazine hydrochloride, Chlorpromazine hydrochloride\*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

**Ring Analogues of Phenothiazines:** Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

**Fluro buterophenones:** Haloperidol, Droperidol, Risperidone.

**Beta amino ketones:** Molindone hydrochloride.

**Benzamides:** Sulpieride.

**C. Anticonvulsants:** SAR of Anticonvulsants, mechanism of anticonvulsant action

**Barbiturates:** Phenobarbitone, Methobarbital.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**Hydantoins:** Phenytoin, Mephenytoin, Ethotoin  
**Oxazolindione diones:** Trimethadione, Paramethadione  
**Succinimides:** Phensuximide, Methsuximide, Ethosuximide  
**Urea and monoacylureas:** Phenacemide, Carbamazepine  
**Benzodiazepines:** Clonazepam  
**Miscellaneous:** Primidone, Valproic acid, Gabapentin, Felbamate

#### UNIT – V

07 Hours

#### Drugs acting on Central Nervous System

##### General anesthetics:

**Inhalation anesthetics:** Halothane\*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

**Ultra short acting barbiturates:** Methohexital sodium\*, Thiopental sodium.

**Dissociative anesthetics:** Ketamine hydrochloride.\*

##### Narcotic and non-narcotic analgesics

**Morphine and related drugs:** SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anileridine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate\*, Methadone hydrochloride\*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

**Narcotic antagonists:** Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.

**Anti-inflammatory agents:** Sodium salicylate, Aspirin, Mefenamic acid\*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepirac, Diclofenac, Ketorolac, Ibuprofen\*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

#### Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



## PS403: PHYSICAL PHARMACEUTICS - II

B. Pharm. II Year II Sem

L T P C  
3 1 0 4

**Course Objectives:** The course deals with the various physical, physicochemical properties and principle involved in dosage forms, formulations. Theory and practical components of the subject help the student to get a better insight in to various areas of formulation research and development and stability studies of pharmaceuticals.

**Course Outcomes:** Upon the completion of the course student shall be able to

- Understand various physicochemical properties of drug molecules in the designing the dosage form
- Know the principles of chemical kinetics & to use them in assigning expiry date for Formulation
- Demonstrate use of physicochemical properties in evaluation of dosage forms.
- Appreciate physicochemical properties of drug molecules in formulation research and Development

### UNIT-I

10 Hours

**Drug stability:** Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

### UNIT-II

10 Hours

**Rheology:** Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatants, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

**Deformation of solids:** Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

### UNIT-III

10 Hours

**Coarse dispersion:** Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Physical stability of emulsions, preservation of emulsions, rheological properties of emulsions, phase equilibria and emulsion formulation.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.

**UNIT-IV****08 Hours**

**Surface and interfacial phenomenon:** Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

**UNIT-V****07 Hours**

**Colloidal dispersions:** Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization & protective action.

**Recommended Books: (Latest Editions)**

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceuticals by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## PC404: PHARMACOLOGY - I

B. Pharm. II Year II Sem

L T P C  
3 1 0 4

**Course Objectives:** The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

**Course Outcomes:** Upon completion of this course the student should be able to

- Understand the pharmacological actions of different categories of drugs
- Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
- Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
- Observe the effect of drugs on animals by simulated experiments
- Appreciate correlation of pharmacology with other bio medical sciences

### UNIT-I

08 hours

#### 1. General Pharmacology

- a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists( competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.
- b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

### UNIT-II

10 Hours

#### General Pharmacology

Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein-coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.

- a. Adverse drug reactions.
- b. Drug interactions (pharmacokinetic and pharmacodynamic)
- c. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

*Signature*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**UNIT-III****10 Hours****2. Pharmacology of peripheral nervous system**

- a. Organization and function of ANS.
- b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.
- c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.
- d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
- e. Local anesthetic agents.
- f. Drugs used in myasthenia gravis and glaucoma

**UNIT-IV****10 Hours****3. Pharmacology of central nervous system**

- a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
- b. General anesthetics and pre-anesthetics.
- c. Sedatives, hypnotics and centrally acting muscle relaxants.
- d. Anti-epileptics
- e. Alcohols and disulfiram

**UNIT-V****7 Hours****Pharmacology of central nervous system 07 Hours**

- a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.
- b. Drugs used in Parkinsons disease and Alzheimer's disease.
- c. CNS stimulants and nootropics.
- d. Opioid analgesics and antagonists
- e. Drug addiction, drug abuse, tolerance and dependence.

**Recommended Books (Latest Editions)**

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,

*Signature of*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501301.

## PC405: PHARMACOGNOSY AND PHYTOCHEMISTRY - I

B. Pharm. II Year II Sem

L T P C  
3 1 0 4

**Course Objective:** The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

**Course Outcomes:** Upon completion of the course, the student shall be able

- to know the techniques in the cultivation and production of crude drugs
- to know the crude drugs, their uses and chemical nature
- know the evaluation techniques for the herbal drugs
- to carry out the microscopic and morphological evaluation of crude drugs

### UNIT-I

10 Hours

**Introduction to Pharmacognosy:** Definition, history, scope and development of Pharmacognosy

(a) Sources of Drugs – Plants, Animals, Marine & Tissue culture

(b) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

**Classification of drugs:** Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

**Quality control of Drugs of Natural Origin:** Adulteration of drugs of natural origin.

Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

### UNIT-II

10 Hours

**Cultivation, Collection, Processing and storage of drugs of natural origin:**

Cultivation and Collection of drugs of natural origin. Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants.

### UNIT-III

7 Hours

**Plant tissue culture:** Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines

### UNIT IV

10 Hours

**Pharmacognosy in various systems of medicine:**

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda,

Unani, Siddha, Homeopathy and Chinese systems of medicine.

**Introduction to secondary metabolites:**

Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

**UNIT V**

**08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs

**Plant Products:** Fibers - Cotton, Jute, Hemp  
Hallucinogens, Teratogens, Natural allergens

**Primary metabolites:**

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: **Carbohydrates:** Acacia, Agar, Tragacanth, Honey

**Proteins and Enzymes:** Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

**Lipids (Waxes, fats, fixed oils) :** Castor oil,  
Chaulmoogra oil, Wool Fat, Bees Wax **Marine Drugs:**  
Novel medicinal agents from marine sources

**Recommended Books: (Latest Editions)**

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, 11nd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

*Signature of*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

PC406: MEDICINAL CHEMISTRY – I LAB

B. Pharm. II Year II Sem

L T P C  
0 0 4 2

List of Experiments:

**I Preparation of drugs/ intermediates**

- 1 1,3-pyrazole
- 2 1,3-oxazole
- 3 Benzimidazole
- 4 Benzotriazole
- 5 2,3- diphenyl quinoxaline
- 6 Benzocaine
- 7 Phenytoin
- 8 Phenothiazine
- 9 Barbiturate

**II Assay of drugs**

- 1 Chlorpromazine
- 2 Phenobarbitone
- 3 Atropine
- 4 Ibuprofen
- 5 Aspirin
- 6 Furosemide

**III Determination of Partition coefficient for any two drugs**

**Recommended Books (Latest Editions)**

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I. Vogel

## PS407: PHYSICAL PHARMACEUTICS – II LAB

B. Pharm. II Year II Sem

L T P C  
0 0 4 2

### List of Experiments:

1. Determination of surface tension of given liquids by drop count and drop weight method
2. Determination of HLB number of a surfactant by saponification method
3. Determination of Freundlich and Langmuir constants using activated char coal
4. Determination of critical micellar concentration of surfactants
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

### Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



## PC408: PHARMACOLOGY – I LAB

B. Pharm. II Year II Sem

L T P C  
0 0 4 2

### List of Experiments:

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods

*Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos*

### Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,

PC409: PHARMACOGNOSY AND PHYTOCHEMISTRY – I LAB

B. Pharm. II Year II Sem

L T P C  
0 0 4 2

**List of Experiments:**

1. Analysis of crude drugs by chemical tests: (i) Tragacanth (ii) Acacia (iii) Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and palisade ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming

**Recommended Books: (Latest Editions)**

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

## MC400: GENDER SENSITIZATION LAB

B. Pharm. II Year II Sem

L T P C  
1 0 0 0

### Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

### Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

### UNIT-I

#### UNDERSTANDING GENDER

**Gender:** Why Should We Study It? (*Towards a World of Equals*: Unit -1)

**Socialization:** Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

### UNIT-II

#### GENDER AND BIOLOGY

**Missing Women:** Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)  
Declining Sex Ratio. Demographic Consequences.

**Gender Spectrum:** Beyond the Binary (*Towards a World of Equals*: Unit -10)  
Two or Many? Struggles with Discrimination.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.

### UNIT-III

#### GENDER AND LABOUR

**Housework:** the Invisible Labour (*Towards a World of Equals*: Unit -3)

“My Mother doesn’t Work.” “Share the Load.”

**Women’s Work:** Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

### UNIT-IV

#### ISSUES OF VIOLENCE

**Sexual Harassment:** Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: “Chupulu”.

**Domestic Violence:** Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-“I Fought for my Life....” - Additional Reading: The Caste Face of Violence.

### UNIT-V

#### GENDER: CO - EXISTENCE

**Just Relationships:** Being Together as Equals (*Towards a World of Equals*: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.


### TEXTBOOK

All the five Units in the Textbook, “*Towards a World of Equals: A Bilingual Textbook on Gender*” written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**, Telangana State in the year **2015**.

**Note:** Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering/pharmacy departments.

### REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. “I Fought For My Life...and Won.” Available online at: <http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulali/>

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.PHARM. III YEAR COURSE STRUCTURE & SYLLABUS (R16)

Applicable From 2016-17 Admitted Batch

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PS501	Pharmaceutical Microbiology	4	1	0	4
2	PS502	Pharmaceutical Technology - I	4	1	0	4
3	PS503	Pharmacology – I	4	1	0	4
4	PS504	Pharmacognosy – II	3	1	0	3
5		<b>Open Elective - II</b>	3	0	0	3
	PS505	Drug Regulatory Affairs				
	PS506	Active Pharmaceutical Ingredient Process Development				
	MS507	Entrepreneurship and Small Business Enterprises				
6	PS508	Pharmaceutical Microbiology Lab	0	0	3	2
7	PS509	Pharmaceutical Technology - I Lab	0	0	3	2
8	PS510	Pharmacology – I Lab	0	0	3	2
9	*MC500	Professional Ethics	3	0	0	0
		Total	21	4	9	24

III YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PS601	Medicinal Chemistry - I	3	1	0	3
2	PS602	Pharmaceutical Technology – II	3	1	0	3
3	PS603	Pharmacology – II	4	1	0	4
4	PS604	Chemistry of Natural Products	3	1	0	3
5		<b>Open Elective - III</b>	3	0	0	3
	PS605	Generic Product Development				
	PS606	Drug Design and Discovery				
	PS607	Screening Methods in Pharmacology				
6	PS608	Medicinal Chemistry - I Lab	0	0	3	2
7	PS609	Pharmaceutical Technology – II Lab	0	0	3	2
8	PS610	Pharmacology – II Lab	0	0	3	2
9	HS611	Advanced English Communication skills Lab	0	0	3	2
		Total	16	04	12	24

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(H), Medchal Dist. T.S.-501301.

## PS501: PHARMACEUTICAL MICROBIOLOGY

B. Pharm III Year I sem

L	T	P	C
4	1	0	4

**Course Objectives:** Microbiology is always considered to be an essential component of Pharmacy curriculum because of its relevance to pharmaceutical sciences and more specifically to pharmaceutical industry.

This course deals with the various aspects of microorganism their classification morphology, laboratory cultivation, identification, maintenance and control of microorganism, sterility testing and biosafety measures.

The course also covers bacterial genetics, drug resistance and microbiological assays and microbial limit tests.

**Course Outcomes:** Upon completion of the subject student shall be able to –

- know the anatomy, identification & cultivation of microorganisms
- Perform sterilization of various pharmaceutical products, equipment, culture media etc.
- Perform sterility testing of pharmaceutical products.
- Perform microbiological assay of antibiotics, Vitamins and amino acids
- Do microbiological analysis of air, water and milk

### UNIT I

**a. Introduction to Microbiology:** Origin, scope and discovery of spontaneous generation theory, contributions of Antony Van Leewenhoek, Louis Pasteur, Robert Koch and Joseph Lister.

**b. Diversity of Microorganisms:** Prokaryotes versus eukaryotes – three domains of life (bacteria, archaea and eukaryotes). A detailed study of bacteria, yeasts, molds and viruses including their classification. Characterization and identification of microorganisms.

### UNIT II

**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 III

**a. Control of Microorganisms:** General concepts, Inhibition of growth and killing, sterilization and disinfection, antiseptics and sanitation, mode of action applications & limitations of physical agents (moist and dry heat, radiation and filtration) and chemical agents. Various types of disinfectants, factors affecting sterilization and disinfection, evaluation of antimicrobial activity.

**b. Official methods of sterility testing of pharmaceuticals and biosafety measures.**

### UNIT IV

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

### UNIT V

**a. Introduction to Microbiology of Air, Water and milk. Methods of quantitative evaluation of microbial Contamination.**

**b. Microbiological Assays:** Principles and methods involved in assay of Antibiotics, Vitamins, Amino acids &

Bio-Sensors in Analysis.

c. Microbial limit tests official in IP

#### TEXT BOOKS

1. Pelzar and Reid, Text Book of Microbiology
2. Anantha Narayan and Jayram Panikar, Text Book of Microbiology, Orient Longman, Delhi, Hyderabad.
3. Indian Pharmacopoeia, 1996

#### REFERENCES

1. Tortora / Funke / Care / Microbiology an introduction.
2. Stephen. P, Denyer, N.A. Hodger- Hugo & Russel's Pharmaceutical Microbiology .

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## PS502: PHARMACEUTICAL TECHNOLOGY – I

B. Pharm III Year I sem

L T P C  
4 1 0 4

**Course Objectives:** The student shall be taught on preformulation factors and objectives of preformulation, stability and Bioavailability of formulation, concept of products, semisolids, aerosols and cosmetic preparations.

**Course Outcome:** Student will know the preformulation parameters in designing the dosage form, ICH guidelines, preparation and evaluation of semisolids, ophthalmic and cosmetics.

### 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

#### a) Tablets: Formulation and evaluation of tablets:

Conventional, matrix, chewable, multi-layered tablets, buccal and sublingual, fast dissolving tablets and gastric retention drug delivery systems

b) Machinery used in granulation techniques like rapid mixer granulation, fluidised bed systems and tablet compression

### UNIT III

**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. Pellet technology

### UNIT IV

a) **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.

b) **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

**Cosmeticology and Cosmetic Preparations:** Fundamentals of cosmetic science, Formulation, preparation and packaging of cosmetics for skin, hair, dentrificers like tooth powders, paste, gels and manicure preparations like nail polish, lipsticks, eye lashes, baby care products etc.

### TEXT BOOKS

- L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of industrial Pharmacy, Lea & Febieger, Philadelphia Latest Edn.
- CVS. Subramanyam, Pharmaceutical production and management, Vallabh Prakashan, New Delhi 2005.
- Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



#### REFERENCES

1. Shobha Rani, Text of Industrial Pharmacy, Hiremath Orient Longman
2. Essentials of pharmaceutical technology by Ajay semelty, Mona Semalty



**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Madhachai Dist. T.S.-501301.

## PS503: PHARMACOLOGY – I

B. Pharm III Year I sem

L T P C  
4 1 0 4

**Course Objectives:** This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, and route of administration, precautions, contraindications and interaction with other drugs.

**Course Outcome:** Understand the pharmacological aspects of drugs, importance of pharmacology subject as a basis of therapeutics and correlate the knowledge therapeutically.

### UNIT I

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

### UNIT II

**Pharmacology of Peripheral Nervous System:**

- Neurohumoral transmission (autonomic and Somatic)
- Parasympathomimetics, parasympatholytics, sympathomimetics & sympatholytics
- Skeleton muscle relaxants

### UNIT III

**Pharmacology of Central Nervous System:**

- Neurohumoral transmission in the C.N.S.
- General anesthetics.
- Alcohols and disulfiram.
- Pharmacology of Sedatives, hypnotics, anti-anxiety agents

### UNIT IV

- Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs.
- Narcotic analgesics and antagonists.
- C.N.S. stimulants
- Drug Addiction and Drug Abuse.
- Local anesthetic agents

### UNIT V

- Psychopharmacological agents (antipsychotics) Antidepressants, anti- maniacs and hallucinogens.
- Pharmacology of Anti-epileptic drugs
- Anti-Parkinsonian Drugs

### TEXT BOOKS

- Tripathi, Textbook of Pharmacology, JAYPEE
- F.S.K Barar, Essentials of Pharmacotherapeutics.
- H.P Rang, M. M. dale & J.M. Ritter, Pharmacology,; Churchill Living stone, 4<sup>th</sup> Ed.

### REFERENCES

- Sathoskar, Pharmacology and pharmaco therapeutics Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.
- Pharmacology, An illustrated review by Mark A Simmons

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryl(V), Keesara(M), Medchal Dist. T.S.-501301.

## PS504: PHARMACOGNOSY – II

B. Pharm III Year I sem

L T P C  
3 1 0 3

**Course Objectives:** To have knowledge on the formation of pharmaceutically important secondary metabolites in plants and their commercial significance. The role of fibres, natural sweetening agents, colorants, volatile oils, tannins, resins in pharmaceutical, cosmetic and food industry. To make the student aware of what is Ayurveda and its various preparations.

**Course Outcome:** After the study of the course, the student shall be able to know about the phytopharmaceuticals of commercial significance and the various applications of the crude drugs in the preparation of formulations as medicaments and excipients (Flavors, perfumes, sweeteners and colorants).

### UNIT I

#### Biogenesis of Natural Products:

- A brief account of primary and secondary metabolite production in plants.
- Shikimic acid pathway and acetate mevalonate path way
- Biosynthesis of Alkaloids- Atropine, Morphine, Ergotamine, Reserpine, Isoprenoid compounds –Diosgenin and scillaren

### UNIT II

- General introduction to Volatile oils.
- Systematic pharmacognostic study of the following: Cinnamon, Cassia, Clove and Cardamom.
- Biological source, collection preparation, chemical constituents uses of the following crude drugs – Fennel, Dill, Ginger, Eucalyptus oil, Gaultheria, Lemon grass oil, Oil of Citronella,
- Mentha oil.

### UNIT III

- General introduction to Tannins and Resins
- Biological source, collection and preparation, chemical constituents, tests for identification and uses of following – Black Catechu, Pale Catechu, Myrobalan, Arjuna, Balsam of Tolu, Benzoin, Guggul and Podophyllum.

### UNIT IV

- Herbal cosmetics: History and concept development of herbal cosmetics. A brief account on the following herbs in cosmetic preparation.  
Skin care: Aloe, Neem, Turmeric, Saffron and Sandal wood.  
Hair care: Amla, Henna, Hibiscus, Bringraj.
- An introduction to potential cardiovascular, anticancer/cytotoxic and antibiotic drugs from marine sources.

### UNIT V

- Study of Fibres used in Pharmacy such as Cotton, Silk, Wool and Glass wool.
- Study of mineral drugs: Asbestos, Bentonite, Kaolin, kessulgurh 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.

### REFERENCES

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

1. Atal C.R & Kapur B.M, Cultivation & Utilization of Medicinal Plants.
2. Mohammad Ali, Pharmacognosy. CBS Publications.

*Geethanjali*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. -501301.

**PS505: DRUG REGULATORY AFFAIRS**  
(Open Elective – II)

**B. Pharm III Year I sem**

**L T P C**  
**3 0 0 3**

**Course Objectives** - Various procedures for approval of API and formulations for manufacture, sale, export and import of drugs.

**Course Outcome:** The clear information about the regulations in India and abroad is gained by the students.

**UNIT I**

Introduction to Drug regulatory affairs, organisation structure of India, in central and state Division of drug controller of India and their function

**UNIT II**

Procedure for obtaining manufacturing for basic drug and formulation, sale of drugs, import & export of drugs and their permission procedures.

**UNIT III**

Application for procedures for approval for formulations and Active Pharmaceutical Ingredient.

**UNIT IV**

USFDA & Europe, Japan guidelines for obtaining approval for API and formulations

**UNIT V**

Salient features and principles of Quality by Design (QBD), ICH and WHO, obtaining for API and formulations approval

**TEXT BOOKS**

1. Laws of drugs in India, Hussain
2. New drug approval process, 5<sup>th</sup> edition, by Guarino
3. Commercial Manual on Drugs and Cosmetics 2004, 2<sup>nd</sup> edition

**REFERENCES**

1. Good Manufacturing Practices for Pharmaceuticals, S.H. Wiling, Vol. 78, Marcel Decker.
2. fda.org, hc-sc.gc.ca, ich.org, cder.org

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**PS506: ACTIVE PHARMACEUTICAL INGREDIENT PROCESS DEVELOPMENT**  
(Open Elective – II)

B. Pharm III Year I sem

L	T	P	C
3	0	0	3

**Course Objectives:** Mainly emphasizes on development of process from pilot preparation to bulk drug synthesis in pharmaceutical industries.

**Course Outcome:** Students would understand the various aspects regarding process development and synthesis from pilot preparation to bulk drug.

**Basic principles, salient features and applications for the following units:**

**UNIT-I:**

Development and scale up techniques for the manufacture of new pharmaceutical active ingredients.

**UNIT-II**

Process optimisation, maximisation of synthetic route from pilot plant.

**UNIT-III**

Commercial production of bulk drugs like (i) reaction sequence (ii) process flow and engineering aspects.

**UNIT-IV**

Process technologies for natural products from plants, animals, marine and microbial sources.

**UNIT-V**

ICH Q11 for API development.

**TEXT BOOKS:**

1. Pharmaceutical Process Chemistry for Synthesis: Rethinking the Routes to Scale-Up ,
2. Peter J. Harrington ,John Wiley and Sons Inc. Publication 2011
3. Strategies for Organic Drug Synthesis and Design by Daniel Lednicer, 2nd Edition,John Wiley and Sons Inc. Publication, 2008

**REFERENCE:**

1. Good Pharmaceutical Manufacturing Practice: Rationale and Compliance by Sharp John, CRC Press; 1<sup>st</sup> edition Management Information Systems by Laudon Kenneth C. Prentice Hall; 12th edition, 2011.
2. ICH Guidelines, www.ich.org

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist, T.S.-501301.

**MS507: ENTREPRENEURSHIP AND SMALL BUSINESS ENTERPRISES**  
(Open Elective – II)

B. Pharm III Year I sem

L	T	P	C
3	0	0	3

**Course Objective:** The aim of this course is to have a comprehensive perspective of inclusive learning, ability to learn and implement the Fundamentals of Entrepreneurship.

**Course Outcome:** It enables students to learn the basics of Entrepreneurship and entrepreneurial development which will help them to provide vision for their own Start-up.

**Unit – I:**

**Entrepreneurial Perspectives:**

Evolution, Concept of Entrepreneurship, Types of Entrepreneurs, Entrepreneurial Competencies, Capacity Building for Entrepreneurs.

Entrepreneurial Training Methods; Entrepreneurial Motivations; Models for Entrepreneurial Development, The process of Entrepreneurial Development.

**Unit – II:**

**New Venture Creation:**

Introduction, Mobility of Entrepreneurs, Models for Opportunity Evaluation; Business plans – Purpose, Contents, Presenting Business Plan, Procedure for setting up Enterprises, Central level - Startup and State level - T Hub, Other Institutions initiatives.

**Unit – III:**

**Management of MSMEs and Sick Enterprises**

Challenges of MSMEs, Preventing Sickness in Enterprises – Specific Management Problems; Industrial Sickness; Industrial Sickness in India – Symptoms, process and Rehabilitation of Sick Units.

**Units – IV:**

**Managing Marketing and Growth of Enterprises:**

Essential Marketing Mix of Services, Key Success Factors in Service Marketing, Cost and Pricing, Branding, New Techniques in Marketing, International Trade.

**Units – V:**

**Strategic perspectives in Entrepreneurship:**

Strategic Growth in Entrepreneurship, The Valuation Challenge in Entrepreneurship, The Final Harvest of New Ventures, Technology, Business Incubation, India way – Entrepreneurship; Women Entrepreneurs – Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India.

**Text Books:**

1. Entrepreneurship Development and Small Business Enterprises, Poornima M. Charantimath, 2e, Pearson, 2014.
2. Entrepreneurship, A South – Asian Perspective, D. F. Kuratko and T.V.Rao, 3e, Cengage, 2012.

**REFERENCES:**

1. Entrepreneurship, Arya Kumar, 4 e, Pearson 2015.
2. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2015.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

PS508: PHARMACEUTICAL MICROBIOLOGY LAB

B. Pharm III Year I sem

L T P C  
0 0 3 2

1. Introduction to equipment and glassware used in microbiology laboratory.
2. Study of morphology of different microbes
3. Preparation of various culture media, 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. Characterization of microbes through Bio chemical reactions:
  - a. Indole test.
  - b. Methyl red test.
  - c. Voges proskauer test.
  - d. Starch hydrolysis test.
  - e. Fermentation of carbohydrates.
9. Isolation of pure cultures by streak plate, spread plate & pour plate techniques.
10. Enumeration of bacteria by pour plate/spread plate technique
11. Enumeration of bacteria by direct microscopic count.
12. Evaluation of any 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.

REFERENCE

1. Garg, F C Experimental Microbiology
2. Gaud, R.S, Gupta G.D, Practical Microbiology
3. Vanitha Kale and kishore Bhusari, Pratical microbiology principles and Techniques

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. -501301.



PS509: PHARMACEUTICAL TECHNOLOGY - I LAB

B. Pharm III Year I sem

L T P C  
0 0 3 2

1. Preformulation studies  
Bulk properties, different densities, size and size distribution analysis, compressibility, Carr's index, Angle of repose, hausner's ratio
2. Solubility profile estimation in different pH media
3. Partition coefficient determination
4. Effect of crystallinity/amorphous structures on the solubility of the given drugs
5. Preparation and evaluation of official ointments and gels (in each category any two)
6. Preparation and evaluation of dry syrups (ampicillin, amoxicillin)
7. Preparation and evaluation of the following cosmetics
  - a. Shampoos, tooth pastes, tooth powders, nail polish, baby shampoo,
  - b. Baby powders, lipsticks, vanishing cream, cold cream, depillators.
8. Evaluation of packaging materials such as glass, plastics, cotton (hydrolytic resistance test for glass) and light absorption test for rubber and closures.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301,

PS510: PHARMACOLOGY – I LAB

B. Pharm III Year I sem

L	T	P	C
0	0	3	2

1. **Introduction to Experimental Pharmacology**
  - a) Preparation of different solutions for experiments.
  - b) Drug dilutions, use of molar and w/v solutions in experimental Pharmacology.
  - c) Common laboratory animals and anesthetics used in animal studies.
  - d) Commonly used instruments in experimental pharmacology.
  - e) Some common and standard techniques.
  - f) Bleeding and intravenous injection, intragastric administration.
2. **Experiments on intact preparations:**  
Study of different routes of administration of drugs in mice/rats.
3. **Experiments in Central Nervous system:**  
Recording of spontaneous motor activity, stereotype, analgesia, anticonvulsant activity, anti-inflammatory activity,
4. **To study the effect of autonomic drugs on rabbit's eye**
5. **Experiments on Isolated Preparations:**  
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.
  - a) To record the concentration response curve (CRC) of acetylcholine using rectus abdominus muscle preparation of frog.
  - b) To study the effects of physostigmine and d-tubocurarine on the CRC of acetylcholine using frog rectus abdominus muscle preparation of frog.
  - c) To record the CRC of 5-HT on rat fundus preparation.
  - d) To record the CRC of histamine on guinea pig ileum preparation.
  - e) To study the inotropic and chronotropic effects of drugs on isolated frog heart.
  - f) 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).**

**REFERENCE:**

Experimental Pharmacology, M.C. Prabhakar.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301,

## MC500: PROFESSIONAL ETHICS

B. Pharm III Year I sem

L	T	P	C
3	0	0	0

**Course Objective:** To enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and Professional lives.

**Course Outcome:** The students will understand the importance of Values and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

### UNIT - I

**Introduction to Professional Ethics:** Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

### UNIT - II

**Basic Theories:** Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

### UNIT - III

**Professional ethics in pharmacy:** general introduction to code of pharmaceutical ethics, objectives, pharmacists in relation to his job, his trade, to his profession and relation to medicinal professions. Pharmacists oath.

### UNIT - IV

Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation.


Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

### UNIT - V

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

### TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

PS601: MEDICINAL CHEMISTRY – I

B. Pharm III Year II sem

L T P C  
3 1 0 3

**Course Objectives:** The basic consideration of drug activity, drug metabolism and medicinal substances belonging to different categories are discussed in an elaborative manner. The synthesis and mechanism of action of the medicinal compounds are explained in an organized way which helps the students to understand the medicinal uses of the compounds.

**Course Outcome:** The students gain good knowledge about the usage of medicinal substances, the synthesis and drug-drug interactions, so that they can get involved with confidence in the patient counseling.

**UNIT I**

**a. 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 approaches.

**b. 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 II**

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

**a. Hypnotics and Anxiolytics:** Phenobarbital, diazepam, alprazolam, glutethimide

**Anti-psychotics:** Chlorpromazine, haloperidol, clozapine, oxyphenazine.

**Anti-epileptics:** Phenytoin, valproic acid, carbamazepine, ethosuximide.

**Anti-depressants:** Imipramine, fluoxetine, doxepine

**b. Local anesthetic and General anesthetic agents:** benzocaine, procaine, dibucaine and lidocaine, halothane and thiopental sodium.

**UNIT III**

**a. Adrenergic agents and adrenergic blockers.** Isoproterenol, atenolol, hexoxybenzamine, amphetamine,

ephedrine, salbutamol,

**b. Cholinergic agents and acetyl cholinesterase inhibitors**

**Cholinergics:** Carbachol, bethanichol

**Anticholinesterase:** Neostigmine, pyridostigmine

**Neuromuscular blockers:** succinyl choline.

**c. Anti-cholinergics:** atropine, ipratropium bromide, dicyclomine, bipyridine, propantheline

**UNIT IV**

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

**b. 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

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301,

- iii. NSAIDS – Aspirin, paracetamol, oxyphenbutazone, ibuprofen, indomethacin, diclofenac and meloxicam
- iv. A brief account on Cox-2 inhibitors and nimsulide.

#### UNIT V

##### General account of cardiovascular diseases

- a. **Antihypertensives:** methyldopa, amlodipine, enalapril, losartan.
- b. **Anti-arrhythmics:** procainamide
- c. **Diuretics:** acetazolamide, hydrochlorthiazide, furosemide
- d. **Anticoagulants, Anti-anginals and Coronary vasodilators:** Isosorbide dinitrate, verapamil, diltiazem

#### 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, 11<sup>th</sup> Ed, Lipcott, Raven, Philadelphia, 2004.
3. Medicinal Chemistry by Korol Kavas.

#### REFERENCES

1. D. Abraham (Ed), Burger Medicinal chemistry and Drug discovery, Vol. 1 & John Wiley & Sons, New York 2003, 6<sup>th</sup> Ed.
2. Daniel Lednicher, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y. 1998.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. -501302.

## PS602: PHARMACEUTICAL TECHNOLOGY – II

B. Pharm III Year II sem

L T P C  
3 1 0 3

**Course Objectives:** Student will know the formulation and evaluation of tablets, coated tablets, capsules, micro-encapsules and parenteral preparations in laboratories and industrial scale.

**Course Outcome:** The students shall be exposed to various aspects of pharmaceutical product preparations and evaluations of tablets, capsules etc.

### UNIT I

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

### UNIT II

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

**b. Dry Syrups,** Formulation, Preparation, Evaluation and special applications with examples.

### UNIT III

#### Parenteral Products

**a. Preformulation factors,** routes of administration, water for injection, treatment apyrogenicity, non-aqueous vehicles, isotonicity and methods of its adjustment.

**b. Formulation details,** container and closures and selection.

**c. Prefilling treatment,** washing and sterilization of containers and closures, preparation of solution and suspensions, filling and closing of ampules, vials, infusion fluids, lyophilization & preparation of sterile powders, equipment for large-scale manufacture and evaluation of parenteral products.

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

### UNIT IV

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

### UNIT V

**a. 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.

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

### TEXT BOOKS

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

### REFERENCES

1. Sagarian & MS Balsam, Cosmetics Sciences & Technology, Vol.1, 2 & 3
2. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## PS603 PHARMACOLOGY – II

B. Pharm III Year II sem

L T P C  
4 1 0 4

**Course Objectives:** This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs.

**Course Outcome:** Understands the pharmacological aspects of drugs, importance of pharmacology subject as a basis of therapeutics and correlate the knowledge therapeutically.

### UNIT I

#### Pharmacology of drugs acting in cardiovascular diseases

- a. Congestive heart failure
- b. Hypertension.
- c. Shock.
- d. Arrhythmias

### UNIT II

- a. Pharmacology of Drugs used in coronary artery disease and Hyperlipidemias.
- b. Pharmacology of Drugs acting on hematopoietic system  
Anti-coagulants, Anti-platelets, Thrombolytics & Hematinics.
- c. Pharmacology of Drugs acting on Urinary system  
Diuretics

### UNIT III

#### Autacoids

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

### UNIT IV

- a. Drugs acting on the respiratory system  
Anti-asthmatic drugs.  
Anti-tussives and expectorants.  
Respiratory stimulants
- b. Bioassays: Applications, Principles and Methods of Bioassays.
- c. Study of bioassay methods for the following drugs  
a. Digitalis,    b. D – tubocurarine,    c. Oxytocine  
d. HCG.

### UNIT V

#### Drugs acting on Endocrine system

- a. Insulin, Oral hypoglycaemic agents
- b. Adrenal steroids
- c. Anti thyroid agents.
- d. Oral contraceptives

### TEXT BOOKS

1. Tripathi, Textbook of Pharmacology, JAYPEE
2. F.S.K Barar, Essentials of Pharmacotherapeutics
3. H.P Rang, M. M. Dale & J.M. Ritter, Pharmacology, Churchill Livingstone, 4<sup>th</sup> Ed.

*Geethanjali*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## REFERENCES

1. Crossland, Lewis 's Pharmacology, Church living stone
2. Mark A. Simmons, Pharmacology An Illustrated Review

*Geethanjali*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



## PS604: CHEMISTRY OF NATURAL PRODUCTS

B. Pharm III Year II sem

L	T	P	C
3	1	0	3

**Course Objectives:** The chemistry including the structure elucidation of the natural products belonging to different groups such as amino acids, alkaloids, carbohydrates, steroids etc. are discussed in depth.

**Course Outcome:** The knowledge of the students is enhanced with the clear information about the natural products which are having medicinal importance.

### UNIT I

#### Poly Functional Natural Products

**(a) Carbohydrates:** Introduction, Definition, Classification, Isolation, General Properties (including isomerism) and Pharmaceutical importance of Carbohydrates, Chemistry (Structure, Nomenclature and Reactions) of glucose, fructose, sucrose, maltose, cellulose and starch.

**(b) Oils & Fats:** Introduction, Definition, Classification, Isolation, General properties and Pharmaceutical importance of oils and fats. Chemistry (structure, nomenclature and reactions) of oils and fats and analysis according to Pharmacopoeial methods

### UNIT II

#### Amino Acids and Proteins

Introduction, definition, classification, isolation, general properties and pharmaceutical importance of amino acids and their relationship to proteins and polypeptides.

Chemistry of Protein Hormones: Insulin, Oxytocin, Thyroxin and Anti-thyroid drugs

### UNIT III

**a. Flavonoids:** Sources, uses, chemistry and General methods of structural determination (chemical & spectral analysis) of Amygdalin, arbutin and quercetin

**b. Terpenoids: Definition and Classification:** Isoprene rule, Special Isoprene rule for terpenes, General methods of isolation. Chemistry and structure elucidation of citral, menthol and camphor.

### UNIT IV

#### a. Alkaloids

Introduction, definition, occurrence, classification, isolation, general properties and pharmaceutical importance of alkaloids. General methods of extraction, structure elucidation and chemistry (structure, nomenclature and reactions) of ephedrine, atropine, papaverine and quinine

#### b. Purine and Xanthine Derivatives

Chemistry and Pharmaceutical importance Caffeine, Theophylline, Theobromine and Uric acid.

### UNIT V

#### Steroids

Introduction, Definition, Occurrence, Classification, Isolation, General properties and Pharmaceutical importance of Sterols: color reactions of cholesterol, stigmasterol, ergosterol. Importance & general concepts of bile acids. Steroidal saponins: Diosgenin and hecogenin. Androgens, Estrogens, Progestational agents, Steroidal contraceptives. Adrenocorticoids, Deoxycorticosterone, Cortisone, Prednisone, Aldosterone. Cardiac Glycosides of Digitalis other Cardiac drugs, Strophanthus and Squill.

### TEXT BOOKS

1. Organic Chemistry, Vol.II by I.L. Finar, The English Language Book Society, London.
2. Natural Products Vol.I & II by O.P. Agarwal Goel publications – Meerut.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

3. F.G.Mann & B. Saunders, Practical Organic Chemistry Longmans Green & Co. Ltd., U.K

**REFERENCE BOOKS**

1. Burger's Medicinal Chemistry, M.E. – Wolff, Ed., John Wiley & Sons, New York.
2. R. M. Acheson, An Introduction to the Chemistry of Heterocyclic Compounds, Interscience NY.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Marichal Dist. T.S.-501301.

**PS605: GENERIC DRUG PRODUCT DEVELOPMENT**  
(Open Elective – III)

B. Pharm III Year II sem

L T P C  
3 0 0 3

**Course Objectives:** To learn the generic drug product development process, dosage form design and development, analytical method development and dossier approval process.

**Course Outcome:** The knowledge of the students is enhanced with the clear information about the generic product development.

**Unit I:**

- a) Concept of generic drug product development, Hatch-Waxman act and its amendments.
- b) History of generic product development in US

**Unit II:**

Design of dosage form to meet equivalence to reference listed drug, product development steps, formula optimization, process optimization and packaging selection.

**Unit III:**

Analytical method development for verification and validation for active ingredient, in-process samples and finished dosage forms.

**Unit IV:**

- a) Stability studies on active ingredient and finished dosage forms, accelerated stability studies, stability studies at different conditions, determination or expiration date.
- b) Scale up studies to optimize manufacturing process and execution of exhibit batches.

**Unit V:**

- a) Bioequivalence studies, various designs of bioequivalence studies, bioequivalence criteria and in-vitro tests to ensure bioequivalence of test product.
- b) Introduction to electronic Common Technical Document (eCTD), various modules and the important information in each module.
- c) Drug product approval process in India and US.

**REFERENCE**

1. Generic Drug product Development: Solid oral dosage forms-Leon Shargel.
2. ICH guidelines.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesora(M), Medchal Dist. T.S.-501 301.

PS606: DRUG DESIGN AND DISCOVERY  
(Open Elective - III)

B. Pharm III Year II sem

L	T	P	C
3	0	0	3

**Course Objectives:** Emphasizes on the conceptual background and development of medicinal chemistry and drug design. Identification of lead for new drug design. Modification of lead aimed at changing Pharmacodynamic and Pharmacokinetics.

**Course Outcome:** The students would be in a position to identify lead for new drug design, to design and discover the novel drugs with the knowledge they gained through the study of the various topics of the syllabus.

**Basic principles, salient features and applications for the following units:**

**Unit-I**

Introduction of modern drug discovery concept and technologies.

**Unit-II**

Principles of combinatorial chemistry.

**Unit-III**

Introduction to structure based drug design.

**Unit-IV**

Molecular modelling and drug design.

**Unit-V**

QSAR.

**TEXT BOOKS**

1. Textbook of Drug Design and Discovery, 4th Ed., by Larsen
2. Structure-based Drug Discovery by Jhoti, Harren
3. William H, Malick JB "Drug Discovery and Development" Humana Press Clifton.

**REFERENCE**

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Park Press Baltimore.
2. Martin YC. "Quantitative Drug Design" Dekker, New York.

*Sanjiv Reddy*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**PS607: SCREENING METHODS IN PHARMACOLOGY**  
(Open Elective – III)

B. Pharm III Year II sem

L	T	P	C
3	0	0	3

**Course Objectives:-** The students is going to study about various techniques for screening of drugs for various pharmacological activities and guide lines for handling animals and human and animal ethics for screening of drugs.

**Course Outcome:** - The expected outcomes are student will know how to handle animals and know about various techniques for screening drugs for different pharmacological activities and guidelines and regulations for screening new drug molecules on animals and human volunteers.

**UNIT I**

Care Handling and breeding techniques of laboratory animals, CPCSEA guidelines, alternatives to animal studies, Good laboratory Practices.

**UNIT II**

Bioassays: Basic principles of Biological standardization, Merits and demerits, methods used in the bio-assay of Rabbis Vaccine and Oxytocin. Test for pyrogens.

**UNIT III**

Toxicity tests: OECD guidelines, determination of LD50, acute, subacute and chronic toxicity studies.

**UNIT IV**

Screening: Definition, types of screening methods. Pharmacological activity of new substances with emphasis on the evaluation of analgesic, antipyretic and anti-inflammatory activity.

**UNIT V**

Screening for the Pharmacological activity of epilepsy, cardiac, psychopharmacological, anti diabetic and anticancer.

**TEXT BOOKS**

1. Screening methods in Pharmacology, Vol.-1&2 by Robert .A. Turner and Peter Hebborn.
2. Pharmacological Screening Methods & Toxicology by Srinivasa Rao A,Pharmamed press publishers.
3. Handbook of experimental pharmacology by S.K. Kulkarni, Vallabh Prakashan, Delhi.

**REFERENCE BOOKS**

1. ICH of technical requirements for registration of pharmaceuticals for human use, ICH harmonized Tripartite guidelines - Guidelines for good clinical practice, E6, May 1996.
2. Good clinical practice - Guidelines for Clinical trails on pharmaceutical products in India, Central drug standard control organization, New Delhi, Minister of Health- 2001

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

PS608: MEDICINAL CHEMISTRY – I LAB

B. Pharm III Year II sem

L	T	P	C
0	0	3	2

i. **Synthesis of some medicinal compounds and their analogues.**


- a. Barbituric acid from Diethyl Malonate.
- b. Phenytyion from Benzoin or Benzil.
- c. Paracetamol from *para*- nitro phenol or *para*- aminophenol.
- d. 1,4- di hydro pyridine from ethyl aceto acetate.
- e. Quinazolinone from anthranilic acid via benzoxazinone.
- f. Synthesis of Finofibrate
- g. Isoniazid from  $\gamma$ -picoline.
- h. Antipyrine from ethyl aceto acetate.
- i. Benzocaine from *para*- nitro benzoic acid.

ii. **Qualitative estimation of some functional groups. \***

- a. Halogens (Strepheno's method).
- b. Hydroxyl groups (acetylation method)
- c. Methoxyl groups (Zeissel's method)
- d. Carboxyl groups (silver salt method).

**REFERENCES**

- 1) A.I. Vogel, Text Book of Practical Organic Chemistry, 5<sup>th</sup> Edition.
- 2) R.K. Bansal, Laboratory Manual of Organic Chemistry.
- 3) F.G. Mann & B.C. Saunders, Pratical Organic Chemistry, 4<sup>th</sup> Edition.
- 4) Advacned medicinal chemistry lab guide by N. Raghu Prasad and M. Raghuram Rao
- 5) Organic chemistry a Lab manual, Cengage learning India Pvt. Ltd. By Pavia

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

PS609: PHARMACEUTICAL TECHNOLOGY – II LAB

B. Pharm III Year II sem

L	T	P	C
0	0	3	2

1. Experiments to illustrate preparation, stabilization and evaluation of pharmaceutical products like capsules and tablets like conventional, matrix, fast dissolving, multilayered, chewable, buccal, sublingual and Gastric retention
2. Coating of tablets like sugar, film, enteric coating and evaluation

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Kaesara(M), Medchal Dist. T.S.-501301.

PS610: PHARMACOLOGY – II LAB

B. Pharm III Year II sem

L	T	P	C
0	0	3	2

- Experiments on Isolated Preparations:
- To calculate the  $PA_2$  value of atropine using acetylcholine as an agonist on rat ileum preparation.
  - To calculate the  $PA_2$  value of mepyramine or chlorampheniramine using histamine as agonist on guinea pig ileum.
  - 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
    - Matching Assay
    - Two point Assay
    - Three point Assay
2. Pharmacology of the Gastrointestinal Tract  
To study the anti-secretory and anti-ulcer activity using pylorus ligated rats.



PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



## HS611: ADVANCED COMMUNICATION SKILLS (ACS) LAB

B. Pharm III Year II sem

L	T	P	C
0	0	3	2

### Introduction

A course on *Advanced English Communication Skills (AECS) Lab* is considered essential at the third year level of B.Tech and B.Pharmacy courses. At this stage, the students need to prepare themselves for their career which requires them to listen to, read, speak and write in English both for their professional and interpersonal communication. The main purpose of this course is to prepare the students of Engineering for their placements.

**Course Objectives:** This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve students' fluency in spoken English
- To enable them to listen to English spoken at normal conversational speed
- To help students develop their vocabulary
- To read and comprehend texts in different contexts
- To communicate their ideas relevantly and coherently in writing
- To make students industry-ready
- To help students acquire behavioral skills for their personal and professional life
- To respond appropriately in different socio-cultural and professional contexts

**Course Outcomes:** Students will be able to:

- Acquire vocabulary and use it contextually
- Listen and speak effectively
- Develop proficiency in academic reading and writing
- Increase possibilities of job prospects
- Communicate confidently in formal and informal contexts

### Syllabus


The following course activities will be conducted as part of the Advanced English Communication Skills (AECS) Lab:

1. **Inter-personal Communication and Building Vocabulary** - Starting a Conversation – Responding Appropriately and Relevantly – Using Appropriate Body Language – Role Play in Different Situations - Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.
2. **Reading Comprehension** –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, , Skimming, Scanning, Inferring Meaning.
3. **Writing Skills** – Structure and Presentation of Different Types of Writing – Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing.
4. **Presentation Skills** – Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ e-mails/Assignments... etc.,
5. **Group Discussion and Interview Skills** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation- Concept and Process, Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

### Minimum Hardware Requirement

Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics**
- **Eight round tables with five movable chairs for each table.**
- **Audio-visual aids**
- **LCD Projector**

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

- Public Address system
- Computer with suitable configuration

**Suggested Software:** The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 8<sup>th</sup> Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.

**REFERENCES:**

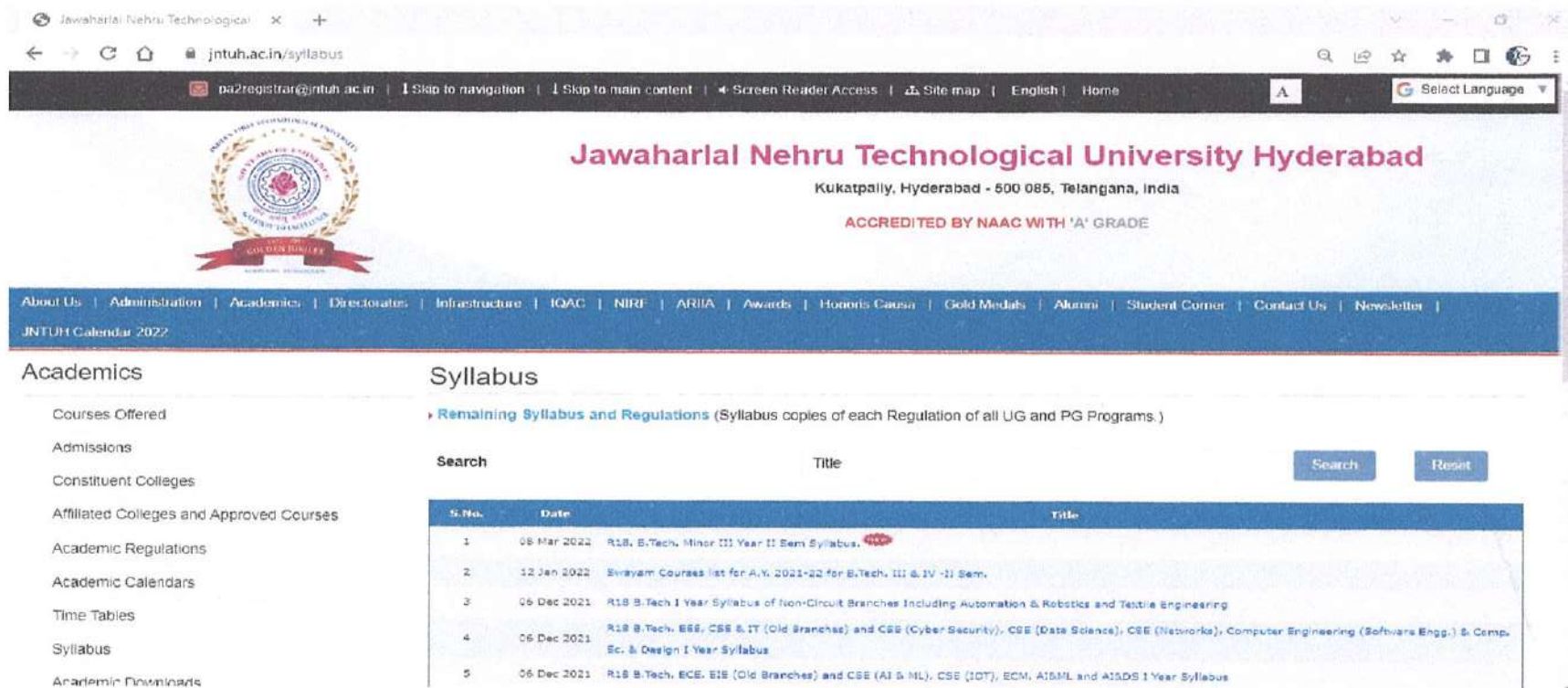
1. Kumar, Sanjay and Pushp Lata. *English for Effective Communication*, Oxford University Press, 2015.
2. Konar, Nira. *English Language Laboratories – A Comprehensive Manual*, PHI Learning Pvt. Ltd., 2011.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## JNTUH Syllabus Links in JNTUH Sites

1. <https://intuh.ac.in/syllabus>
2. <https://studentservices.intuh.ac.in/oss/syllabus.html?type=syllabus>



The screenshot shows a web browser window displaying the JNTUH Syllabus page. The browser's address bar shows the URL <https://intuh.ac.in/syllabus>. The page header includes the JNTUH logo and the text "Jawaharlal Nehru Technological University Hyderabad, Kukatpally, Hyderabad - 500 085, Telangana, India, ACCREDITED BY NAAC WITH 'A' GRADE". A navigation menu is visible below the header, listing various university departments and services. The main content area is titled "Syllabus" and features a search bar with "Search" and "Reset" buttons. Below the search bar is a table listing syllabus entries.

**Academics**

- Courses Offered
- Admissions
- Constituent Colleges
- Affiliated Colleges and Approved Courses
- Academic Regulations
- Academic Calendars
- Time Tables
- Syllabus
- Academic Ordinances

**Syllabus**

▶ [Remaining Syllabus and Regulations](#) (Syllabus copies of each Regulation of all UG and PG Programs.)

Search  Title

S. No.	Date	Title
1	08 Mar 2022	R18 B.Tech. Minor III Year II Sem Syllabus.
2	12 Jan 2022	Elvayam Courses list for A.Y. 2021-22 for B.Tech. III & IV -II Sem.
3	06 Dec 2021	R18 B.Tech I Year Syllabus of Non-Circuit Branches Including Automation & Robotics and Textile Engineering
4	06 Dec 2021	R18 B.Tech. ESE, CSE & IT (Old Branches) and CSE (Cyber Security), CSE (Data Science), CSE (Networks), Computer Engineering (Software Engg.) & Comp. Sc. & Design I Year Syllabus
5	06 Dec 2021	R18 B.Tech. ECE, EIE (Old Branches) and CSE (AI & ML), CSE (IoT), ECM, AISMML and AISMDS I Year Syllabus

Grams: "TECHNOLOGY"  
E-Mail : dapjntuh@gmail.com



Phone: Off: +914023156115  
Fax: +914023158665

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by Andhra Pradesh Act No.30 of 2008)  
Kukatpally, Hyderabad 500 085, Telangana State, India

### IMPORTANT POINTS ON R 15 REGULATIONS:

- ☞ The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.
- ☞ After eight academic years of course of study, the candidate is permitted to write the examinations for two more years.
- ☞ The candidate shall register for 226 (224+2 credits for Gender Sensitization) and secure 218 (216+2) credits and all practical subjects, Industry oriented mini project, Comprehensive Viva-Voce, Seminar and Project work are compulsory subjects.
- ☞ The student can avail exemption of two subjects upto 8 credits, that is, one open elective and one elective subject OR two elective subjects.

### ACADEMIC REQUIREMENTS:

- ➔ A student is eligible to write the University examinations only if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects.
- ➔ Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or first year may be granted by the College Academic Committee
- ➔ Shortage of Attendance below 65% in aggregate shall not be condoned.
- ➔ If any candidate fulfills the attendance requirement in the present semester or first year, he/she shall not be eligible for readmission into the same class.

### MINIMUM ACADEMIC REQUIREMENTS:

- ➔ A student is deemed to have satisfied the minimum academic requirements if he/she has earned the credits allotted to each theory/practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the mid-term and end semester exams.

### PROMOTION POLICY: No. of Credits required:

First to Second Year	From Second to Third Year upto II Year I Sem.	From Third to Fourth Year upto III Year I Sem.
28 credits out of 56 credits of I year from all the examinations (50%)	50 credits out of 84 credits from one regular and one supplementary examinations of I year, and one regular and one supplementary examination of II year I semester irrespective of whether or not the candidate takes the examination, and secures prescribed minimum attendance in II Year II Semester (60%)	84 credits out of 140 credits up to III year I semester or 100 credits from the following examinations, whether the candidate takes the examinations or not, and secures prescribed minimum attendance in III Year II Semester. a. Two regular and two supplementary examinations of I year. b. Two regular and two supplementary examinations of II year I semester. c. Two regular and one supplementary examinations of II year II semester. One regular and one supplementation examination of III year I semester (60%)

- ➔ A student shall register and put up minimum attendance in all 226 credits and earn 218 credits. Marks obtained in the best 216 credits shall be considered for the calculation of percentage of marks.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Pharm - I Sem

www.universityupdates.in

L	P	C
3+1	-	3

**(R70027) PHARMACOGNOSY -III**

**Objective:** To learn about the therapeutically important crude drugs and phytopharmaceuticals under a suitable pharmacognostic scheme and the importance of plant tissue culture in pharmacy. To make the student aware of biologically important molecules from marine sources and neutraceuticals.

**UNIT I**

General introduction to Alkaloids. Systematic pharmacognostic study of following: Cinchona, Ergot, Opium, Ipecac. Biological source, diagnostic features, chemical constituents and tests for identification, uses, adulterants and substituents of following: Belladonna, Catharanthus, Ephedra, Coffee, Colchicum, Datura, Duboisia, Hyosyamus, Kurchi, Nux-vomica, Pilocarpus, Solanum, Tobacco, Tea, Withania, Rauwolfia and Vasaka.

**UNIT II**

General introduction to Glycosides. Systematic pharmacognostic study of following: Aloe, Digitalis, Senna and Saffron. Biological sources, diagnostic features, chemical constituents and tests for identification, uses, adulterants and substitutes of following: Ammi, Vismaga, Cascara, Chirata, Dioscoria, Gentian, Ginseng, Strophanthus gratus and Liquorice.

**UNIT III**

Historical development of plant tissue culture: Types of cultures, nutritional requirements, establishment of cultures, measurement of growth in cultures and their maintenance. Applications of plant tissue culture in production of pharmaceutically important secondary metabolites.

**UNIT IV**

Biological source, chemical nature (with structure) and uses of following phytoconstituents: Artemesinin, Asiaticosides, Bacoposides, Camptothecin, Gymnemic acid and taxol. A brief account of Neem active constituents (chemical structures not necessary).

**UNIT V**

www.universityupdates.in

- An introduction to potential cardiovascular, anticancer/cytotoxic and antibiotic drugs from marine sources.
- Neutraceuticals : Definition of functional foods and neutraceuticals, classification of neutraceuticals. Source, Name of marker compounds and their chemical nature, medicinal uses and health benefits of Spirulina, Garlic, Soya and Gingko.

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**Outcome:** Since it is being the last part of Pharmacognosy subject, the student must be enriched with the knowledge on the crude drugs in a systematic way and in the use of crude drugs and phytopharmaceuticals in various systems of medicine for the treatment of different ailments and in various industries.

[www.universityupdates.in](http://www.universityupdates.in)

### 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.Dwiveit ataal, Scientific Publisher, Jodhpur.
5. 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. Dwiveti, 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.

[www.universityupdates.in](http://www.universityupdates.in)  
[www.universityupdates.in](http://www.universityupdates.in)

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medcna Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Pharm - I Sem [www.universityupdates.in](http://www.universityupdates.in) L P C  
1+1 - 3

(R70028) BIOPHARMACEUTICS AND PHARMACOKINETICS

**Objective:** This course is designed to impart fundamental knowledge of Biopharmaceutics and Pharmacokinetics. It also helps to know how the absorption distribution, metabolism, excretion takes place and bioavailability and bioequivalence parameters.

UNIT I

a) **Introduction:** Definitions of Biopharmaceutics, Pharmacokinetics and Pharmacodynamics.

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

UNIT II

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

UNIT III

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

b) **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 IV

**Bioavailability and bioequivalence**

Definitions, concept of equivalence, Definitions of various types of equivalence, types of Bioavailability studies, measurement of Bioavailability, plasma level and urinary excretion studies. Bioequivalence study design. Bioavailability testing procedure and protocol (CDSCO), Invitro – Invivo correlation of data.

UNIT V

**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.

**Outcome:** The students shall be able to understand Bioavailability, Bioequivalence, Biopharmaceutical parameters, Pharmacodynamic and Pharmacokinetics of the drug. It also explains the ADME of the drug besides

non-linear pharmacokinetics.

[www.universityupdates.in](http://www.universityupdates.in)

### TEXT BOOKS

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

### REFERENCES

1. Remington's pharmaceutical sciences, Mac Pub. Co., Easton Pennsylvania.
2. Modern pharmaceuticals by banker Marcel Dekker Inc., NY.
3. L. Iachman, H.A. Lieberman, J.L. Kanig, the theory and practice of industrial pharmacy, Varghese publ house, Mumbai.
4. AR. Gennerio Remington: the science and practice 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, 4<sup>th</sup> edn, Appleton – century – crofts, Connecticut, 2004.

[www.universityupdates.in](http://www.universityupdates.in)

*Signature of*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keasara(M), Medchal Dist. T.S.-501301.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Pharm - I Sem

L P C

[www.universityupdates.in](http://www.universityupdates.in)

4+1 - 4

**(R70029) PHARMACOLOGY – III**

**Objectives:** This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. The basic practical knowledge relevant to therapeutics will be imparted. This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.

**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,
- Tetracyclines aminoglycosides, chloramphenicol, erythromycin,
- Quinolones and miscellaneous antibiotics.

**UNIT III**

**Chemotherapy of following diseases**

- Tuberculosis
- Leprosy
- Urinary tract infections
- Fungal diseases
- Viral diseases,

[www.universityupdates.in](http://www.universityupdates.in)

*Geethanjali*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Pharm - I Sem

www.universityupdates.in

L	P	C
4+1	-	4

(R70030) MEDICINAL CHEMISTRY – II

**Objective:** The drug discovery and design with respect to the lead molecules and its optimization is clearly discussed. The concept of CADD is also discussed. Sufficient information about various antibiotics and their chemotherapeutic agents are also studied in depth.

UNIT I

(a) Drug discovery and drug design

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

(b) Computer aided drug design: Introduction to CADD, Parameters in QSAR, Hansch analysis, Free Wilson analysis.

UNIT II

a. **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 Penicillinase, amidase.

Classification: Oral and parenteral, based on spectrum of  $\beta$ ,  $\gamma$  – lactamase, as natural, biosynthetic and semi-synthetic.

General method of synthesis of penicillins from 6-APA; SAR, mechanism of action, therapeutic uses, toxicity.  $\beta$ -lactamase inhibitors.

b. **Cephalosporins:** Structures of some important compounds (Cephalosporins, Cephamycins. Cefadroxil, Cefoxitin. 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.

www.universityupdates.in

UNIT III

a. **Tetracyclins:** 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.

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

Geethanjali College of Pharmacy  
Cheerjalli(V), Keesara(M), Medchal Dist, T.S 501301.

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

**c. Quinoline type: Ciprofloxacin & norfloxacin**

**UNIT IV**

**a. Chemotherapeutic Agents:**

**Sulphadruugs** : Sulphadiazine, Suphasalazine, Trimethoprim, Sulphamethoxazole, Sulphameter

**b. Antifungal Agents** : Fluconazole and Itraconazole.

**c. Anti viral Drugs** : Acyclovir, Zidovudine

**d. Anti tubercular agents** : Isonicotinic acid hydrazide and ethambutol,

**e. Anti leprotic agents** : Dapsone, clofazemine

**f. Antiamoebics** : Metronidazole, diloxanide furoate

**g. Anthelmintics** : Diethylcarbamazine citrate, pyrantel pamoate, mebendazole, Ibandazole

**h. Antimalarial drugs** : Chloroquine, primaquine and pyrimethamine, norflaxacin and ciprofloxacin

**UNIT V**

**a. Anticancer Drugs** : Chlorambucil, busulphan, procarbazine, carmustine, 5-fluorouracil, 5-mercaptopurine methotrexate, vinca alkaloids – vinblastin, vincristine

**b. Immunosuppressive agents.**

Brief introduction to therapeutic agents developed from recombinant DNA technology

**c. Diagnostic agents and radioprotective agents.**

**Outcome:** The students would be in a position to participate in the community pharmacy activities with the knowledge they gained through the study of the various topics of the syllabus.

**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), 11<sup>th</sup> Ed, Lipincott, Raven, Philadelphia, 2004.
3. S. N. Pandeya, Textbook of mediacinal chemistry, SG Publ. Varanasi, 2003.

**REFERENCES**

1. D. Abraham (Ed), Burger Medicinal chemistry and Drug discovery, Vol.

Geethanjali College of Pharmacy  
PRINCIPAL

- 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.
10. Sri Ram, Medicinal Chemistry.
11. Rama Rao Nadendla, Medicinal Chemistry.

www.universityupdates.in  
www.universityupdates.in

*Geethanjali*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501201.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Pharm - I Sem

L	P	C
4+1	-	4

**(R70031) PHARMACY ADMINISTRATION**

**Objective:** 1. To expose the students, facets of business administration in the new economic environment.

2. The manufacturing management.

3. Social and behaviour aspects of pharmacy:

Pharmaceutical outcomes, Pharmacoeconomics and Pharmacovigilance.

**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:** Social uses of drugs; Abuse of prescription drugs.

**Behavioral Pharmacy:** Compliance / 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.

**Pharmacovigilance / Pharmacoepidemiology:**

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

www.universityupdates.in

PRINCIPAL

Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist, T.S.-501301.

#### 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.

**Outcome:** At the end of the course, these students will be familiarized with the above all areas.

#### TEXT BOOK

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

#### REFERENCES

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



*Geethanjali*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

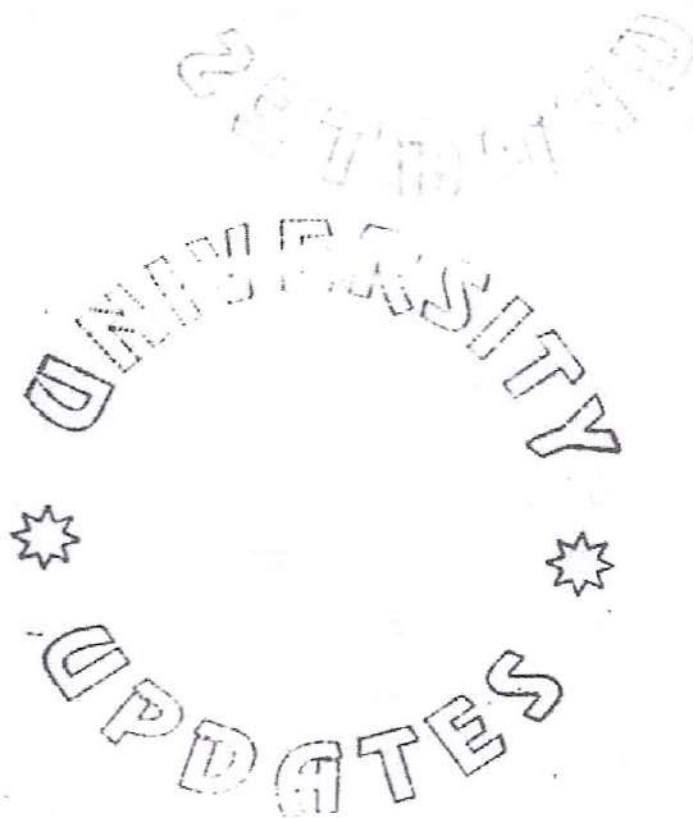
IV Year B.Pharm - I Sem

L	P	C
-	-	2

**(R70074) SEMINAR/ INDUSTRIAL VISIT**

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

[www.universityupdates.in](http://www.universityupdates.in)  
[www.universityupdates.in](http://www.universityupdates.in)  
[www.universityupdates.in](http://www.universityupdates.in)



*Signature*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**IV Year B.Pharm - I Sem**

**L P C**

www.universityupdates.in

- 3 2

**(R70075) PHARMACOGNOSY – III LAB**

1. Isolation of Caffeine from a marketed formulation (Paracetamol + Caffeine).
2. Isolation of Piperine from Black Pepper.
3. Detection of alkaloids in a powdered crude drug by precipitation tests
4. Extraction and TLC of Nux-vomica/Cinchona alkaloids.
5. Detection of Steroidal/Triterpenoidal and Flavonoidal glycosides in powdered crude drugs by test tube reaction method.
6. Differentiation of a glycoside and its aglycone by TLC.
7. Identification of following powdered crude drugs and their constituents by microscopical, microchemical and chemical methods (If any).  
a) Senna    b) Vasaka    c) Cinchona    d) Cassia  
e) Kurchi    f) NUX-vomica    g) Ipecac    h) Rauwolfia  
i) Liquorice
8. Spotting – Identification of crude drugs mentioned in theory by organoleptic method.

**REFERENCES**

1. Pharmacognosy, Phytochemistry, Medicinal Plants by Jean Bruneton.
2. Pharmacognosy by C. K. Kokate.
3. Pharmacognosy by Trease and Evans.
4. Pharmacognosy and Phytochemistry by Vinod Rangari.
5. Pharmacognosy by Brady Taylor et. al.
6. Plant Drug Analysis by Wagner. H. & Blandt. S.

www.universityupdates.in

*Geethanjali*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheruvu (V), Venkateswara, Medak Dist. T.S. 501301

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Pharm - I Sem [www.universityupdates.in](http://www.universityupdates.in) L P C  
[www.universityupdates.in](http://www.universityupdates.in) - 3 2

**(R70076) BIOPHARMACEUTICS & PHARMACOKINETICS LAB**

1. Estimation of various Pharmacokinetic parameters from the given data.
2. Influence of dosage form on dissolution behaviour of same API.
3. Influence of Physico-chemical properties (Particle size, salt form, crystalline form) on dissolution rate of drug substances.
4. Approaches to enhance the dissolution rate of drugs.  
i.e., i) Cyclodextrin complexation.  
ii) Inclusion of Hydrophilic polymers such as PVP, PEG.  
iii) Co-solvency.
5. Absorption studies – invitro and invivo.
6. Determination of rate of clearance.
7. Statistical treatment of Pharmaceutical data i.e.,  
i) test ii) Chi-square test iii) ANOVA.

**Reference book**

1. Dr. D. Dhachinamoorthi- Biopharmaceutical and Pharmacokinetic- A Practical Manual.

[www.universityupdates.in](http://www.universityupdates.in)  
[www.universityupdates.in](http://www.universityupdates.in)

UNIVERSITY  
UPDATES

*Handwritten*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501304.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Pharm - I Sem

[www.universityupdates.in](http://www.universityupdates.in)

L

P

C

-

3

2

(R70077) 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
    - i. Matching Assay.
    - ii. Two point Assay.
    - iii. Three point Assay.
2. Pharmacology of the Gastrointestinal Tract.

To study the anti-secretory and anti-ulcer activity using pylorus ligated rats.

[www.universityupdates.in](http://www.universityupdates.in)

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S. 501501.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Pharm - I Sem

L	P	C
-	3	2

(R70078) MEDICINAL CHEMISTRY – II LAB

Estimations of the following.

1. Ascorbic acid.
2. Vitamin B1.
3. Penicillin.
4. Alkaloid (by gravimetry).
5. Ibuprofen by volumetric method.
6. Aspirin by volumetric method.
7. Metronidazole (antiprotozoal).
8. Ibuprofen (analgesic, antiinflammatory).
9. Furosemide (diuretic).
10. Isoniazid (anti tubercular).
11. Compound benzoic acid (anti fungal).

www.universityupdates.in  
www.universityupdates.in  
www.universityupdates.in

REFERENCES

1. Indian Pharmacopoeia.. – 1996, 4<sup>th</sup> Edition.
2. P.D.Sethi – Quantitative Analysis of Drugs and Pharmaceuticals.
3. B.G.Nagavi Lab Hand Book of Instrumental Drug Analysis.
4. Organic chemistry a Lab manual Cengage India Pvt. Ltd. by Pavia.

UNIVERSITY  
UPDATES

PRINCIPAL

Geethanjali College of Pharmacy  
Unnava (V), Keesara (M), Medchal Dist. T.S. - 501301

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Pharm - II Sem

[www.universityupdates.in](http://www.universityupdates.in)

L	P	C
3+1	-	3

**(R80032) NOVEL DRUG DELIVERY SYSTEMS & REGULATORY AFFAIRS**

**Objective:** This course is designed to impart knowledge on controlled drug delivery systems including oral, transdermal, mucoadhesive, targeted (Liposomes and Nanoparticles). It also helps to know how regulatory agencies (Indian CDSCO, USFDA, Canadian HPFBI and Australian TGA) act on release of NDA & ANDA.

**UNIT I**

**Oral Control Drug Delivery Systems:** Fundamental study of different types of Oral Controlled drug delivery systems, sustained release concept, design of sustained release dosage form, Zero order release, first order release approximation, multiple dosing.

Dissolution Controlled, Diffusion Controlled, Ion Exchange Resins, Osmotic based systems, pH Independent Systems.

**UNIT II**

**a. Transdermal Drug Delivery Systems:** Fundamentals, types of TDDS, Materials Employed and Evaluation of TDDS.

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

**UNIT III**

**a. Mucoadhesive Delivery Systems:** Mechanism of bioadhesion, mucoadhesive materials, formulation and development of mucoadhesive-based systems.

**b. Targeted Drug Delivery Systems:** Fundamentals and applications, formulation and evaluation of liposomes, resealed erythrocytes and nano particles.

[www.universityupdates.in](http://www.universityupdates.in)

**UNIT IV**

[www.universityupdates.in](http://www.universityupdates.in)

**Governing Regulatory bodies across the globe**

USFDA, CDSCO, Australian TGA, European FDA, NDA & ANDA Submissions of USFDA, Product filing.

**UNIT V**

**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).

Geethanjali College of Pharmacy  
Gneerayal(V), Keerasara(M), Medchal Dist. T.S. 502305

**Outcome:** Student shall be able to know the controlled, sustained drug delivery systems, their methods of preparation. They also know how regulatory agencies help filing and submissions of USFDA; Student shall be able to know the validation of the Analytical methods.

### TEXT BOOKS

[www.universityupdates.in](http://www.universityupdates.in)

1. Novel drug delivery system by Prof. (Dr) A.K. Bandyopadhyay.
2. N.K. Jain, Control Drug Delivery Systems by
3. Y.Anjaneyulu & Maraiiah, Quality Assurance & Quality Management in Pharmaceutical Industry.
4. L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of industrial pharmacy by, Lea & Febieger, 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 Rawlkins, Bentley's Text Book of Pharmaceutics, Elbs publ.
5. HC Ansel, Introduction to Pharmaceutical Dosage forms.
6. S.H. Willing, M.M Tucherman and W.S. Hitchings IV, Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, Marcel Dekker, Inc., New York.
7. Gilbert S. Banker and Christopher T Rhodes, Modern Pharmaceutics, 14th ed, marcel dekker, usa, 2005.
8. Yiew Chien, novel drug delivery systems, 2<sup>nd</sup> ed, marcel dekker 2003.
9. Robert. A. Nash, Pharmaceutical Process Validation, 3<sup>rd</sup> 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 2<sup>nd</sup> ed. [www.universityupdates.in](http://www.universityupdates.in)
12. Aukunuru Jithan, Oral Drug Delivery Technology.
13. Quality Assurance of Pharmaceuticals WHO PMP.
14. Novel drug delivery system and regulatory affairs by S.Chand, Dr. Yajaman Sudhakar, Dr. K.N.Jayaveera.
15. Novel drug delivery system by, V.Sankar, S.Ramesh, V.Shannugam.
16. Advances in Drug delivery systems by Y. Madhusudan Rao

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Pharm - II Sem	www.universityupdates.in	L	P	C
	www.universityupdates.in	1	-	4

(R80033) PHARMACEUTICAL BIOTECHNOLOGY

**Objective:** Pharmaceutical biotechnology is considered to be a logical extension of pharmaceutical microbiology, thus expected to show a dramatic change in the drug product scenario in future.

This course is designed to impart knowledge on isolation of industrially interesting microbes, various techniques employed in biotechnology Viz., r-DNA technology, Hybridoma technology, enzyme technology and the products derived using these techniques.

UNIT I

**a. Fermentation Technology:** Isolation, Selection and Screening of Industrially important microbes, Strain improvement. Types of fermentations, optimization of fermentation process. Types, design & operation of Bioreactor.

**b. Specific Fermentations:** Selection of organism, fermentation & purification of various antibiotics, vitamins, aminoacids, organic acids, solvents, biomass like penicillin, streptomycin, tetracycline, erythromycin, cyanocobalamin, glutamic acid, citric acid, alcohol, Lactobacillus sporogenes.

UNIT II

**a. Recombinant DNA Technology:** Introduction to r-DNA technology and genetic engineering, steps involved in isolation of enzymes, vectors, recombination and cloning of genes.

Production of r-DNA technology derived therapeutic proteins like humulin, humatrope, intron a, recombinax HB(hepatitis b).

**b. Hybridoma Technology:** Production and applications of Monoclonal Antibodies.

UNIT III

**Immunology & Immunological Preparations:** Principles of Immunity, Humoral immunity, cell mediated immunity, Antigen – Antibody reactions, Hypersensitivity reactions.

Active & passive immunizations preparation of vaccines, standardization & storage of BCG, cholera, smallpox, polio, typhus, tetanus toxoid, immuno serum & diagnostic agents.

UNIT IV

**a. Enzyme Technology:** Methods of immobilization of enzymes and cells and their applications, factors affecting immobilized enzyme kinetics, advantages of immobilized enzymes over isolated enzymes. Study of enzymes such as hyaluronidase, penicillinase, streptokinase & streptodornase, protease.

**b. Blood Products:** Collection processing, storage and control of official blood products, plasma substitutes (dextran) and sutures & ligatures.

#### UNIT V

[www.universityupdates.in](http://www.universityupdates.in)

**a. Microbial Transformations:** Types, Methods of bioconversions & Application in Pharma Industry, Steroidal transformations.

**b. An introductory study on bioinformatics and its applications, Regulatory control of Biotechnological products.**

**Outcome:** Upon completion of the course, the student shall be able to-

- Know screening of industrially interesting microbes.
- Optimize fermentation process parameters
- Know about preparation, standardization, storage and labelling of biotechnologically derived products
- Know about bioinformatics and its applications in pharmacy.
- Know about the regulatory control of biotechnological products.

#### TEXT BOOKS

1. P. F. Stanbury & A. Whitaker, Principles of fermentation technology, Pergamon Press.
2. Sambamurthy. K, Text Book of Pharmaceutical Biotechnology.
3. S. S. Kori, Pharmaceutical biotechnology.

#### REFERENCES.

1. Wulf Crueger and Anneliese Crueger, Biotechnology, 2<sup>nd</sup> Ed, Publ- Panima publication co-peration, New Delhi.
2. U. Satyanarayana, Text book of Biotechnology
3. J. D. Watson, Recombinant DNA technology.
4. E.A. Rawlins, Bentley's, A text book of pharmaceuticals, 8<sup>th</sup> Ed, 1982 Bailler Tindall & Co.
5. Alexander N. Glazer & Hiroshi Nikaido, Microbial biotechnology, W. H. Freeman Co.
6. Casida, Industrial microbiology.
7. Dr. P. K. Shiva kumar, Dr. M. M. Joe, Dr. K. Suresh An Introduction to industrial micro biology. [www.universityupdates.in](http://www.universityupdates.in)
8. Pharmaceutical Bio technology by Dr. Chandrakanth Kokare.
9. S.P. Vyas and V.K. Dixit CBS Publisher, Delhi, Pharmaceutical Biotechnology.
10. I.D'Souza, Suresh G. Killedar - Biotechnology and fermentation process Indian Pharmacopoein, 1996.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Pharm - II Sem

L	P	C
3+1	-	3

(R80034) PHARMACEUTICAL ANALYSIS - II

**Objective:** The principles involved in the determination of various bulk drugs and formulations are discussed. Modern methods and instrumental techniques are applied in the study and analysis of pharmaceutical substances.

[www.universityupdates.in](http://www.universityupdates.in)

UNIT I

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

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

UNIT II

**a. 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.

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

UNIT III

**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 IV

**Mass Spectrometry:** Basic principle, theory, instrumentation and applications, basic principles in the interpretation of Mass Spectra.

UNIT V

[www.universityupdates.in](http://www.universityupdates.in)

An Elementary study of the following:

- (a) GC: Columns, Carrier gas and detectors used
- (b) HPLC & HPTLC: Basic Principles
- (c) Electrophoresis: Various types of Electrohoresis
- (d) ORD Curves, RIA & ELISA: Basic principles

*Geethanjali*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist., T.S. 501302.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Pharm - II Sem

www.universityupdates.in  
www.universityupdates.in

L	P	C
4	-	4

(R80035) HUMAN VALUES AND PROFESSIONAL ETHICS

**Objectives :** This introductory course input is intended

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

**Unit I:**

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration—what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right Understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

**Unit II:**

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

**Unit III:**

Understanding Harmony in the Family and Society- Harmony in Human - Human Relationship : Understanding harmony in the Family- the basic Unit

www.universityupdates.in

Geethanjali College of Pharmacy  
Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501301.

of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; **Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.** Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal-harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha )- from family to world family!

#### Unit IV:

Understanding Harmony in the Nature and Existence = Whole existence as Co-existence : Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

#### Unit V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics : Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

- a) Ability to utilize the professional competence for augmenting universal human order,
- b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
- c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order:

- a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers.
- b) At the level of society: as mutually enriching institutions and organizations.

#### TEXT BOOKS

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics. See Ahajun College of Pharmacy, Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501301.

www.universityupdates.in

Principal

2. Prof. KV Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3<sup>rd</sup> Edition.

#### REFERENCE BOOKS

[www.universityupdates.in](http://www.universityupdates.in)

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA.
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A.N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Patekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajan, S Natrajan & V.S. Senthil Kumar, Engineering Ethichs (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

#### Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology - the Untold Story

[www.universityupdates.in](http://www.universityupdates.in)

*Geethanjali*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Pharm - II Sem

L P C  
4+1 - 4

(R80036) CLINICAL PHARMACY PRACTICE

**Objective:** To impart quality use of medicines & their therapeutics of various diseases management. Monitor adverse drug reaction, interpret selected laboratory results of specific disease states, retrieve, analyse, interpret and formulate drug or medicine information.

**UNIT I**

**Basic concepts of Pharmacotherapy**

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

**UNIT II**

**Important Disorders of Organ Systems and their Management:**

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

**UNIT III**

**Important Disorders of Organ Systems and their Management**

- Respiratory Disease:** Asthma, COPD.
- Gastrointestinal Disorders:** Peptic Ulcer Disease, Ulcerative Colitis, Hepatitis, and Cirrhosis.
- Infectious Diseases:** Enteric Infections, sexually transmitted diseases, AIDS, Conjunctivitis.

**UNIT IV**

**Important Disorders of Organ Systems and their Management**

- Endocrine Disorders:** Diabetes mellitus and Thyroid Disorders.
- Neoplastic Diseases:** Leukaemias, Hodgkin's disease, Lymphomas

**UNIT V**

- Therapeutic Drug Monitoring, Concept of Essential Drugs, Drug and

[www.universityupdates.in](http://www.universityupdates.in)

Poison information, Drug induced diseases.

- b. Community Pharmacy practice, patient counselling, medication review ward round participation, drug utilization review.

**Outcome:** Know the pathophysiology of selected disease states and the rationale for drug therapy, their therapeutic approach in management of diseases. Understand the needs to identify the patient-specific parameters relevant in initiating drug therapy and its monitoring.

### TEXT BOOKS

1. Roger, Walker, Clinical Pharmacy and Therapeutics.
2. G. Parthasarathi / Karin Nyfort-Hansu A text book of Clinical Pharmacy practice – Universities Press.
3. Dr. D.R Krishna, V. Klotz, Clinical pharmaco kinetics, Publ Springer Verlab.

### REFERENCES

1. Laurence, DR and Bennet PN. Clinical Pharmacology, Scientific book agency.
2. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences, 20<sup>th</sup> edn.
3. Hamsten, Drug interaction, Kven Stockley.
4. J.K. Mehra, Drug interaction, Basic Business Publ, Bombay.
5. Grahame smith and Aronson, Clinical pharmacology and drug therapy.
6. Richard A Helms, Text Book of Therapeutics Drug and Disease Management Hardbound.
4. Herfindal E T and Hirschman JI, Williams and Wilkins, Clinical Pharmacy and therapeutics.
5. Applied Therapeutics, The clinical uses of Drugs applied therapeutics INC.
6. Dr. A.R. Paradker, Hospital and Clinical Pharmacy, Nirali Prakashan.
7. D. Sudheer Kumar. Fundamentals of Clinical Pharmacy Practice- Pharm Med Press.
8. Katzung, B.G. Basic and Clinical Pharmacology, Prentice hall, International.
9. M Rowland and T N Tozer, "Clinical Pharmacokinetics" 2nd ed Lea & Febiger, NY.

[www.universityupdates.in](http://www.universityupdates.in)

  
PRINCIPAL

Geethanjali College of Pharmacy  
(heeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Pharm - II Sem

L	P	C
-	-	4

**(R80079) PROJECT WORK & COMPREHENSIVE VIVA**

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

www.universityupdates.in  
www.universityupdates.in  
www.universityupdates.in

*Geethanjali*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. 501301.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Pharm - II Sem

L P C  
- 3 2

**(R80080) 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 Nano particles (Minimum two drugs)
8. Preparation and evaluation of Liposomes
9. Preparation and Evaluation of Alginate Beads.
10. Analytical Method Validation
11. Assignment on Product development and filing to various regulatory agencies , FDA, MCC, EMEA, TGA. Etc (Ref.: www.fda.gov)

*Signature of*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesarai(M), Medchal Dist. T.S.-501301.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Pharm - II Sem

www.universityupdates.in	L	P	C
	-	3	2

(R80082) PHARMACEUTICAL ANALYSIS – II LAB

Experiments

1. Interpretation of IR Spectra of any two compounds.
2. Determination of  $\lambda_{max}$  of few bulk drugs.
3. Assay of any two bulk drugs and their formulations by UV-spectro photometry.
4. Assay of any two bulk drugs and their formulations by Colorimetric method.
5. Assay of Quinine Sulphate by Fluorimetry
6. Ascending paper chromatography.
7. Radial paper chromatography.
8. Two dimensional paper chromatography
9. Thin layer chromatography.
10. Column chromatography
11. Determination of amino acids by Paper electrophoresis.
12. Gel electrophoresis (Demonstration Only).
13. HPLC (Demonstration Only).

**BOOKS RECOMMENDED FOR REFERENCE:**

**PHARMACEUTICS**

1. Cooper and Gunns "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.



# भारत का राजपत्र The Gazette of India

साप्ताहिक/WEEKLY

प्राधिकार से प्रकाशित  
PUBLISHED BY AUTHORITY

सं० 19] नई दिल्ली, शनिवार, मई 10—मई 16, 2008 (वैशाख 20, 1930)  
No. 19] NEW DELHI, SATURDAY, MAY 10—MAY 16, 2008 (VAISAKHA 20, 1930)

इस भाग में भिन्न पृष्ठ संख्या दी जाती है जिससे कि यह अलग संकलन के रूप में रखा जा सके।  
(Separate paging is given to this Part in order that it may be filed as a separate compilation)

भाग III—खण्ड 4

[PART III—SECTION 4]

[सांविधिक निकायों द्वारा जारी की गई विविध अधिसूचनाएं जिसमें कि आदेश, विज्ञापन और सूचनाएं सम्मिलित हैं]  
[Miscellaneous Notifications including Notifications, Orders, Advertisements and Notices issued by  
Statutory Bodies]

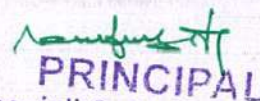
भारतीय रिज़र्व बैंक

मुंबई-400001, दिनांक 9 अप्रैल 2008

सदर्थ : बैंपविवि. सं. आईबीडी.-14241/23.13.048/2007-08-- भारतीय रिज़र्व बैंक अधिनियम, 1934 (1934 का 2) की धारा 42 की उप-धारा (6) के खण्ड (ग) के अनुसरण में भारतीय रिज़र्व बैंक इसके द्वारा निदेश देता है कि उक्त अधिनियम की दूसरी अनुसूची में निम्नलिखित परिवर्तन किये जाएं :--

“अरब बांग्लादेश बैंक लिमिटेड” शब्दों के स्थान पर “एबी बैंक लिमिटेड” शब्द होंगे।

आनन्द सिन्हा  
कार्यपालक निदेशक

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501306.

[PUBLISHED IN THE GAZETTE OF INDIA, No.19, PART III, SECTION 4]

Ministry of Health and Family Welfare  
(Pharmacy Council of India)

New Delhi, 10<sup>th</sup> May, 2008.

### **Pharm.D. Regulations 2008**

Regulations framed under section 10 of the Pharmacy Act, 1948 (8 of 1948).

(As approved by the Government of India, Ministry of Health vide, letter March, No.V.13013/1/2007-PMS, dated the 13<sup>th</sup> 2008 and notified by the Pharmacy Council of India).

No.14-126/2007-PCI.— In exercise of the powers conferred by section 10 of the Pharmacy Act, 1948 (8 of 1948), the Pharmacy Council of India, with the approval of the Central Government, hereby makes the following regulations, namely:-

#### **CHAPTER-I**

1. Short title and commencement. – (1) These regulations may be called the Pharm.D. Regulations 2008.  
(2) They shall come into force from the date of their publication in the official Gazette.
2. Pharm.D. shall consist of a certificate, having passed the course of study and examination as prescribed in these regulations, for the purpose of registration as a pharmacist to practice the profession under the Pharmacy Act, 1948.

  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-50

## CHAPTER-II

### 3. Duration of the course. –

- a) Pharm.D: The duration of the course shall be six academic years (five years of study and one year of internship or residency) full time with each academic year spread over a period of not less than two hundred working days. The period of six years duration is divided into two phases –

Phase I – consisting of First, Second, Third, Fourth and Fifth academic year.

Phase II – consisting of internship or residency training during sixth year involving posting in speciality units. It is a phase of training wherein a student is exposed to actual pharmacy practice or clinical pharmacy services and acquires skill under supervision so that he or she may become capable of functioning independently.

- b) Pharm.D. (Post Baccalaureate): The duration of the course shall be for three academic years (two years of study and one year internship or residency) full time with each academic year spread over a period of not less than two hundred working days. The period of three years duration is divided into two phases –

Phase I – consisting of First and Second academic year.

Phase II – consisting of Internship or residency training during third year involving posting in speciality units. It is a phase of training wherein a student is exposed to actual pharmacy practice or clinical pharmacy services, and acquires skill under supervision so that he or she may become capable of functioning independently.

### 4. Minimum qualification for admission to. –

- a) Pharm.D. Part-I Course – A pass in any of the following examinations -

(1) 10+2 examination with Physics and Chemistry as compulsory subjects along with one of the following subjects:

Mathematics or Biology.

(2) A pass in D.Pharm course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

(3) Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

Provided that a student should complete the age of 17 years on or before 31<sup>st</sup> December of the year of admission to the course.

Provided that there shall be reservation of seats for the students belonging to the Scheduled Castes, Scheduled Tribes and other Backward Classes in accordance with the instructions issued by the Central Government/State Government/Union Territory Administration as the case may be from time to time.

## b) Pharm.D. (Post Bacallaureate) Course -

A pass in B.Pharm from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act:

Provided that there shall be reservation of seats for the students belonging to the Scheduled Castes, Scheduled Tribes and other Backward Classes in accordance with the instructions issued by the Central Government/State Government/Union Territory Administration as the case may be from time to time.

5. Number of admissions in the above said programmes shall be as prescribed by the Pharmacy Council of India from time to time and presently be restricted as below –
  - i) Pharm.D. Programme – 30 students.
  - ii) Pharm.D. (Post Bacallaureate) Programme – 10 students.
6. Institutions running B.Pharm programme approved under section 12 of the Pharmacy Act, will only be permitted to run Pharm.D. programme. Pharm.D. (Post Bacallaureate) programme will be permitted only in those institutions which are permitted to run Pharm.D. programme.
7. Course of study. – The course of study for Pharm.D. shall include the subjects as given in the Tables below. The number of hours in a week, devoted to each subject for its teaching in theory, practical and tutorial shall not be less than that noted against it in columns (3), (4) and (5) below.

### TABLES

#### First Year :

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
1.1	Human Anatomy and Physiology	3	3	1
1.2	Pharmaceutics	2	3	1
1.3	Medicinal Biochemistry	3	3	1
1.4	Pharmaceutical Organic Chemistry	3	3	1
1.5	Pharmaceutical Inorganic Chemistry	2	3	1
1.6	Remedial Mathematics/ Biology	3	3*	1
	<b>Total hours</b>	<b>16</b>	<b>18</b>	<b>6 = (40)</b>

\* For Biology

**Second Year:**

S.No	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
2.1	Pathophysiology	3	-	1
2.2	Pharmaceutical Microbiology	3	3	1
2.3	Pharmacognosy & Phytopharmaceuticals	3	3	1
2.4	Pharmacology-I	3	-	1
2.5	Community Pharmacy	2	-	1
2.6	Pharmacotherapeutics-I	3	3	1
	<b>Total Hours</b>	<b>17</b>	<b>9</b>	<b>6 = 32</b>

**Third Year:**

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
3.1	Pharmacology-II	3	3	1
3.2	Pharmaceutical Analysis	3	3	1
3.3	Pharmacotherapeutics-II	3	3	1
3.4	Pharmaceutical Jurisprudence	2	-	-
3.5	Medicinal Chemistry	3	3	1
3.6	Pharmaceutical Formulations	2	3	1
	<b>Total hours</b>	<b>16</b>	<b>15</b>	<b>5 = 36</b>



**Fourth Year:**

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical/ Hospital Posting	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
4.1	Pharmacotherapeutics-III	3	3	1
4.2	Hospital Pharmacy	2	3	1
4.3	Clinical Pharmacy	3	3	1
4.4	Biostatistics & Research Methodology	2	-	1
4.5	Biopharmaceutics & Pharmacokinetics	3	3	1
4.6	Clinical Toxicology	2	-	1
	<b>Total hours</b>	<b>15</b>	<b>12</b>	<b>6 = 33</b>

**Fifth Year:**

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Hospital posting*	No. of hours of Seminar
(1)	(2)	(3)	(4)	(5)
5.1	Clinical Research	3	-	1
5.2	Pharmacoepidemiology and Pharmacoeconomics	3	-	1
5.3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	2	-	1
5.4	Clerkship *	-	-	1
5.5	Project work (Six Months)	-	20	-
	<b>Total hours</b>	<b>8</b>	<b>20</b>	<b>4 = 32</b>

\* Attending ward rounds on daily basis.

**Sixth Year:**

Internship or residency training including postings in speciality units. Student should independently provide the clinical pharmacy services to the allotted wards.

- (i) Six months in General Medicine department, and
- (ii) Two months each in three other speciality departments

8. Syllabus. – The syllabus for each subject of study in the said Tables shall be as specified in Appendix -A to these regulations.
9. Approval of the authority conducting the course of study. – (1) No person, institution, society or university shall start and conduct Pharm.D or Pharm.D. (Post Baccalaureate) programme without the prior approval of the Pharmacy Council of India.
  - (2) Any person or pharmacy college for the purpose of obtaining permission under sub-section (1) of section 12 of the Pharmacy Act, shall submit a scheme as prescribed by the Pharmacy Council of India.
  - (3) The scheme referred to in sub-regulation (2) above, shall be in such form and contain such particulars and be preferred in such manner and be accompanied with such fee as may be prescribed:
 

Provided that the Pharmacy Council of India shall not approve any institution under these regulations unless it provides adequate arrangements for teaching in regard to building, accommodation, labs., equipments, teaching staff, non-teaching staff, etc., as specified in Appendix-B to these regulations.
10. Examination. – (1) Every year there shall be an examination to examine the students.
  - (2) Each examination may be held twice every year. The first examination in a year shall be the annual examination and the second examination shall be supplementary examination.
  - (3) The examinations shall be of written and practical (including oral nature) carrying maximum marks for each part of a subject as indicated in Tables below :

**T A B L E S****First Year examination :**

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
1.1	Human Anatomy and Physiology	70	30	100	70	30	100
1.2	Pharmaceutics	70	30	100	70	30	100
1.3	Medicinal Biochemistry	70	30	100	70	30	100
1.4	Pharmaceutical Organic Chemistry	70	30	100	70	30	100
1.5	Pharmaceutical Inorganic Chemistry	70	30	100	70	30	100
1.6	Remedial Mathematics/Biology	70	30	100	70*	30*	100*
				600			600 = 1200

\* for Biology.

**Second Year examination :**

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
2.1	Pathophysiology	70	30	100	-	-	-
2.2	Pharmaceutical Microbiology	70	30	100	70	30	100
2.3	Pharmacognosy & Phytopharmaceuticals	70	30	100	70	30	100
2.4	Pharmacology -I	70	30	100	-	-	-
2.5	Community Pharmacy	70	30	100	-	-	-
2.6	Pharmacotherapeutics-I	70	30	100	70	30	100
				600			300 = 900

**Third Year examination :**

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
3.1	Pharmacology -II	70	30	100	70	30	100
3.2	Pharmaceutical Analysis	70	30	100	70	30	100
3.3	Pharmacotherapeutics-II	70	30	100	70	30	100
3.4	Pharmaceutical Jurisprudence	70	30	100	-	-	-
3.5	Medicinal Chemistry	70	30	100	70	30	100
3.6	Pharmaceutical Formulations	70	30	100	70	30	100
				600			500 = 1100

**Fourth Year examination :**

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
4.1	Pharmacotherapeutics-III	70	30	100	70	30	100
4.2	Hospital Pharmacy	70	30	100	70	30	100
4.3	Clinical Pharmacy	70	30	100	70	30	100
4.4	Biostatistics & Research Methodology	70	30	100	-	-	-
4.5	Biopharmaceutics & Pharmacokinetics	70	30	100	70	30	100
4.6	Clinical Toxicology	70	30	100	-	-	-
				600			400 = 1000

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501506.

**Sixth Year:**

Internship or residency training including postings in speciality units. Student should independently provide the clinical pharmacy services to the allotted wards.

- (i) Six months in General Medicine department, and
- (ii) Two months each in three other speciality departments

8. Syllabus. – The syllabus for each subject of study in the said Tables shall be as specified in Appendix -A to these regulations.
9. Approval of the authority conducting the course of study. – (1) No person, institution, society or university shall start and conduct Pharm.D or Pharm.D. (Post Baccalaureate) programme without the prior approval of the Pharmacy Council of India.
- (2) Any person or pharmacy college for the purpose of obtaining permission under sub-section (1) of section 12 of the Pharmacy Act, shall submit a scheme as prescribed by the Pharmacy Council of India.
- (3) The scheme referred to in sub-regulation (2) above, shall be in such form and contain such particulars and be preferred in such manner and be accompanied with such fee as may be prescribed:
- Provided that the Pharmacy Council of India shall not approve any institution under these regulations unless it provides adequate arrangements for teaching in regard to building, accommodation, labs., equipments, teaching staff, non-teaching staff, etc., as specified in Appendix-B to these regulations.
10. Examination. – (1) Every year there shall be an examination to examine the students.
- (2) Each examination may be held twice every year. The first examination in a year shall be the annual examination and the second examination shall be supplementary examination.
- (3) The examinations shall be of written and practical (including oral nature) carrying maximum marks for each part of a subject as indicated in Tables below :

**T A B L E S****First Year examination :**

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
1.1	Human Anatomy and Physiology	70	30	100	70	30	100
1.2	Pharmaceutics	70	30	100	70	30	100
1.3	Medicinal Biochemistry	70	30	100	70	30	100
1.4	Pharmaceutical Organic Chemistry	70	30	100	70	30	100
1.5	Pharmaceutical Inorganic Chemistry	70	30	100	70	30	100
1.6	Remedial Mathematics/Biology	70	30	100	70*	30*	100*
				600			600 = 1200

\* for Biology.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Chireyal(V), Keesara(M), Medchal Dist. T.S.-501301.

**Fifth Year examination :**

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
5.1	Clinical Research	70	30	100	-	-	-
5.2	Pharmacoepidemiology and Pharmacoeconomics	70	30	100	-	-	-
5.3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	70	30	100	-	-	-
5.4	Clerkship *	-	-	-	70	30	100
5.5	Project work (Six Months)	-	-	-	100**	-	100
				300			200 = 500

\* Attending ward rounds on daily basis .

\*\* 30 marks – viva-voce (oral)

70 marks – Thesis work

11. Eligibility for appearing Examination.— Only such students who produce certificate from the Head of the Institution in which he or she has undergone the Pharm.D. or as the case may be, the Pharm.D. (Post Baccalaureate) course, in proof of his or her having regularly and satisfactorily undergone the course of study by attending not less than 80% of the classes held both in theory and in practical separately in each subject shall be eligible for appearing at examination.
12. Mode of examinations.— (1) Theory examination shall be of three hours and practical examination shall be of four hours duration.
- (2) A Student who fails in theory or practical examination of a subject shall re-appear both in theory and practical of the same subject.
- (3) Practical examination shall also consist of a viva –voce (Oral) examination.
- (4) Clerkship examination – Oral examination shall be conducted after the completion of clerkship of students. An external and an internal examiner will evaluate the student. Students may be asked to present the allotted medical cases followed by discussion. Students' capabilities in delivering clinical pharmacy services, pharmaceutical care planning and knowledge of therapeutics shall be assessed.
13. Award of sessional marks and maintenance of records.— (1) A regular record of both theory and practical class work and examinations conducted in an institution imparting training for Pharm.D. or as the case may be, Pharm.D. (Post Baccalaureate) course, shall be maintained for each student in the institution and 30 marks for each theory and 30 marks for each practical subject shall be allotted as sessional.
- (2) There shall be at least two periodic sessional examinations during each academic year and the highest aggregate of any two performances shall form the basis of calculating sessional marks.
- (3) The sessional marks in practicals shall be allotted on the following basis:-
- (i) Actual performance in the sessional examination (20 marks);
- (ii) Day to day assessment in the practical class work, promptness, viva- voce record maintenance, etc. (10 marks).

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

14. Minimum marks for passing examination.— A student shall not be declared to have passed examination unless he or she secures at least 50% marks in each of the subjects separately in the theory examinations, including sessional marks and at least 50% marks in each of the practical examinations including sessional marks. The students securing 60% marks or above in aggregate in all subjects in a single attempt at the Pharm.D. or as the case may be, Pharm. D. (Post Baccalaureate) course examination shall be declared to have passed in first class. Students securing 75% marks or above in any subject or subjects shall be declared to have passed with distinction in the subject or those subjects provided he or she passes in all the subjects in a single attempt.
15. Eligibility for promotion to next year.— All students who have appeared for all the subjects and passed the first year annual examination are eligible for promotion to the second year and, so on. However, failure in more than two subjects shall debar him or her from promotion to the next year classes.
16. Internship.— (1) Internship is a phase of training wherein a student is expected to conduct actual practice of pharmacy and health care and acquire skills under the supervision so that he or she may become capable of functioning independently.
- (2) Every student has to undergo one year internship as per Appendix-C to these regulations.
17. Approval of examinations.— Examinations mentioned in regulations 10 to 12 and 14 shall be held by the examining authority hereinafter referred to as the university, which shall be approved by the Pharmacy Council of India under sub-section (2) of section 12 of the Pharmacy Act, 1948. Such approval shall be granted only if the examining authority concerned fulfills the conditions as specified in Appendix-D to these regulations.
18. Certificate of passing examination.— Every student who has passed the examinations for the Pharm.D. (Doctor of Pharmacy) or Pharm.D. (Post Baccalaureate) (Doctor of Pharmacy) as the case may be, shall be granted a certificate by the examining authority.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

### CHAPTER-III Practical training

19. Hospital posting.— Every student shall be posted in constituent hospital for a period of not less than fifty hours to be covered in not less than 200 working days in each of second, third & fourth year course. Each student shall submit report duly certified by the preceptor and duly attested by the Head of the Department or Institution as prescribed. In the fifth year, every student shall spend half a day in the morning hours attending ward rounds on daily basis as a part of clerkship. Theory teaching may be scheduled in the afternoon.
20. Project work.— (1) To allow the student to develop data collection and reporting skills in the area of community, hospital and clinical pharmacy, a project work shall be carried out under the supervision of a teacher. The project topic must be approved by the Head of the Department or Head of the Institution. The same shall be announced to students within one month of commencement of the fifth year classes. Project work shall be presented in a written report and as a seminar at the end of the year. External and the internal examiners shall do the assessment of the project work.
- (2) Project work shall comprise of objectives of the work, methodology, results, discussions and conclusions.
21. Objectives of project work.— The main objectives of the project work is to—
- (i) show the evidence of having made accurate description of published work of others and of having recorded the findings in an impartial manner; and
  - (ii) develop the students in data collection, analysis and reporting and interpretation skills.
22. Methodology.— To complete the project work following methodology shall be adopted, namely:—
- (i) students shall work in groups of not less than *two* and not more than *four* under an authorised teacher;
  - (ii) project topic shall be approved by the Head of the Department or Head of the Institution;
  - (iii) project work chosen shall be related to the pharmacy practice in community, hospital and clinical setup. It shall be patient and treatment (Medicine) oriented, like drug utilisation reviews, pharmacoepidemiology, pharmacovigilance or pharmacoconomics;
  - (iv) project work shall be approved by the institutional ethics committee;
  - (v) student shall present at least three seminars, one in the beginning, one at middle and one at the end of the project work; and
  - (vi) two-page write-up of the project indicating title, objectives, methodology anticipated benefits and references shall be submitted to the Head of the Department or Head of the Institution.

23. Reporting .— (1) Student working on the project shall submit jointly to the Head of the Department or Head of the Institution a project report of about 40-50 pages. Project report should include a certificate issued by the authorised teacher, Head of the Department as well as by the Head of the Institution

(2) Project report shall be computer typed in double space using Times Roman font on A4 paper. The title shall be in bold with font size 18, sub-titles in bold with font size 14 and the text with font size 12. The cover page of the project report shall contain details about the name of the student and the name of the authorised teacher with font size 14.

(3) Submission of the project report shall be done at least one month prior to the commencement of annual or supplementary examination.

24. Evaluation.— The following methodology shall be adopted for evaluating the project work—

(i) Project work shall be evaluated by internal and external examiners.

(ii) Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of four students).

(iii) Three seminars presented by students shall be evaluated for twenty marks each and the average of best two shall be forwarded to the university with marks of other subjects.

(iv) Evaluation shall be done on the following items:	<b>Marks</b>
a) Write up of the seminar	(7.5)
b) Presentation of work	(7.5)
c) Communication skills	(7.5)
d) Question and answer skills	(7.5)
<b>Total</b>	<b>(30 marks)</b>

(v) Final evaluation of project work shall be done on the following items:	<b>Marks</b>
a) Write up of the seminar	(17.5)
b) Presentation of work	(17.5)
c) Communication skills	(17.5)
d) Question and answer skills	(17.5)
<b>Total</b>	<b>(70 marks)</b>

*Explanation.*— For the purposes of differentiation in the evaluation in case of topic being the same for the group of students, the same shall be done based on item numbers b, c and d mentioned above.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S. - 501301.



# APPENDIX-A

(See regulation 8)

## PHARM.D. SYLLABUS

### First Year

#### 1.1 HUMAN ANATOMY & PHYSIOLOGY (THEORY)

**Theory : 3 Hrs. /Week**

1. **Scope and Objectives:** This course is designed to impart a fundamental knowledge on the structure and functions of the human body. It also helps in understanding both homeostasis mechanisms and homeostatic imbalances of various body systems. Since a medicament, which is produced by pharmacist, is used to correct the deviations in human body, it enhances the understanding of how the drugs act on the various body systems in correcting the disease state of the organs.
  
2. **Upon completion of the course the student shall be able to:**
  - a. describe the structure (gross and histology) and functions of various organs of the human body;
  - b. describe the various homeostatic mechanisms and the ir imbalances of various systems;
  - c. identify the various tissues and organs of the different systems of the human body;
  - d. perform the hematological tests and also record blood pressure, heart rate, pulse and Respiratory volumes;
  - e. appreciate coordinated working pattern of different organs of each system; and
  - f. appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body
  
3. **Course materials:**

**Text books**

  - a. Tortora Gerard J and Nicholas, P Principles of anatomy and physiology Publisher Harpercollins college New York.
  - b. Wilson, K.J.W. Ross and Wilson's foundations of anatomy and physiology. Publisher: Churchill Livingstone, Edinburg.

**Reference books**

  - a. Guyton arthur, C. *Physiology of human body*. Publisher: Holtsaunders.
  - b. Chatterjee, C.C. *Human physiology*. Volume 1&11. Publisher: medical allied agency, Calcutta.
  - c. Peter L. Williams, Roger Warwick, Mary Dyson and Lawrence, H.
  - d. *Gray's anatomy*. Publisher: Churchill Livingstone, London.

#### 4. Lecture wise program

##### : Topics

- 1 Scope of anatomy and physiology, basic terminologies used in this subject (Description of the body as such planes and terminologies)
- 2 Structure of cell – its components and their functions.
- 3 Elementary tissues of the human body: epithelial, connective, Muscular and nervous tissues-their sub-types and characteristics
- 4 a) Osseous system - structure, composition and functions of the
  - b) Classification of joints, Types of movements of joints and disorders of joints (Definitions only)
- 5 Haemopoetic System
  - a) Composition and functions of blood
  - b) Haemopoiesis and disorders of blood components (definition of disorder)
  - c) Blood groups
  - d) Clotting factors and mechanism
  - e) Platelets and disorders of coagulation
- 6 Lymph
  - a) Lymph and lymphatic system, composition, formation and circulation.
  - b) Spleen: structure and functions, Disorders
  - c) Disorders of lymphatic system (definition only)
- 7 Cardiovascular system
  - a) Anatomy and functions of heart
  - b) Blood vessels and circulation (Pulmonary, coronary and systemic circulation)
  - c) Electrocardiogram (ECG)
  - d) Cardiac cycle and heart sounds
  - e) Blood pressure – its maintenance and regulation
  - f) Definition of the following disorders  
Hypertension, Hypotension, Arteriosclerosis, Atherosclerosis, Angina, Myocardial infarction, Congestive heart failure, Cardiac arrhythmias
- 8 Respiratory system
  - a) Anatomy of respiratory organs and functions
  - b) Mechanism / physiology of respiration and regulation of respiration
  - c) Transport of respiratory gases
  - d) Respiratory volumes and capacities, and Definition of: Hypoxia, Asphyxia, Dybarism, Oxygen therapy and resuscitation.
- 9 Digestive system
  - a) Anatomy and physiology of GIT
  - b) Anatomy and functions of accessory glands of GIT
  - c) Digestion and absorption
  - d) Disorders of GIT (definitions only)

- 10 Nervous system
  - a) Definition and classification of nervous system
  - b) Anatomy, physiology and functional areas of cerebrum
  - c) Anatomy and physiology of cerebellum
  - d) Anatomy and physiology of mid brain
  - e) Thalamus, hypothalamus and Basal Ganglia
  - f) Spinal cord: Structure & reflexes – mono-poly-planter
  - g) Cranial nerves – names and functions
  - h) ANS – Anatomy & functions of sympathetic & parasympathetic N.S.
- 11 Urinary system
  - a) Anatomy and physiology of urinary system
  - b) Formation of urine
  - c) Renin Angiotensin system – Juxtaglomerular apparatus - acid base Balance
  - d) Clearance tests and micturition
- 12 Endocrine system
  - a) Pituitary gland
  - b) Adrenal gland
  - c) Thyroid and Parathyroid glands
  - d) Pancreas and gonads
- 13 Reproductive system
  - a) Male and female reproductive system
  - b) Their hormones – Physiology of menstruation
  - c) Spermatogenesis & Oogenesis
  - d) Sex determination (genetic basis)
  - e) Pregnancy and maintenance and parturition
  - f) Contraceptive devices
- 14 Sense organs
  - a) Eye
  - b) Ear
  - c) Skin
  - d) Tongue & Nose
- 15 Skeletal muscles
  - a) Histology
  - b) Physiology of Muscle contraction
  - c) Physiological properties of skeletal muscle and their disorders (definitions)
- 16 Sports physiology
  - a) Muscles in exercise, Effect of athletic training on muscles and muscle performance,
  - b) Respiration in exercise, CVS in exercise, Body heat in exercise, Body fluids and salts in exercise,
  - c) Drugs and athletics

## 1.1 HUMAN ANATOMY & PHYSIOLOGY (PRACTICAL)

**Practical : 3 Hrs./Week**

**General Requirements:** Dissection box, Laboratory Napkin, muslin cloth, record, Observation book(100pages), Stationary items, Blood lancet.

### Course materials:

#### Text books

Goyal, R. K, Natvar M.P, and Shah S.A, Practical anatomy, physiology and biochemistry, latest edition, Publisher: B.S Shah Prakashan, Ahmedabad.

#### Reference books

Ranade VG, Text book of practical physiology, Latest edition, Publisher: PVG, Pune  
Anderson Experimental Physiology, Latest edition, Publisher: NA

### List of Experiments:

1. Study of tissues of human body
  - (a) Epithelial tissue.
  - (b) Muscular tissue.
2. Study of tissues of human body
  - (a) Connective tissue.
  - (b) Nervous tissue.
3. Study of appliances used in hematological experiments.
4. Determination of W.B.C. count of blood.
5. Determination of R.B.C. count of blood.
6. Determination of differential count of blood.
7. Determination of
  - (a) Erythrocyte Sedimentation Rate.
  - (b) Hemoglobin content of Blood.
  - (c) Bleeding time & Clotting time.
8. Determination of
  - (a) Blood Pressure.
  - (b) Blood group.
9. Study of various systems with the help of charts, models & specimens
  - (a) Skeleton system part I-axial skeleton.
  - (b) Skeleton system part II- appendicular skeleton.
  - (c) Cardiovascular system.
  - (d) Respiratory system.

- (e) Digestive system.
- (f) Urinary system.
- (g) Nervous system.
- (h) Special senses.
- (i) Reproductive system.

10. Study of different family planning appliances.
11. To perform pregnancy diagnosis test.
12. Study of appliances used in experimental physiology.
13. To record simple muscle curve using gastrocnemius sciatic nerve preparation.
14. To record simple summation curve using gastrocnemius sciatic nerve preparation.
15. To record simple effect of temperature using gastrocnemius sciatic nerve preparation.
16. To record simple effect of load & after load using gastrocnemius sciatic nerve preparation.
17. To record simple fatigue curve using gastrocnemius sciatic nerve preparation.

**Scheme of Practical Examination:**

	<b>Sessionals</b>	<b>Annual</b>
Identification	04	10
Synopsis	04	10
Major Experiment	07	20
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

## 1.2 PHARMACEUTICS (THEORY)

**Theory : 2 Hrs. /Week**

1. **Scope and objectives:** This course is designed to impart a fundamental knowledge on the art and science of formulating different dosage forms. It prepares the students for most basics of the applied field of pharmacy.
2. **Upon the completion of the course the student s should be able to:**
  - a. know the formulation aspects of different dosage forms;
  - b. do different pharmaceutical calculation involved in formulation;
  - c. formulate different types of dosage forms; and
  - d. appreciate the importance of good formulation for effectiveness.

### 3. Course materials:

#### Text books

- a. Cooper and Gunns Dispensing for pharmacy students.
- b. A text book Professional Pharmacy by N.K.Jain and S.N.Sharma.

#### Reference books

- a. Introduction to Pharmaceutical dosage forms by Howard C. Ansel.
- b. Remington's Pharmaceutical Sciences.
- c. Register of General Pharmacy by Cooper and Gunn.
- d. General Pharmacy by M.L.Schroff.

### 4. Lecture wise

#### programme: Topics

- 1
  - a. Introduction to dosage forms - classification and definitions
  - b. Prescription: definition, parts and handling
  - c. Posology: Definition, Factors affecting dose selection. Calculation of children and infant doses.
- 2 Historical back ground and development of profession of pharmacy and pharmaceutical industry in brief.
- 3 Development of Indian Pharmacopoeia and introduction to other Pharmacopoeias such as BP, USP, European Pharmacopoeia, Extra pharmacopoeia and Indian national formulary.
- 4 Weights and measures, Calculations involving percentage solutions, allegation, proof spirit, isotonic solutions etc.
- 5 Powders and Granules: Classification advantages and disadvantages, Preparation of simple, compound powders, Insufflations, Dusting powders, Eutectic and Explosive powders, Tooth powder and effervescent powders and granules.
- 6 Monophasic Dosage forms: Theoretical aspects of formulation including adjuvant like stabilizers, colorants, flavours with examples. Study of Monophasic liquids like gargles, mouth washes, Throat paint, Ear drops, Nasal drops, Liniments and lotions, Enemas and collodions.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

- 7 Biphasic dosage forms: Suspensions and emulsions, Definition, advantages and disadvantages, classification, test for the type of emulsion, formulation, stability and evaluation.
- 8 Suppositories and pessaries: Definition, advantages and disadvantages, types of base, method of preparation, Displacement value and evaluation.
- 9 Galenicals: Definition, equipment for different extraction processes like infusion, Decoction, Maceration and Percolation, methods of preparation of spirits, tinctures and extracts.
- 10 Pharmaceutical calculations.
- 11 Surgical aids: Surgical dressings, absorbable gelatin sponge, sutures, ligatures and medicated bandages.
- 12 Incompatibilities: Introduction, classification and methods to overcome the incompatibilities.

## 1.2 PHARMACEUTICS (PRACTICAL)

**Practical : 3 Hrs./Week**

### **List of Experiments:**

- 1. Syrups**
  - a. Simple Syrup I.P
  - b. Syrup of Ephedrine Hcl NF
  - c. Syrup Vasaka IP
  - d. Syrup of ferrous Phosphate IP
  - e. Orange Syrup
- 2. Elixir**
  - a. Piperizine citrate elixir BP
  - b. Cascara elixir BPC
  - c. Paracetamol elixir BPC
- 3. Linctus**
  - a. Simple Linctus BPC
  - b. Pediatric simple Linctus BPC
- 4. Solutions**
  - a. Solution of cresol with soap IP
  - b. Strong solution of ferric chloride BPC
  - c. Aqueous Iodine Solution IP
  - d. Strong solution of Iodine IP
  - e. Strong solution of ammonium acetate IP

*Signature*  
**PRINCIPAL**

5. **Liniments**
  - a. Liniment of turpentine IP\*
  - b. Liniment of camphor IP
6. **Suspensions\***
  - a. Calamine lotion
  - b. Magnesium Hydroxide mixture BP
7. **Emulsions\***
  - a. Cod liver oil emulsion
  - b. Liquid paraffin emulsion
8. **Powders\***
  - a. Eutectic powder
  - b. Explosive powder
  - c. Dusting powder
  - d. Insufflations
9. **Suppositories\***
  - a. Boric acid suppositories
  - b. Chloral suppositories
10. **Incompatibilities**
  - a. Mixtures with Physical
  - b. Chemical & Therapeutic incompatibilities

\* colourless bottles required for dispensing \* Paper envelope (white), butter paper and white paper required for dispensing.

#### Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).



### 1.3 MEDICINAL BIOCHEMISTRY (THEORY)

Theory : 3 Hrs. /Week

1. **Scope of the Subject:** Applied biochemistry deals with complete understanding of the molecular level of the chemical process associated with living cells. Clinical chemistry deals with the study of chemical aspects of human life in health and illness and the application of chemical laboratory methods to diagnosis, control of treatment, and prevention of diseases.

2. **Objectives of the Subject (Know, do, appreciate) :**

The objective of the present course is providing biochemical facts and the principles to the students of pharmacy. Upon completion of the subject student shall be able to –

- understand the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases;
- know the metabolic process of biomolecules in health and illness (metabolic disorders);
- understand the genetic organization of mammalian genome; protein synthesis; replication; mutation and repair mechanism;
- know the biochemical principles of organ function tests of kidney, liver and endocrine gland; and
- do the qualitative analysis and determination of biomolecules in the body fluids.

#### Text books (Theory)

- Harpers review of biochemistry - Martin
- Text book of biochemistry – D.Satyanarayana
- Text book of clinical chemistry- Alex kaplan & Laverve L.Szabo

#### Reference books (Theory)

- Principles of biochemistry -- Lehninger
- Text book of biochemistry -- Ramarao
- Practical Biochemistry-David T.Plummer.
- Practical Biochemistry-Pattabhiraman.

3. **Lecture wise programme:**

#### Topics

- Introduction to biochemistry:** Cell and its biochemical organization, transport process across the cell membranes. Energy rich compounds; ATP, Cyclic AMP and their biological significance.
- Enzymes:** Definition; Nomenclature; IUB classification; Factor affecting enzyme activity; Enzyme action; enzyme inhibition. Isoenzymes and their therapeutic and diagnostic applications; Coenzymes and their biochemical role and deficiency diseases.
- Carbohydrate metabolism:** Glycolysis, Citric acid cycle (TCA cycle), HMP shunt, Glycogenolysis, gluconeogenesis, glycogenesis. Metabolic disorders of carbohydrate metabolism (diabetes mellitus and glycogen storage diseases); Glucose, Galactose tolerance test and their significance; hormonal regulation of carbohydrate metabolism.

*Signature of*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501302.

- 4 **Lipid metabolism:** Oxidation of saturated ( $\beta$ -oxidation); Ketogenesis and ketolysis; biosynthesis of fatty acids, lipids; metabolism of cholesterol; Hormonal regulation of lipid metabolism. Defective metabolism of lipids (Atherosclerosis, fatty liver, hypercholesterolemia).
- 5 **Biological oxidation:** Coenzyme system involved in Biological oxidation. Electron transport chain (its mechanism in energy capture; regulation and inhibition); Uncouplers of ETC; Oxidative phosphorylation;
- 6 **Protein and amino acid metabolism:** protein turn over; nitrogen balance; Catabolism of Amino acids (Transamination, deamination & decarboxylation). Urea cycle and its metabolic disorders; production of bile pigments; hyperbilirubinemia, porphoria, jaundice. Metabolic disorder of Amino acids.
- 7 **Nucleic acid metabolism:** Metabolism of purine and pyrimidine nucleotides; Protein synthesis; Genetic code; inhibition of protein synthesis; mutation and repair mechanism; DNA replication (semiconservative /onion peel models) and DNA repair mechanism.
- 8 **Introduction to clinical chemistry: Cell;** composition; malfunction; Roll of the clinical chemistry laboratory.
- 9 **The kidney function tests:** Role of kidney; Laboratory tests for normal function includes-
  - a) Urine analysis (macroscopic and physical examination, quantitative and semiquantitative tests.)
  - b) Test for NPN constituents. (Creatinine /urea clearance, determination of blood and urine creatinine, urea and uric acid)
  - c) Urine concentration test
  - d) Urinary tract calculi. (stones)
- 10 **Liver function tests:** Physiological role of liver, metabolic, storage, excretory, protective, circulatory functions and function in blood coagulation.
  - a) Test for hepatic dysfunction-Bile pigments metabolism.
  - b) Test for hepatic function test- Serum bilirubin, urine bilirubin, and urine urobilinogen.
  - c) Dye tests of excretory function.
  - d) Tests based upon abnormalities of serum proteins.
- 11 **Lipid profile tests:** Lipoproteins, composition, functions. Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides.
- 12 **Immunochemical techniques** for determination of hormone levels and protein levels in serum for endocrine diseases and infectious diseases.  
Radio immuno assay (RIA) and Enzyme Linked Immuno Sorbent Assay (ELISA)
- 13 **Electrolytes:** Body water, compartments, water balance, and electrolyte distribution. Determination of sodium, calcium potassium, chlorides, bicarbonates in the body fluids.

*Geethanjali*  
PRINCIPAL

### 1.3 MEDICINAL BIOCHEMISTRY (PRACTICAL)

Practical : 3 Hrs./Week

**Title of the Experiment:**

- 1 Qualitative analysis of normal constituents of urine.\*
  - 2 Qualitative analysis of abnormal constituents of urine.\*
  - 3 Quantitative estimation of urine sugar by Benedict's reagent method.\*\*
  - 4 Quantitative estimation of urine chlorides by Volhard's method.\*\*
  - 5 Quantitative estimation of urine creatinine by Jaffe's method.\*\*
  - 6 Quantitative estimation of urine calcium by precipitation method.\*\*
  - 7 Quantitative estimation of serum cholesterol by Libermann Burchard's method.\*\*
  - 8 Preparation of Folin Wu filtrate from blood.\*
  - 9 Quantitative estimation of blood creatinine.\*\*
  - 10 Quantitative estimation of blood sugar Folin- Wu tube method.\*\*
  - 11 Estimation of SGOT in serum.\*\*
  - 12 Estimation of SGPT in serum.\*\*
  - 13 Estimation of Urea in Serum.\*\*
  - 14 Estimation of Proteins in Serum.\*\*
  - 15 Determination of serum bilirubin\*\*
  - 16 Determination of Glucose by means of Glucoseoxidase.\*\*
  - 17 Enzymatic hydrolysis of Glycogen/Starch by Amylases.\*\*
  - 18 Study of factors affecting Enzyme activity. (pH & Temp.)\*\*
  - 19 Preparation of standard buffer solutions and its pH measurements (any two)\*
  - 20 Experiment on lipid profile tests\*\*
  - 21 Determination of sodium,calcium and potassium in serum.\*\*
- \*\* indicate major experiments & \* indicate minor experiments

**Assignments:**

Format of the assignment

1. Minimum & Maximum number of pages.
2. It shall be computer draft copy.
3. Reference(s) shall be included at the end.
4. Name and signature of the student.
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 Min.

**Scheme of Practical Examination:**

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## 1.4 PHARMACEUTICAL ORGANIC CHEMISTRY (THEORY)

Theory : 3 Hrs. /Week

1. **Scope and objectives:** This course is designed to impart a very good knowledge about
  - a. IUPAC/Common system of nomenclature of simple organic compounds belonging to different classes of organic compounds;
  - b. Some important physical properties of organic compounds;
  - c. Free radical/ nucleophilic [alkyl/ acyl/ aryl] /electrophilic substitution, free radical/ nucleophilic / electrophilic addition, elimination, oxidation and reduction reactions with mechanism, orientation of the reaction, order of reactivity, stability of compounds;
  - d. Some named organic reactions with mechanisms; and
  - e. Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

### 2. Course materials:

#### Text books

- a. T.R.Morrison and R. Boyd - Organic chemistry,
- b. Bentley and Driver-Text book of Pharmaceutical chemistry
- c. I.L.Finer- Organic chemistry, the fundamentals of chemistry

#### Reference books

- a. Organic chemistry – J.M.Cram and D.J.Cram
- b. Organic chemistry- Brown
- c. Advanced organic chemistry- Jerry March, Wiley
- d. Organic chemistry- Cram and Hammett, Pine Hendrickson

### 3. Lecture wise programme

#### : Topics

- 1 Structures and Physical properties:
  - a. Polarity of bonds, polarity of molecules, M.P, Inter molecular forces, B.P, Solubility, non ionic solutes and ionic solutes, protic and aprotic Solvents, ion pairs,
  - b. Acids and bases, Lowry bronsted and Lewis theories
  - c. Isomerism
- 2 Nomenclature of organic compound belonging to the following classes Alkanes, Alkenes, Dienes, Alkynes, Alcohols, Aldehydes, Ketones, Amides, Amines, Phenols, Alkyl Halides, Carboxylic Acid, Esters, Acid Chlorides And Cycloalkanes.
- 3 Free radicals chain reactions of alkane : Mechanism, relative reactivity and stability
- 4 Alicyclic compounds : Preparations of cyclo alkanes, Bayer strain theory and orbital picture of angle strain.
- 5 Nucleophilic aliphatic substitution mechanism: Nucleophiles and leaving groups, kinetics of second and first order reaction, mechanism and kinetics of SN 2 reactions. Stereochemistry and steric hindrance, role of solvents, phase transfer catalysis, mechanism and kinetics of SN1 reactions, stereochemistry, carbocation and their stability, rearrangement of carbocation, role of solvents in SN1 reaction, Ion dipole bonds, SN2 versus SN1 solvolyses, nucleophilic assistance by the solvents.

*Principal*  
PRINCIPAL

- 6 Dehydro halogenation of alkyl halides: 1,2 elimination, kinetics, E2 and E1 mechanism, elimination via carbocation, evidence for E2 mechanism, absence of rearrangement isotope effect, absence hydrogen exchange, the element effect, orientation and reactivity, E2 versus E1, elimination versus substitution, dehydration of alcohol, ease of dehydration, acid catalysis, reversibility, orientation.
- 7 Electrophilic and free radicals addition: Reactions at carbon-carbon, double bond, electrophile, hydrogenation, heat of hydrogenation and stability of alkenes, markownikoff rule, addition of hydrogen halides, addition of hydrogen bromides, peroxide effect, electrophilic addition, mechanism, rearrangement, absence of hydrogen exchange, orientation and reactivity, addition of halogen, mechanism, halohydrin formation, mechanism of free radicals addition, mechanism of peroxide initiated addition of hydrogen bromide, orientation of free addition, additions of carbene to alkene, cyclo addition reactions.
- 8 Carbon-carbon double bond as substituents: Free radical halogenations of alkenes, comparison of free radical substitution with free radical addition, free radical substitution in alkenes, orientation and reactivity, allylic rearrangements.
- 9 Theory of resonance: Allyl radical as a resonance hybrid, stability, orbital picture, resonance stabilisation of allyl radicals, hyper conjugation, allyl cation as a resonance hybrid, nucleophilic substitution in allylic substrate, SN1 reactivity, allylic rearrangement, resonance stabilisation of allyl cation, hyper conjugation, nucleophilic substitution in allylic substrate, SN2 nucleophilic substitution in vinylic substrate, vinylic cation, stability of conjugated dienes, resonance in alkenes, hyper conjugation, ease of formation of conjugated dienes, orientation of elimination, electrophilic addition to conjugated dienes, 1,4- addition, 1,2-versus 1,4-addition, rate versus equilibrium, orientation and reactivity of free radical addition to conjugated dienes.
- 10 Electrophilic aromatic substitution: Effect of substituent groups, determination of orientation, determination of relative reactivity, classification of substituent group, mechanism of nitration, sulphonation, halogenation, friedel craft alkylation, friedel craft acylation, reactivity and orientation, activating and deactivating O,P,M directing groups, electron release via resonance, effect of halogen on electrophilic aromatic substitution in alkyl benzene, side chain halogenation of alkyl benzene, resonance stabilization of benzyl radical.
- 11 Nucleophilic addition reaction: Mechanism, ionisation of carboxylic acids, acidity constants, acidity of acids, structure of carboxylate ions, effect of substituent on acidity, nucleophilic acyl substitution reaction, conversion of acid to acid chloride, esters, amide and anhydride. Role of carboxyl group, comparison of alkyl nucleophilic substitution with acyl nucleophilic substitution.

- 12 Mechanism of aldol condensation, claisen condensation, cannizzaro reaction, crossed aldol condensation, crossed cannizzaro reaction, benzoin condensation, perkin condensation. Knoevenagel, Reformatsky reaction, Wittig reaction, Michael addition.
- 13 Hoffman rearrangement: Migration to electron deficient nitrogen, Sandmeyer's reaction, basicity of amines, diazotisation and coupling, acidity of phenols, Williamson synthesis, Fries rearrangement, Kolbe reaction, Reimer tieman's reactions.
- 14 Nucleophilic aromatic substitution: Bimolecular displacement mechanisms, orientation, comparison of aliphatic nucleophilic substitution with that of aromatic.
- 15 Oxidation reduction reaction.
- 16 Study of the following official compounds- preparation, test for purity, assay and medicinal uses of Chlorbutol, Dimercaprol, Glyceryl trinitrate, Urea, Ethylene diamine dihydrate, Vanillin, Paraldehyde, Ethylene chloride, Lactic acid, Tartaric acid, citric acid, salicylic acid, aspirin, methyl salicylate, ethyl benzoate, benzyl benzoate, dimethyl pthalate, sodium lauryl sulphate, saccharin sodium, mephensin.

#### 1.4 PHARMACEUTICAL ORGANIC CHEMISTRY (PRACTICAL)

Practical : 3 Hrs./Week

**I. Introduction to the various laboratory techniques through de monstration involving synthesis of the following compounds (at least 8 compounds to be synthesised):**

1. Acetanilide / aspirin (Acetylation)
2. Benzanilide / Phenyl benzoate (Benzoylation)
3. P-bromo acetanilide / 2,4,6 – tribromo aniline (Bromination)
4. Dibenzylidene acetone (Condensation)
5. 1-Phenylazo-2-naphthol (Diazotisation and coupling)
6. Benzoic acid / salicylic acid (Hydrolysis of ester)
7. M-dinitro benzene (Nitration)
8. 9, 10 – Anthraquinone (Oxidation of anthracene) / preparation of benzoic acid from toluene or benzaldehyde
9. M-phenylene diamine (Reduction of M-dinitrobenzene) / Aniline from nitrobenzene
10. Benzophenone oxime
11. Nitration of salicylic acid
12. Preparation of picric acid
13. Preparation of O-chlorobenzoic acid from O-chlorotoluene
14. Preparation of cyclohexanone from cyclohexanol

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**II. Identification of organic compounds belonging to the following classes by :**

Systematic qualitative organic analysis including preparation of derivatives Phenols, amides, carbohydrates, amines, carboxylic acids, aldehyde and ketones, Alcohols, esters, hydrocarbons, anilides, nitrocompounds.

**III. Introduction to the use of stereo models:**

Methane, Ethane, Ethylene, Acetylene, Cis alkene, Trans alkene, inversion of configuration.

**Scheme of Practical Examination:**

	<b>Sessionals</b>	<b>Annual</b>
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).



**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## 1.5 PHARMACEUTICAL INORGANIC CHEMISTRY (THEORY)

Theory : 2 Hrs. /Week

1. **Scope and objectives:** This course mainly deals with fundamentals of Analytical chemistry and also the study of inorganic pharmaceuticals regarding their monographs and also the course deals with basic knowledge of analysis of various pharmaceuticals.
2. **Upon completion of the course student shall be able to:**
  - a. understand the principles and procedures of analysis of drugs and also regarding the application of inorganic pharmaceuticals;
  - b. know the analysis of the inorganic pharmaceuticals their applications; and
  - c. appreciate the importance of inorganic pharmaceuticals in preventing and curing the disease.

### 3. Course materials:

#### Text books

- a. A text book Inorganic medicinal chemistry by Surendra N. Pandeya
- b. A. H. Beckett and J. B. Stanlake's Practical Pharmaceutical chemistry Vol-I & Vol-II
- c. Inorganic Pharmaceutical Chemistry III-Edition P.Gundu Rao

#### Reference books

- a. Inorganic Pharmaceutical Chemistry by Anand & Chetwal
- b. Pharmaceutical Inorganic chemistry by Dr.B.G.Nagavi
- c. Analytical chemistry principles by John H. Kennedy d. I.P.1985 and 1996, Govt. of India, Ministry of health

### 4. Lecture wise programme:

#### Topics

- 1 Errors
- 2 Volumetric analysis
- 3 Acid-base titrations
- 4 Redox titrations
- 5 Non aqueous titrations
- 6 Precipitation titrations
- 7 Complexometric titrations
- 8 Theory of indicators
- 9 Gravimetry
- 10 Limit tests
- 11 Medicinal gases
- 12 Acidifiers
- 13 Antacids
- 14 Cathartics
- 15 Electrolyte replenishers



- 16 Essential Trace elements
- 17 Antimicrobials
- 18 Pharmaceutical aids
- 19 Dental Products
- 20 Miscellaneous compounds
- 21 Radio Pharmaceuticals

## 1.5 PHARMACEUTICAL INORGANIC CHEMISTRY (PRACTICAL)

**Practical : 3 Hrs./Week**

### 1. Limit test (6 exercises)

- a. Limit test for chlorides
- b. Limit test for sulphates
- c. Limit test for iron
- d. Limit test for heavy metals
- e. Limit test for arsenic
- f. Modified limit tests for chlorides and sulphates

### 2. Assays (10 exercises)

- a. Ammonium chloride- Acid-base titration
- b. Ferrous sulphate- Cerimetry
- c. Copper sulphate- Iodometry
- d. Calcilugluconate- Complexometry
- e. Hydrogen peroxide – Permanganometry
- f. Sodium benzoate – Nonaqueous titration
- g. Sodium chloride – Modified volhard's method
- h. Assay of KI – KIO<sub>3</sub> titration
- i. Gravimetric estimation of barium as barium sulphate
- j. Sodium antimony gluconate or antimony potassium tartarate

### 3. Estimation of mixture (Any two exercises)

- a. Sodium hydroxide and sodium carbonate
- b. Boric acid and Borax
- c. Oxalic acid and sodium oxalate

### 4. Test for identity (Any three exercises)

- a. Sodium bicarbonate
- b. Barium sulphate
- c. Ferrous sulphate
- d. Potassium chloride

**5. Test for purity (Any two exercises)**

- a. Swelling power in Bentonite
- b. Acid neutralising capacity in aluminium hydroxide gel
- c. Ammonium salts in potash alum
- d. Adsorption power heavy Kaolin
- e. Presence of Iodates in KI

**6. Preparations (Any two exercises)**

- a. Boric acids
- b. Potash alum
- c. Calcium lactate
- d. Magnesium sulphate

**Scheme of Practical Examination :**

	<b>Sessionals</b>	<b>Annual</b>
Synopsis	05	15
Major Experiment	10	25
Minor Experiment 1&2	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

## 1.6 REMEDIAL MATHEMATICS/BIOLOGY (THEORY)

Theory : 3 Hrs. /Week

### REMEDIAL MATHEMATICS :

1. **Scope and objectives:** This is an introductory course in mathematics. This subjects deals with the introduction to matrices, determinants, trigonometry, analytical geometry, differential calculus, integral calculus, differential equations, laplace transform.
2. **Upon completion of the course the student shall be able to : –**
  - a. Know Trignometry, Analytical geometry, Matrices, Determinant, Integration, Differential equation, Laplace transform and their applications;
  - b. solve the problems of different types by applying theory; and
  - c. appreciate the important applications of mathematics in pharmacy.

### 3. Course materials:

#### Text books

- a. Differential calculus By Shantinakaran
- b. Text book of Mathematics for second year pre- university by Prof.B.M.Sreenivas

#### Reference books

- a. Integral calculus By Shanthinarayan
- b. Engineering mathematics By B.S.Grewal
- c. Trigonometry Part-I By S.L.Loney

### 4. Lecture wise programme :

#### Topics

- 1 **Algebra :** Determinants, Matrices
- 2 **Trigonometry :** Sides and angles of a triangle, solution of triangles
- 3 **Analytical Geometry :**Points, Straight line, circle, parabola
- 4 **Differential calculus:** Limit of a function, Differential calculus, Differentiation of a sum, Product, Quotient Composite, Parametric, exponential, trigonometric and Logarithmic function. Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions of two variables
- 5 **Integral Calculus:** Definite integrals, integration by substitution and by parts, Properties of definite integrals.
- 6 **Differential equations:** Definition, order, degree, variable separable, homogeneous, Linear, heterogeneous, linear, differential equation with constant coefficient, simultaneous linear equation of second order.
- 7 **Laplace transform:** Definition, Laplace transform of elementary functions, Properties of linearity and shifting

**BIOLOGY :**

**1. Scope and objectives:** This is an introductory course in Biology, which gives detailed study of natural sources such as plant and animal origin. This subject has been introduced to the pharmacy course in order to make the student aware of various naturally occurring drugs and its history, sources, classification, distribution and the characters of the plants and animals. This subject gives basic foundation to Pharmacognosy.

**2. Course materials:****Text books**

- a. Text book of Biology by S.B.Gokhale
- b. A Text book of Biology by Dr.Thulajappa and Dr. Seetaram.

**Reference books**

- a. A Text book of Biology by B.V.Sreenivasa Naidu
- b. A Text book of Biology by Naidu and Murthy
- c. Botany for Degree students By A.C.Dutta.
- d. Outlines of Zoology by M.Ekambaranatha ayyer and T.N.Ananthkrishnan.
- e. A manual for pharmaceutical biology practical by S.B.Gokhale and C.K.Kokate.

**3. Lecture wise programme :****Topic****PART – A**

- 01 Introduction
- 2 General organization of plants and its inclusions
- 3 Plant tissues
- 4 Plant kingdom and its classification
- 5 Morphology of plants
- 6 Root, Stem, Leaf and Its modifications
- 7 Inflorescence and Pollination of flowers
- 8 Morphology of fruits and seeds
- 9 Plant physiology
- 10 Taxonomy of Leguminosae, umbelliferae, Solanaceae, Lilliaceae, Zinziberaceae, Rubiaceae
- 11 Study of Fungi, Yeast, Penicillin and Bacteria

**PART-B**

- 1 Study of Animal cell
- 2 Study animal tissues
- 3 Detailed study of frog
- 4 Study of Pisces, Raptiles, Aves
- 5 Geneeral organization of mammals
- 6 Study of poisonous animals

## 1.6 BIOLOGY (PRACTICAL)

**Practical : 3 Hrs./Week**


**Title:**

1. Introduction of biology experiments
2. Study of cell wall constituents and cell inclusions
3. Study of Stem modifications
4. Study of Root modifications
5. Study of Leaf modifications
6. Identification of Fruits and seeds
7. Preparation of Permanent slides
8. T.S. of Senna, Cassia, Ephedra, Podophyllum.
9. Simple plant physiological experiments
10. Identification of animals
11. Detailed study of Frog
12. Computer based tutorials

**Scheme of Practical Examination :**

	<b>Sessionals</b>	<b>Annual</b>
Identification	04	10
Synopsis	04	10
Major Experiment	07	20
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301,

## Second year

### 2.1 PATHOPHYSIOLOGY (THEORY)

Theory : 3 Hrs. /Week

1. **Scope of the Subject:** This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic Pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge of its application in other subject of pharmacy.
2. **Objectives of the Subject :** Upon completion of the subject student shall be able to –
  - a. describe the etiology and pathogenesis of the selected disease states;
  - b. name the signs and symptoms of the diseases; and
  - c. mention the complications of the diseases.

#### Text books (Theory)

- a. Pathologic basis of disease by- Cotran, Kumar, Robbins
- b. Text book of Pathology- Harsh Mohan
- c. Text book of Pathology- Y.M. Bhide

#### Reference books (Theory)

- a. Clinical Pharmacy and Therapeutics; Second edition; Roger Walker; Churchill Livingstone publication

### 3. Detailed syllabus and lecture wise schedule :

#### Chapter

#### 1 Basic principles of cell injury and Adaptation

- a) Causes, Pathogenesis and morphology of cell injury
- b) Abnormalities in lipoproteinaemia, glycogen infiltration and glycogen infiltration and glycogen infiltration and glycogen storage diseases

#### 2 Inflammation

- a) Pathogenesis of acute inflammation, Chemical mediators in inflammation, Types of chronic inflammation
- b) Repairs of wounds in the skin, factors influencing healing of wounds

#### 3 Diseases of Immunity

- a) Introduction to T and B cells
- b) MHC proteins or transplantation antigens
- c) Immune tolerance
  - Hypersensitivity  
Hypersensitivity type I, II, III, IV, Biological significance, Allergy due to food, chemicals and drugs
  - Autoimmunity  
Criteria for autoimmunity, Classifications of autoimmune diseases in man, mechanism of autoimmunity, Transplantation and immunologic tolerance, allograft rejections, transplantation antigens, mechanism of rejection of allograft.
  - Acquired immune deficiency syndrome (AIDS)

- Amyloidosis

- 4 **Cancer:** differences between benign and malignant tumors, Histological diagnosis of malignancy, invasions and metastasis, patterns of spread, disturbances of growth of cells, classification of tumors, general biology of tumors, spread of malignant tumors, etiology and pathogenesis of cancer.
- 5 Types of shock, mechanisms, stages and management
- 6 Biological effects of radiation
- 7 Environmental and nutritional diseases
  - i) Air pollution and smoking- SO<sub>2</sub>,NO, NO<sub>2</sub>, and CO
  - ii) Protein calorie malnutrition, vitamins, obesity, pathogenesis of starvation.
- 8 Pathophysiology of common diseases
  - a. Parkinsonism
  - b. Schizophrenia
  - c. Depression and mania
  - d. Hypertension,
  - e. Stroke (ischaemic and hemorrhage)
  - f. Angina, CCF, Atherosclerosis, Myocardial infarction
  - g. Diabetes Mellitus
  - h. Peptic ulcer and inflammatory bowel diseases
  - i. Cirrhosis and Alcoholic liver diseases
  - j. Acute and chronic renal failure
  - k. Asthma and chronic obstructive airway diseases
- 9 Infectious diseases :  
Sexually transmitted diseases (HIV,Syphilis,Gonorrhea), Urinary tract infections, Pneumonia, Typhoid, Tuberculosis, Leprosy, Malaria Dysentery (bacterial and amoebic ), Hepatitis- infective hepatitis.

#### 4. Assignments :

##### Title of the Experiment

- 1 Chemical Mediators of inflammation
- 2 Drug Hypersensitivity
- 3 Cigarette smoking & its ill effects
- 4 Biological Effects of Radiation
- 5 Etiology and hazards of obesity
- 6 Complications of diabetes
- 7 Diagnosis of cancer
- 8 Disorders of vitamins
- 9 Methods in Pathology- Laboratory values of clinical significance
- 10 Pathophysiology of Dengue Hemorrhagic Fever (DHF)

##### Format of the assignment

- 1 Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year
4. It shall be computer draft copy.
5. Name and signature of the student
6. Time allocated for presentation may be 8+2 Min.

  
PRINCIPAL

## 2.2 PHARMACEUTICAL MICROBIOLOGY (THEORY)

**Theory : 3 Hrs. /Week**

- 1. Scope of the Subject:** Microbiology has always been an essential component of pharmacy curriculum. This is because of the relevance of microbiology to pharmaceutical sciences and more specifically to pharmaceutical industry. Pharmaceutical biotechnology is the logical extension of pharmaceutical microbiology, which is expected to change the complete drug product scenario in the future.

This course deals with the various aspects of microorganisms, its classification, morphology, laboratory cultivation identification and maintenance. Its also discusses with sterilization of pharmaceutical products, equipment, media etc. The course further discusses the immunological preparations, diseases its transmission, diagnosis, control and immunological tests.

**2. Objectives of the Subject :**

Upon completion of the subject student shall be able to –

- know the anatomy, identification, growth factors and sterilization of microorganisms;
- know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
- do estimation of RNA and DNA and there by identifying the source ;
- do cultivation and identification of the microorganisms in the laboratory;
- do identification of diseases by performing the diagnostic tests; and
- appreciate the behavior of motility and behavioral characteristics of microorganisms.

**Text books (Theory)**

- Vanitha Kale and Kishor Bhusari — Applied Microbiology | Himalaya Publishing house Mumbai.
- Mary Louis Turgeon — Immunology and Serology in Laboratory Medicines| 2<sup>nd</sup> edition, 1996 Mosby- Year book inc St. Louis Missouri 63146.
- Harsh Mohan, — Text book of Pathology| 3<sup>rd</sup> edition, 1998, B-3 Ansari road Darya ganj N. Delhi.

**Reference books (Theory)**

- Prescot L.M., Jarley G.P Klein D.A —Microbiology| 2<sup>nd</sup>- edition Mc Graw Hill Company Inc
- Rawlins E.A.|Bentley's Text Book of Pharmaceutics| B ailliere Tindals 24-28 London 1988
- Forbisher — Fundamentals of Microbiology| Philidelphia W.B. Saunders.
- Prescott L.M. Jarley G.P., Klein.D.A. — Microbiology.|2<sup>nd</sup> edition WMC Brown Publishers, Oxford. 1993
- War Roitt, Jonathan Brostoff, David male, — Immunology|3<sup>rd</sup> edition 1996, Mosby-year book Europe Ltd, London.
- Pharmacopoeia of India, Govt of India, 1996.

*Naifunet*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheerayal(V), Keesara(M), Medchal Dist, T.S.-501301.



### 3. Detailed syllabus and lecture wise schedule :

#### Title of the topic

- 1 Introduction to the science of microbiology. Major divisions of microbial world and Relationship among them.
- 2 Different methods of classification of microbes and study of Bacteria, Fungi, virus, Rickettsiae, Spirochetes.
- 3 Nutritional requirements, growth and cultivation of bacteria and virus. Study of different important media required for the growth of aerobic and anaerobic bacteria & fungi. Differential media, enriched media and selective media, maintenance of lab cultures.
- 4 Different methods used in isolation and identification of bacteria with emphasis to different staining techniques and biochemical reactions. Counting of bacteria -Total and Viable counting techniques.
- 5 Detailed study of different methods of sterilization including their merits and demerits. Sterilization methods for all pharmaceutical products. Detailed study of sterility testing of different pharmaceutical preparations . Brief information on Validation.
- 6 Disinfectants- Study of disinfectants, antiseptics, fungicidal and virucidal agents factors affecting their activation and mechanism of action. Evaluation of bactericidal, bacteristatic, , virucidal activities, evaluation of preservatives in pharmaceutical preparations.
- 7 Immunology- Immunity, Definition, Classification, General principles of natural immunity, Phagocytosis, acquired immunity( active and passive ) . Antigens, chemical nature of antigens structure and formation of Antibodies, Antigen-Antibody reactions. Bacterial exotoxins and endotoxins. Significance of toxoids in active immunity, Immunization programme, and importance of booster dose.
- 8 Diagnostic tests : Schick's Test, Elisa test, Western Blot test, Southern Blot PCR Widal, QBC, Mantoux Peripheral smear. Study of malarial parasite.
- 9 Microbial culture sensitivity Testing: Interpretation of results Principles and methods of different microbiological assays, microbiological assay of Penicillin, Streptomycin and vitamin B<sub>2</sub> and B<sub>12</sub>. Standardisation of vaccines and sera.
- 10 Study of infectious diseases: Typhoid, Tuberculosis, Malaria, Cholera, Hepatitis, Meningitis, Syphilis & Gonorrhoea and HIV.

## 2.2 PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)

**Practical : 3 Hrs./Week**

#### Title of the Experiment:

- 1 Study of apparatus used in experimental microbiology\*.
- 2 Sterilisation of glass ware's. Preparation of media and sterilisation.\*
- 3 Staining techniques – Simple staining ; Gram's staining ; Negative staining\*\*
- 4 Study of motility characters\*.
- 5 Enumeration of micro-organisms (Total and Viable)\*
- 6 Study of the methods of isolation of pure culture.\*
- 7 Bio chemical testing for the identification of micro\*-organisms.

*Geethanjali*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

- 8 Cultural sensitivity testing for some micro-organisms.\*
- 9 Sterility testing for powders and liquids.\*
- 10 Determination of minimum inhibitory concentration.\*
- 11 Microbiological assay of antibiotics by cup plate method.\*
- 12 Microbiological assay of vitamins by Turbidometric method\*\*
- 13 Determination of RWC.\*\*
- 14 Diagnostic tests for some common diseases, Widal, malarial parasite.\*\*

\* Indicate minor experiment & \*\* indicate major experiment

#### Assignments:

- 1 Visit to some pathological laboratories & study the activities and equipment/instruments used and reporting the same.
2. Visit to milk dairies (Pasturization) and microbial laboratories (other sterilization methods) & study the activities and equipment/instruments used and reporting the same.
3. Library assignments
  - a. Report of recent microbial techniques developed in diagnosing some common diseases.
  - b. Latest advancement developed in identifying, cultivating & handling of microorganisms.

#### Format of the assignment:

1. Minimum & Maximum number of pages.
2. It shall be computer draft copy.
3. Reference(s) shall be included at the end.
4. Name and signature of the student.
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 Min.

#### Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501302.

## 2.3 PHARMACOGNOSY & PHYTOPHARMACEUTICALS (THEORY)

Theory : 3 Hrs. /Week

1. **Scope and objectives:** This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.

2. **Upon completion of the course student shall be able to:**

- under stand the basic principles of cultivation, collection and storage of crude drugs;
- know the source, active constituents and uses of crude drugs; and
- appreciate the applications of primary and secondary metabolites of the plant.

3. **Course materials:**

### Text books

- Pharmacognosy by G.E. Trease & W.C.Evans.
- Pharmacognosy by C.K.Kokate, Gokhale & A.C.Purohit.

### Reference books

- Pharmacognosy by Brady & Tyler.E.
- Pharmacognosy by T.E.Wallis.
- Pharmacognosy by C.S. Shah & Qadery.
- Pharmacognosy by M.A. Iyengar.

4. **Lecture wise programme:**

### Topics

- Introduction.
- Definition, history and scope of Pharmacognosy.
- Classification of crude drugs.
- Cultivation, collection, processing and storage of crude drugs.
- Detailed method of cultivation of crude drugs.
- Study of cell wall constituents and cell inclusions.
- Microscopical and powder Microscopical study of crude drugs.
- Study of natural pesticides.
- Detailed study of various cell constituents.
- Carbohydrates and related products.
- Detailed study carbohydrates containing drugs.(11 drugs)
- Definition sources, method extraction, chemistry and method of analysis of lipids.
- Detailed study of oils.
- Definition, classification, chemistry and method of analysis of protein.
- Study of plants fibers used in surgical dressings and related products.
- Different methods of adulteration of crude drugs.

*Geethanjali*  
PRINCIPAL

## 2.3 PHARMACOGNOSY & PHYTOPHARMACEUTICALS (PRACTICAL)

**Practical : 3 Hrs./Week**

**General Requirements:** Laboratory Napkin, Observation Book 150 pages Zero brush, Needle, Blade, Match box.

**List of experiments:**

- 1 Introduction of Pharmacognosy laboratory and experiments.
- 2 Study of cell wall constituents and cell inclusions.
- 3 Macro, powder and microscopic study of Datura.
- 4 Macro, powder and microscopic study of Senna.
- 5 Macro, powder and microscopic study of Cassia.cinnamon.
- 6 Macro, powder and microscopic study of Cinchona.
- 7 Macro, powder and microscopic study of Ephedra.
- 8 Macro, powder and microscopic study of Quassia.
- 9 Macro, powder and microscopic study of Clove
- 10 Macro, powder and microscopic study of Fennel.
- 11 Macro, powder and microscopic study of Coriander.
- 12 Macro, powder and microscopic study of Isapgol.
- 13 Macro, powder and microscopic study of Nux vomica.
- 14 Macro, powder and microscopic study of Rauwolfia.
- 15 Macro, powder and microscopic study of Liquorice.
- 16 Macro, powder and microscopic study of Ginger.
- 17 Macro, powder and microscopic study of Podophyllum.
- 18 Determination of Iodine value.
- 19 Determination of Saponification value and unsaponifiable matter.
- 20 Determination of ester value.
- 21 Determination of Acid value.
- 22 Chemical tests for Acacia.
- 23 Chemical tests for Tragacanth.
- 24 Chemical tests for Agar.
- 25 Chemical tests for Starch.
- 26 Chemical tests for Lipids.(castor oil,sesame oil, shark liver oil,bees wax)
- 27 Chemical tests for Gelatin.

**Scheme of Practical Examination:**

	Sessionals	Annual
Identification	04	10
Synopsis	04	10
Major Experiment	07	20
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## 2.4 PHARMACOLOGY – I (THEORY)

**Theory : 3 Hrs. /Week**

1. **Scope of the Subject:** This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, apart from general pharmacology, drugs acting on autonomic nervous system, cardiovascular system, central nervous system, blood and blood forming agents and renal system will be taught. In addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.
2. **Objectives of the Subject :** Upon completion of the subject student shall be able to (Know, do, appreciate) –
  - a. understand the pharmacological aspects of drugs falling under the above mentioned chapters;
  - b. handle and carry out the animal experiments;
  - c. appreciate the importance of pharmacology subject as a basis of therapeutics; and
  - d. correlate and apply the knowledge therapeutically.

**Text books (Theory)** (Author, Title, Edition, Publication Place, Publisher, Year of Publication)

- a. Tripathi, K. D. Essentials of medical pharmacology. 4<sup>th</sup> Ed, 1999. Publisher: Jaypee, Delhi.
- b. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16<sup>th</sup> edition (single volume), 1999. Publisher: Popular, Dubai.
- c. Rang, H.P. & Dale, M.M. Pharmacology. 4<sup>th</sup> edition, 1999. Publisher: Churchill Living stone.

**Reference books (Theory)**(Author, Title, Edition, Publication Place, Publisher, Publication Year)

- a. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 9<sup>th</sup> Ed, 1996. Publisher Mc Graw Hill, Pergamon press.
- b. Craig, C.R.&Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher : Little Brown.Co
- c. Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, Int.
- d. Shargel and Leon. Applied Biopharmaceutics and pharmacokinetics. Latest edition. Publisher: Prentice Hall, London.

**Text books (Practical) :**

Kulkarni, S. K. and Dandia, P. C. Hand book of experimental pharmacology. Latest edition, Publisher: Vallab, Delli.

**Reference books (Practical)**

- a. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition, Publisher: Churchill livingstone.

- b. Macleod, L.J. Pharmacological experiments on isolated preparations. Latest edition, Publisher: Churchill livingstone.
- c. Ghosh, M.N. Fundamentals of experimental pharmacology. Latest edition, Publisher: Scientific book agency, Kolkata.
- d. Ian Kitchen. Textbook of in vitro practical pharmacology. Latest edition, Publisher: Black well Scientific.

### 3. Detailed syllabus and lecture wise schedule :

#### Title of the topic

#### 1. General Pharmacology

- a) Introduction, definitions and scope of pharmacology
- b) Routes of administration of drugs
- c) Pharmacokinetics (absorption, distribution, metabolism and excretion)
- d) Pharmacodynamics
- e) Factors modifying drug effects
- f) Drug toxicity - Acute, sub- acute and chronic toxicity.
- g) Pre-clinical evaluations
- h) Drug interactions

*Note:* The term Pharmacology used here refers to the classification, mechanism of action, pharmacokinetics, pharmacodynamics, adverse effects, contraindications, Therapeutic uses, interactions and dose and route of administration.

#### 2. Pharmacology of drugs acting on ANS

- a) Adrenergic and antiadrenergic drugs
- b) Cholinergic and anticholinergic drugs
- c) Neuromuscular blockers
- d) Mydriatics and miotics
- e) Drugs used in myasthenia gravis
- f) Drugs used in Parkinsonism

#### 3. Pharmacology of drugs acting on cardiovascular system

- a) Antihypertensives
- b) Anti-anginal drugs
- c) Anti-arrhythmic drugs
- d) Drugs used for therapy of Congestive Heart Failure
- e) Drugs used for hyperlipidaemias

*Signature of*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501501.

4. **Pharmacology of drugs acting on Central Nervous System**
  - a) General anesthetics
  - b) Sedatives and hypnotics
  - c) Anticonvulsants
  - d) Analgesic and anti- inflammatory agents
  - e) *Psychotropic drugs*
  - f) Alcohol and methyl alcohol
  - g) CNS stimulants and cognition enhancers
  - h) Pharmacology of local anaesthetics
  
5. **Pharmacology of Drugs acting on Respiratory tract**
  - a) Bronchodilators
  - b) Mucolytics
  - c) Expectorants
  - d) Antitussives
  - e) NasalDecongestants
  
6. **Pharmacology of Hormones and Hormone antagonists**
  - a) Thyroid and Antithyroid drugs
  - b) Insulin, Insulin analogues and oral hypoglycemic agents
  - c) Sex hormones and oral contraceptives
  - d) Oxytocin and other stimulants and relaxants
  
7. **Pharmacology of autocooids and their antagonists**
  - a) Histamines and Antihistaminics
  - b) 5-Hydroxytryptamine and its antagonists
  - c) Lipid derived autocooids and platelet activating factor

## 2.5 COMMUNITY PHARMACY (THEORY)

**Theory : 2 Hrs. /Week**

1. **Scope:** In the changing scenario of pharmacy practice in India, Community Pharmacists are expected to offer various pharmaceutical care services. In order to meet this demand, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling, health screening services for improved patient care in the community set up.
2. **Objectives:** Upon completion of the course, the student shall be able to –
  - a. know pharmaceutical care services;
  - b. know the business and professional practice management skills in community pharmacies;
  - c. do patient counselling & provide health screening services to public in community pharmacy;
  - d. respond to minor ailments and provide appropriate medication;
  - e. show empathy and sympathy to patients; and
  - f. appreciate the concept of Rational drug therapy.

### Text Books:

- a. Health Education and Community Pharmacy by N.S.Parmar.
- b. WHO consultative group report.
- c. Drug store & Business management by Mohammed Ali & Jyoti.

### Reference books:

- a. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.
- b. Comprehensive Pharmacy Review – Edt. Leon Shargel. Lippincott Williams & Wilkins.

### Special require ments:

1. Either the college is having model community pharmacy (meeting the schedule N requirement) or sign MoU with at least 4-5 community pharmacies nearby to the college for training the students on dispensing and counselling activities.
2. Special equipments like B.P apparatus, Glucometer, Peak flow meter, and apparatus for cholesterol estimation.

### 3. Scheme of evaluation (80 Marks)

- |   |    |
|---|----|
| 1. Synopsis   | 10 |
| 2. Major Experiment<br>(Counselling of patients with specific diseases – emphasis should be given on Counselling introduction, content, process and conclusion) | 30 |
| 3. Minor Experiment(Ability to measure B.P/ CBG / Lung function)  | 15 |
| 4. Prescription Analysis (Analyzing the prescriptions for probable drug interaction and ability to tell the management)   | 15 |
| 5. Viva – Voce  | 10 |



#### 4. Lecture wise programme :

##### Topics

- 1 **Definition, scope, of community pharmacy**  
Roles and responsibilities of Community pharmacist
- 2 **Community Pharmacy Management**
  - a) Selection of site, Space layout, and design
  - b) Staff, Materials- coding, stocking
  - c) Legal requirements
  - d) Maintenance of various registers
  - e) Use of Computers: Business and health care soft wares
- 3 **Prescriptions** – parts of prescription, legality & identification of medication related problems like drug interactions.
- 4 **Inventory control in community pharmacy**  
Definition, various methods of Inventory Control  
**ABC, VED, EOQ, Lead time, safety stock**
- 5 **Pharmaceutical care**  
Definition and Principles of Pharmaceutical care.
- 6 **Patient counselling**  
Definition, outcomes, various stages, barriers, Strategies to overcome barriers  
Patient information leaflets- content, design, & layouts, advisory labels
- 7 **Patient medication adherence**  
Definition, Factors affecting medication adherence, role of pharmacist in improving the adherence.
- 8 **Health screening services**  
Definition, importance, methods for screening  
Blood pressure/ blood sugar/ lung function and Cholesterol testing
- 9 **OTC Medication- Definition, OTC medication list & Counselling**
- 10 **Health Education**  
WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients.  
Commonly occurring Communicable Diseases, causative agents,  
Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhoea and AIDS  
Balance diet, and treatment & prevention of deficiency disorders  
Family planning – role of pharmacist
- 11 **Responding to symptoms of minor ailments**  
Relevant pathophysiology, common drug therapy to,  
Pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea, constipation), Pyrexia, Ophthalmic symptoms, worms infestations.
- 12 **Essential Drugs concept and Rational Drug Therapy Role of community pharmacist**
- 13 **Code of ethics for community pharmacists**

*Geethanjali*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist, T.S.-501501.

## 2.6 PHARMACOTHERAPEUTICS - I (THEORY)

**Theory : 3 Hrs. /Week**

1. **Scope of the Subject:** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
2. **Objectives:** At completion of this subject it is expected that students will be able to understand –
  - a. the pathophysiology of selected disease states and the rationale for drug therapy;
  - b. the therapeutic approach to management of these diseases;
  - c. the controversies in drug therapy;
  - d. the importance of preparation of individualised therapeutic plans based on diagnosis;
  - e. needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);
  - f. describe the pathophysiology of selected disease states and explain the rationale for drug therapy;
  - g. summarise the therapeutic approach to management of these diseases including reference to the latest available evidence;
  - h. discuss the controversies in drug therapy;
  - i. discuss the preparation of individualised therapeutic plans based on diagnosis; and
  - j. identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

### Text Books

- a. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication.
- b. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange.

### Reference Books

- a. Pathologic basis of disease - Robins SL, W.B.Saunders publication.
- b. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication.
- c. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication.
- d. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
- e. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
- f. Relevant review articles from recent medical and pharmaceutical literature.

### 3. Detailed syllabus and lecture wise schedule :

**Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases**

**Title of the topic**

- 1 **Cardiovascular system:** Hypertension, Congestive cardiac failure, Angina Pectoris, Myocardial infarction, , Hyperlipidaemias , Electrophysiology of heart and Arrhythmias
- 2 **Respiratory system :** Introduction to Pulmonary function test, Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases  
**Endocrine system :** Diabetes, Thyroid diseases, Oral contraceptives, Hormone replacement therapy, Osteoporosis
- 3 **General prescribing guidelines for**
  - a. Paediatric patients
  - b. Geriatric patients
  - c. Pregnancy and breast feeding
- 4 **Ophthalmology:** Glaucoma, Conjunctivitis- viral & bacterial
- 5 **Introduction to rational drug use**  
Definition, Role of pharmacist Essential drug concept Rational drug formulations

## 2.6 PHARMACOTHERAPEUTICS - I (PRACTICAL)

**Practical : 3 Hrs./Week**

### **Practicals :**

Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds; follow up the progress and changes made in drug therapy in allotted patients; case presentation upon discharge. Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation. A minimum of 20 cases should be presented and recorded covering most common diseases.

### **Assignments :**

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**Format of the assignment:**

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

**Scheme of Practical Examination:**

	<b>Sessionals</b>	<b>Annual</b>
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

## Third Year

### 3.1 PHARMACOLOGY – II (THEORY)

Theory : 3 Hrs. /Week

1. **Scope of the Subject:** This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, drugs acting on autacoids, respiratory system, GIT, immune system and hormones, and pharmacology of autacoids and hormones will be concentrated. In addition, pharmacology of chemotherapeutic agents, vitamins, essential minerals and principles of toxicology are also taught. In addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.
2. **Objectives of the Subject Upon completion of the subject student shall be able to:**
  - a. understand the pharmacological aspects of drugs falling under the above mentioned chapters,
  - b. carry out the animal experiments confidently,
  - c. appreciate the importance of pharmacology subject as a basis of therapeutics, and
  - d. correlate and apply the knowledge therapeutically.

#### **Text books (Theory)**

- a. Tripathi, K. D. Essentials of medical pharmacology. 4<sup>th</sup> edition, 1999. Publisher: Jaypee, Delhi.
- b. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16<sup>th</sup> edition (single volume), 1999. Publisher: Popular, Dubai.
- c. Rang, H.P. and Dale, M.M. Pharmacology. 4<sup>th</sup> edition, 1999. Publisher: Churchill Living stone.

#### **Reference books (Theory)**

- a. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 9<sup>th</sup> edition, 1996. Publisher: Mc Graw Hill, Pergamon press.
- b. Craig, C.R. and Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown and company.
- c. Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, International.
- d. Gupta, P.K. and Salunkhe, D.K. Modern Toxicology. Volume I, II and III. Latest edition. Publisher: B.V. Gupta, Metropolitan Book Co. (p) Ltd, New Delhi.

#### **Text books (Practical)**

Kulkarni, S. K. and Dandia, P. C. Hand book of experimental pharmacology. Latest edition, Publisher: Vallab, Delhi.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501361.

**Reference books (Practical) :**

- a. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition, Publisher: Churchill livingstone.
- b. Macleod, L.J. Pharmacological experiments on isolated preparations. Latest edition, Publisher: Churchill livingstone.
- c. Ghosh, M.N. Fundamentals of experimental pharmacology. Latest edition, Publisher: Scientific book agency, Kolkata.
- d. Ian Kitchen. Textbook of in vitro practical pharmacology. Latest edition, Publisher: Black well Scientific.

**3. Detailed syllabus and lecture wise schedule:****Title of the topic**

1. **Pharmacology of Drugs acting on Blood and blood forming agents**
  - a) Anticoagulants
  - b) Thrombolytics and antiplatelet agents
  - c) Haemopoietics and plasma expanders
2. **Pharmacology of drugs acting on Renal System**
  - a) Diuretics
  - b) Antidiuretics
3. **Chemotherapy**
  - a) Introduction
  - b) Sulfonamides and co-trimoxazole
  - c) Penicillins and Cephalosporins
  - d) Tetracyclins and Chloramphenicol
  - e) Macrolides, Aminoglycosides, Polyene & Polypeptide antibiotics
  - f) Quinolines and Fluroquinolines
  - g) Antifungal antibiotics
  - h) Antiviral agents
  - i) Chemotherapy of tuberculosis and leprosy
  - j) Chemotherapy of Malaria
  - k) Chemotherapy of protozoal infections (amoebiasis, Giardiasis)
  - l) Pharmacology of Anthelmintic drugs
  - m) Chemotherapy of cancer (Neoplasms)
4. **Immunopharmacology**  
Pharmacology of immunosuppressants and stimulants
5. **Principles of Animal toxicology**  
Acute, sub acute and chronic toxicity

6. **The dynamic cell: The structures and functions of the components of the cell**

- a) Cell and macromolecules: Cellular classification, subcellular organelles, macromolecules, large macromolecular assemblies
- b) Chromosome structure: Pro and eukaryotic chromosome structures, chromatin structure, genome complexity, the flow of genetic information.
- c) DNA replication: General, bacterial and eukaryotic DNA replication.
- d) The cell cycle: Restriction point, cell cycle regulators and modifiers.
- e) Cell signaling: Communication between cells and their environment, ion-channels, signal transduction pathways (MAP kinase, P38 kinase, JNK, Ras and PI3-kinase pathways, biosensors.

**The Gene: Genome structure and function:**

- a) Gene structure: Organization and elucidation of genetic code.
- b) Gene expression: Expression systems (pro and eukaryotic), genetic elements that control gene expression (nucleosomes, histones, acetylation, HDACS, DNA binding protein families.
- c) Transcription and Transcription factors: Basic principles of transcription in pro and eukaryotes. Transcription factors that regulate transcription in pro and eukaryotes.

RNA processing: rRNA, tRNA and mRNA processing.

Protein synthesis: Mechanisms of protein synthesis, initiation in eukaryotes, translation control and post-translation events

Altered gene functions: Mutations, deletions, amplifications, LOH, traslocations, trinucleotide repeats and other genetic abnormalities.

Oncogenes and tumor suppressor genes.

The gene sequencing, mapping and cloning of human disease genes.

Introduction to gene therapy and targeting.

Recombinant DNA technology: principles. Processes (gene transfer technology) and applications

**Books:**

- 1 Molecular Biology of the Cell by Alberts B., Bray, D., Lewis, J., Raff M., Roberts, K and Watson, JD, 3<sup>rd</sup> edition.
- 2 Molecular Cell Biology By Lodish, H., Baltimore, D., Berk, A et al., 5<sup>th</sup> edition.
- 3 Molecular Biology by Turner, PC., McLennan, AG., Bates, AD and White MRH 2<sup>nd</sup> edition.
- 4 Genes VIII by Lewin, B., (2004)
- 5 Pharmaceutical Biotechnology, by Crommelin, DJA and Sindelar RD (1997)
- 6 Recombinant DNA by Watson, JD., Gilman, M., ct al., (1996)
- 7 Biopharmaceutical: Biochemistry and Biotechnology by Walsh, G., (1998)

*Signature of*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

### 3.1 PHARMACOLOGY – II (PRACTICAL)

**Practical : 3 Hrs./Week**

**List of Experiments:**

1. Study of laboratory animals and their handling (a. Frogs, b. Mice, c. Rats, d. Guinea pigs, e. Rabbits).
2. Study of physiological salt solutions used in experimental pharmacology.
3. Study of laboratory appliances used in experimental pharmacology.
4. Study of use of anesthetics in laboratory animals.
5. To record the dose response curve of Ach using isolated ileum/rectus abdominis muscle preparation.
6. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation method.
7. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by three point method.
8. To record the dose response curve of Histamine using isolated guinea-pig ileum preparation.
9. Study of agonistic and antagonistic effects of drugs using isolated guinea-pig ileum preparation.
10. To carry out bioassay of Histamine using isolated guinea-pig ileum preparation by interpolation method.
11. To carry out bioassay of Histamine using guinea-pig ileum preparation by three point method.
12. To study the routes of administration of drugs in animals (Rats, Mice, Rabbits).
13. Study of theory, principle, procedure involved and interpretation of given results for the following experiments:
  - a) Analgesic property of drug using analgesiometer.
  - b) Antiinflammatory effect of drugs using rat-paw edema method.
  - c) Anticonvulsant activity of drugs using maximal electroshock and pentylene tetrazole methods.
  - d) Antidepressant activity of drugs using pole climbing apparatus and pentobarbitone induced sleeping time methods.
  - e) Locomotor activity evaluation of drugs using actophotometer and rotorod.
  - f) Cardiotoxic activity of drugs using isolated frog heart and mammalian heart preparations.

**Scheme of Practical Examination:**

	Sessionals	Annual
Identification	02	10
Synopsis	04	10
Major Experiment (Bioassay)	08	30
Minor Experiment (Interpretation of given Graph or simulated experiment)	04	10
Viva	02	10
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>3hrs</b>	<b>4hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



### 3.2 PHARMACEUTICAL ANALYSIS (THEORY)

Theory : 3 Hrs. /Week

#### 1. Quality Assurance:

- a. Introduction, sources of quality variation, control of quality variation.
- b. Concept of statistical quality control.
- c. Validation methods- quality of equipment, validation of equipment and validation of analytical instruments and calibration.
- d. GLP, ISO 9000.
- e. Total quality management, quality review and documentation.
- f. ICH- international conference for harmonization-guidelines.
- g. Regulatory control.

#### 2. Chromatography:

Introduction, history, classification, separation techniques, choice of methods. The following techniques be discussed with relevant examples of pharmaceutical products involving principles and techniques of separation of drugs from excipients.

- a. **Column Chromatography:** Adsorption column chromatography, Operational technique, frontal analysis and elution analysis. Factors affecting column efficiency, applications and partition chromatography.
- b. **TLC:** Introduction, principle, techniques, R<sub>f</sub> value and applications.
- c. **PC:** Introduction, principle, types of paper chromatography, preparation techniques, development techniques, applications.
- d. **Ion-exchange chromatography :** Introduction, principles, types of ion exchange synthetic resins, physical properties, factors affecting ion exchange, methodology and applications.
- e. **HPLC:** Introduction, theory, instrumentation, and applications.
- f. **HPTLC:** Introduction, theory, instrumentation, and applications.
- g. **Gas Chromatography:** Introduction, theory, instrumentation-carrier gases, types of columns, stationary phases in GLC & GSC. Detectors- Flame ionization detectors, electron capture detector, thermal conductivity detector. Typical gas chromatogram, derivatisation techniques, programmed temperature gas chromatography, applications.
- h. **Electrophoresis:** Principles of separation, equipment for paper and gel electrophoresis, and application.
- i. **Gel filtration and affinity chromatography:** Introduction, technique, applications.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

### 3. Electrometric Methods:

Theoretical aspects, instrumentation, interpretation of data/spectra and analytical applications be discussed on the following topics.

- a. **Potentiometry:** Electrical potential, electrochemical cell, reference electrodes, indicator electrodes, measurement of potential and pH, construction and working of electrodes, Potentiometric titrations, methods of detecting end point, Karl Fischer titration.
- b. **Conductometry:** Introduction, conductivity cell, conductometric titrations and applications.
- c. **Polarography:** Instrumentation, DME, residual current, diffusion current and limiting current, polarographic wave, Ilkovic's equation, Effect of oxygen on polarographic wave, Polarographic maxima and suppressors and applications.
- d. **Amperometric Titrations:** Introduction, types of electrodes used, reference and indicator electrode, instrumentation, titration procedure, advantages and disadvantages of Amperometry over potentiometry. Pharma applications.

### 4. Spectroscopy:

Theoretical aspects, instrumentation, elements of interpretation of data/spectra and application of analytical techniques be discussed on:

#### a. Absorption Spectroscopy:

- Theory of electronic, atomic and molecular spectra. Fundamental laws of photometry, Beer-Lambert's Law, application and its deviation, limitation of Beer law, application of the law to single and multiple component analysis, measurement of equilibrium constant and rate constant by spectroscopy. Spectra of isolated chromophores, auxochromes, batho-chromic shift, hypsochromic shift, hyperchromic and hypochromic effect, effect of solvent on absorption spectra, molecular structure and infrared spectra.

**Instrumentation** – Photometer, U.V.-Visible spectrophotometer – sources of U.V.-Visible radiations, collimating systems, monochromators, samples cells and following detectors-Photocell, Barrier layer cell, Phototube, Diode array, applications of U.V.-Visible spectroscopy in pharmacy and spectrophotometric titrations.

- **Infrared Spectroscopy:** Vibrational transitions, frequency – structure correlations, Infrared absorption bands, Instrumentation-IR spectrometer – sources of IR, Collimating systems, monochromators, sample cells, sample handling in IR spectroscopy and detectors- Thermocouple, Golay Cells, Thermistor, Bolometer, Pyroelectric detector, Applications of IR in pharmacy.

  
PRINCIPAL

- **Fluorimetric Analysis:** Theory, luminescence, factors affecting fluorescence, quenching. Instrumentation, Applications, fluorescent indicators, study of pharmaceutically important compounds estimated by fluorimetry.
- b. **Flame Photometry:** Theory, nebulisation, flame and flame temperature, interferences, flame spectrometric techniques and instrumentation and pharmaceutical applications.
- c. **Atomic Absorption Spectrometry:** Introduction, Theory, types of electrodes, instrumentation and applications.
- d. **Atomic Emission Spectroscopy :** Spectroscopic sources, atomic emission spectrometers, photographic and photoelectric detection.
- e. **NMR & ESR (introduction only):** Introduction, theoretical aspects and applications.
- f. **Mass Spectroscopy: (Introduction only) –** Fragmentation, types of ions produced mass spectrum and applications.
- g. **Polarimetry: (Introduction only) –** Introduction to optical rotatory dispersion, circular dichroism, polarimeter.
- h. **X-RAY Diffraction: (Introduction only) –** Theory, reciprocal lattice concept, diffraction patterns and applications.
- i. **Thermal Analysis:** Introduction, instrumentation, applications, and DSC and DTA.

### 3.2 PHARMACEUTICAL ANALYSIS (PRACTICAL)

**Practical : 3 Hrs./Week**

**List of Experiments:**

1. Separation and identification of Amino Acids by Paper Chromatography.
2. Separation and identification of Sulpha drugs by TLC technique.
3. Effect of pH and solvent on the UV spectrum of given compound.
4. Comparison of the UV spectrum of a compound with that of its derivatives.
5. Determination of dissociation constant of indicators using UV-Visible spectroscopy.
6. Conductometric titration of mixture of acids with a strong base.
7. Potentiometric titration of an acid with a strong base.
8. Estimation of drugs by Fluorimetric technique.
9. Study of quenching effect in fluorimetry.
10. Colourimetric estimation of Sulpha drugs using BMR reagent.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

11. Simultaneous estimation of two drugs present in given formulation.
12. Assay of Salicylic Acid by colourimetry.
13. Determination of Chlorides and Sulphates in Calcium gluconate by Nepheloturbidimetric Method.
14. Determination of Na/K by Flame Photometry.
15. Determination of pKa using pH meter.
16. Determination of specific rotation.
17. Comparison of the IR spectrum of a compound with that of its derivatives.
18. Demonstration of HPLC.
19. Demonstration of HPTLC.
20. Demonstration of GC-MS.
21. Demonstration of DSC.
22. Interpretation of NMR spectra of any one compound.

#### Reference Books:

1. Text Book of Pharm. Analysis by Higuchi. T and Hasen. E. B., New York Inter Science Publishers.
2. Quantitative Pharma. Analysis by Jenkins, The Blakiston division, New York.
3. Quantitative Drug Analysis, by Garrot. D, Chapman & Hall Ltd., London.
4. Undergraduate Instrumental Analysis by James. E., CBS Publishers.
5. Instrumental Analysis by Willard and Merritt, EWP, East West Press Ltd., Delhi/Madras.
6. Pharm Analysis by Skoog and West, Sounders Manipal College Publishing.
7. Text Book of Chemical Analysis, by A.I.Vogel, ELBS with Macmillan press, Hampshire.
8. Textbook of Pharm. Analysis by K.A.Connors, John Wiley & Sons, New York, Brisbane, Singapore.
9. Textbook of Pharm. Analysis (Practical) by Beckett & Stenlake, CBS
10. Textbook of Drug Analysis by P.D. Sethi., CBS Publishers, Delhi.
11. Spectroscopy by Silverstein, John & Wiley & Sons. Inc., Canada & Singapore.
12. How to practise GMP-A Plan for total quality control by P.P. Sharma, Vandana Publications, Agra.
13. The Science & Practice of Pharmacy by Remington Vol-I & II, Mack Publishing Co. Pennsylvania.
14. TLC by Stahl, Spring Verlay.
15. Text Book of Pharm. Chemistry by Chatten, CBS Publications.
16. Spectroscopy by William Kemp, ELBS with Macmillan Press, Hampshire.
17. I.P.-1996, The Controller of Publications, New Delhi.
18. BPC- Dept. of Health, U.K. for HMSO.
19. USP - Mack Publishing Co., Easton, PA.
20. The Extra Pharmacopoeia – The Pharm. Press, London.

## Practicals

### Title of the Experiment:

- 1 Study of agonistic and antagonistic effects of drugs using Guinea-pig ileum preparation.\*\*
- 2 To study the effects of drugs on intestinal motility using frog's esophagus model\*
- 3 To study the effects of drugs using rat uterus preparation.\*\*
- 4 To study the anticonvulsant property of drugs (any one model).\*
- 5 To study antihistaminic property of drug using histamine induced anaphylactic reaction in guinea pigs.
- 6 To study the apomorphine- induced compulsive behaviour (stereotypy) in mice.\*
- 7 To study the muscle relaxant property of diazepam in mice using rotarod apparatus.\*
- 8 To study the antiinflammatory property of indomethacin against carrageenan- induced paw oedema.\*\*
- 9 To study the anxiolytic effect of diazepam in mice using mirrored-chamber apparatus.\*\*
- 10 To demonstrate the effect of various drugs on the blood pressure and respiration of anaesthetized dog.
- 11 To study the effect of anthelmintics on earthworms.
- 12 To study the taming effect of chlorpromazine.\*
- 13 To study the effects of drugs on vas deferense of the male rat.\*\*
- 14 To study the effect of drugs on pesticide toxicity using rats as model.
- 15 To study the effect of drugs on heavy metal toxicity.

\*\* indicate major experiment & \* indicate minor experiment

### Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

### 3.3 PHARMACOTHERAPEUTICS – II (THEORY)

Theory : 3 Hrs. /Week

1. **Scope of the Subject:** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
2. **Objectives of the Subject Upon completion of the subject student shall be able to –**
  - a. know the pathophysiology of selected disease states and the rationale for drug therapy
  - b. know the therapeutic approach to management of these diseases;
  - c. know the controversies in drug therapy;
  - d. know the importance of preparation of individualised therapeutic plans based on diagnosis; and
  - e. appreciate the needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

#### Text books (Theory)

Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication


#### Reference books (Theory)

- a. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
- b. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
- c. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA]

### 3. Detailed syllabus and lecture wise schedule :

**Etiopathogenesis and pharmacotherapy of diseases associated with following systems / diseases –**

1. **Infectious disease:** Guidelines for the rational use of antibiotics and surgical Prophylaxis, Tuberculosis, Meningitis, Respiratory tract infections, Gastroenteritis, Endocarditis, Septicemia, Urinary tract infections, Protozoal infection- Malaria, HIV & Opportunistic infections, Fungal infections, Viral infections, Gonorrhoea and Syphilis
2. **Musculoskeletal disorders**  
Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic lupus erythematosus.
3. **Renal system**  
Acute Renal Failure, Chronic Renal Failure, Renal Dialysis, Drug induced renal disorders

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

- 4 **Oncology:** Basic principles of Cancer therapy, General introduction to cancer chemotherapeutic agents, Chemotherapy of breast cancer, leukemia. Management of chemotherapy nausea and emesis
- 5 **Dermatology:** Psoriasis, Scabies, Eczema, Impetigo

### 3.3 PHARMACOTHERAPEUTICS – II (PRACTICAL)

**Practical : 3 Hrs./Week**

**Practicals :**

Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds; follow up the progress and changes made in drug therapy in allotted patients; case presentation upon discharge. Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation.

The student shall be trained to understand the principle and practice involved in selection of drug therapy including clinical discussion.

A minimum of 20 cases should be presented and recorded covering most common diseases.

**Assignments :**

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.


**Format of the assignment :**

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

**Scheme of Practical Examination :**

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

### 3.4 PHARMACEUTICAL JURISPRUDENCE (THEORY)

Theory : 2 Hrs. /Week

1. **Scope of the Subject:** (4-6 lines): This course exposes the student to several important legislations related to the profession of pharmacy in India. The Drugs and Cosmetics Act, along with its amendments are the core of this course. Other acts, which are covered, include the Pharmacy Act, dangerous drugs, medicinal and toilet preparation Act etc. Besides this the new drug policy, professional ethics, DPCO, patent and design Act will be discussed.
2. **Objectives of the Subject:** Upon completion of the subject student shall be able to (Know, do, and appreciate) –
  - a. practice the Professional ethics;
  - b. understand the various concepts of the pharmaceutical legislation in India;
  - c. know the various parameters in the Drug and Cosmetic Act and rules ;
  - d. know the Drug policy, DPCO, Patent and design act;
  - e. understand the labeling requirements and packaging guidelines for drugs and cosmetics;
  - f. be able to understand the concepts of Dangerous Drugs Act, Pharmacy Act and Excise duties Act; and
  - g. other laws as prescribed by the Pharmacy Council of India from time to time including International Laws.

#### Text books (Theory)

Mithal , B M. Textbook of Forensic Pharmacy. Calcutta :National; 1988.


#### Reference books (Theory)

- a. Singh, KK, editor. Beotra's the Laws of Drugs, Medicines & cosmetics. Allahabad: Law Book House; 1984.
- b. Jain, NK. A Textbook of forensic pharmacy. Delhi: Vallabh prakashan ; 1995.
- c. Reports of the Pharmaceutical enquiry Committee
- d. I.D.M.A., Mumbai. DPCO 1995
- e. Various reports of Amendments.
- f. Deshapande, S.W. The drugs and magic remedies act 1954 and rules 1955. Mumbai: Susmit Publications; 1998.
- g. Eastern Book Company .The narcotic and psychotropic substances act 1985, Lucknow: Eastern; 1987.

### 3. Detailed syllabus and lecture wise schedule:

#### Title of the topic

1. **Pharmaceutical Legislations** – A brief review.
2. Principle and Significance of professional ethics. Critical study of the code of pharmaceutical ethics drafted by PCI.
3. **Drugs and Cosmetics Act, 1940, and its rules 1945.**  
Objectives, Legal definition, Study of Schedule's with reference to Schedule B, C&C1, D, E1, F&F1, F2, F3, FF, G, H, J, K, M, N, P, R, V, W, X, Y.  
Sales, Import, labeling and packaging of Drugs And Cosmetics  
Provisions Relating to Indigenous Systems. Constitution and Functions of DTAB, DCC, CDL. Qualification and duties – Govt. analyst and Drugs Inspector.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501002.



4. **Pharmacy Act –1948.**  
Objectives Legal Definitions, General Study, Constitution and Functions of State & Central Council, Registration & Procedure, ER.
5. **Medicinal and Toilet Preparation Act –1955.**  
Objectives, Legal Definitions, Licensing, Bonded and Non Bonded Laboratory, Ware Housing, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations.
6. **Narcotic Drugs and Psychotropic substances Act-1985 and Rules.** Objectives, Legal Definitions, General Study, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and regulations, Schedules to the Act.
7. **Study of Salient Features of Drugs and magic remedies Act and its rules.**
8. **Study of essential Commodities Act Relevant to drugs price control Order.**
9. **Drug Price control Order & National Drug Policy (Current).**
10. **Prevention Of Cruelty to animals Act-1960.**
11. **Patents & design Act-1970.**
12. **Brief study of prescription and Non-prescription Products.**

#### 4. Assignments:

##### Format of the assignment

1. Minimum & Maximum number of pages
2. It shall be a computer draft copy
3. Reference(s) shall be included at the end.
4. Name and signature of the student
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 Min

##### Case studies relating to

1. Drugs and Cosmetics Act and rules along with its amendments, Dangerous Drugs Act, Medicinal and Toilet preparation Act, New Drug Policy, Professional Ethics, Drugs (Price control) Order, Patent and Design Act.
2. Various prescription and non-prescription products.
3. Medical and surgical accessories.
4. Diagnostic aids and appliances available in the market.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

### 3.5 MEDICINAL CHEMISTRY (THEORY)

Theory : 3 Hrs. /Week

1. Modern concept of rational drug design: A brief introduction to Quantitative Structure Activity Relationship (QSAR), prodrug, combinatorial chemistry and computer aided drug design (CADD) and concept of antisense molecules.  
A study of the development of the following classes of drugs including SAR, mechanism of action, synthesis of important compounds, chemical nomenclature, brand names of important marketed products and their side effects.
2. Anti- infective agents
  - a) Local anti- infective agents
  - b) Preservatives
  - c) Antifungal agents
  - d) Urinary tract anti- infectives
  - e) Antitubercular agents
  - f) Antiviral agents and Anti AIDS agents
  - g) Antiprotozoal agents
  - h) Anthelmintics
  - i) Antiscabies and Antipedicular agents
3. Sulphonamides and sulphones
4. Antimalarials
5. Antibiotics
6. Antineoplastic agents
7. Cardiovascular agents
  - a) Antihypertensive agents
  - b) Antianginal agents and vasodilators
  - c) Antiarrhythmic agents
  - d) Antihyperlipidemic agents
  - e) Coagulants and Anticoagulants
  - f) Endocrine
8. Hypoglycemic agents
9. Thyroid and Antithyroid agents
10. Diuretics
11. Diagnostic agents
12. Steroidal Hormones and Adrenocorticoids

  
PRINCIPAL

### 3.5 MEDICINAL CHEMISTRY (PRACTICAL)

#### Practical : 3 Hrs./Week

1. Assays of important drugs from the course content.
2. Preparation of medicinally important compounds or intermediates required for synthesis of drugs.
3. Monograph analysis of important drugs.
4. Determination of partition coefficients, dissociation constants and molar refractivity of compounds for QSAR analysis.

#### Reference Books:

- a. Wilson and Gisvold's Text book of Organic, Medicinal and Pharmaceutical Chemistry, Lippincott-Raven Publishers-New York, Philadelphia.
- b. William.O.Foye, Principles of Medicinal Chemistry, B.I. Waverly Pvt. Ltd., New Delhi.
- c. Burgers, Medicinal Chemistry, M.E., Welly Med.Chemistry M.E. Walffed Johnwiley and Sons, Wiley-interscience Publication, New York, Toranto.
- d. A Text Book of Medicinal Chemistry Vol. I and II by Surendra N. Pandeya, S.G. Publisher, 6, Dildayal Nagar, Varanasi -10.
- e. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.
- f. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.
- g. Organic Drug Synthesis-Ledniser Mitzsher Vol. I and II.
- h. Pharmaceutical Chemistry drug Synthesis Vol. I and II by H. J. Roth and A. Kleemann.
- i. The Science and Practice of Pharmacy Vol. 1 and 2, Remington, MACK Publishing Company, Easton, Pennsylvania.

### 3.6 PHARMACEUTICAL FORMULATIONS (THEORY)

**Theory : 2 Hrs. /Week**

1. **Scope of the Subject:** Scope and objectives of the course: Subject deals with the formulation and evaluation of various pharmaceutical dosage forms.
2. **Objectives of the Subject:** Upon completion of the subject student shall be able to (Know, do, appreciate) –
  - a. understand the principle involved in formulation of various pharmaceutical dosage forms;
  - b. prepare various pharmaceutical formulation;
  - c. perform evaluation of pharmaceutical dosage forms; and
  - d. understand and appreciate the concept of bioavailability and bioequivalence, their role in clinical situations.

**Text books (Theory)**

- a. Pharmaceutical dosage forms, Vol, I,II and III by lachman
- b. Rowlings Text book of Pharmaceutics
- c. Tutorial Pharmacy – Cooper &Gun

**Reference books (Theory)**

- a. Remington's Pharmaceutical Sciences
- b. USP/BP/IP

**3. Detailed syllabus and lecture wise schedule:**

**Title of the topic**

1. Pharmaceutical dosage form- concept and classification
2. **Tablets:** Formulation of different types of tablets, tablet excipients, granulation techniques quality control and evaluation of tablets. Tablet coating, Type of coating, quality control tests for coated tablet.
3. **Capsules;** Production and filling of hard gelatin capsules, Raw material for shell, finishing, quality control tests for capsules. Production and filling of soft gelatin capsules, quality control tests for soft gelatin capsules.
4. **Liquid orals:** Formulation and evaluation of suspensions, emulsions and solutions. Stability of these preparations
5. **Parenterals** Introduction Containers used for Parenterals (including official tests) Formulation of large and small volume Parenterals Sterilization
6. **Ophthalmic preparations (Semi – Solids):** Introduction and classification Factors affecting absorption and anatomy of skin Packaging storage and labeling, Ointments Types of Ointment Base Preparation of ointment, Jellies Types of jellies Formulation of jellies Suppositories, Method of preparation, Types Packaging
7. Definition and concept of **Controlled and novel Drug delivery systems** with available examples, viz. parenteral, trans dermal, buccal, rectal, nasal, implants, ocular

*Principal*  
PRINCIPAL

### 3.6 PHARMACEUTICAL FORMULATIONS (PRACTICAL)

Practical : 3 Hrs./Week

List of Experiments :

1. **Manufacture of Tablets**
  - a. Ordinary compressed tablet-wet granulation
  - b. Tablets prepared by direct compression.
  - c. Soluble tablet.
  - d. Chewable tablet.
2. **Formulation and filling of hard gelatin capsules**
3. **Manufacture of parenterals**
  - a. Ascorbic acid injection
  - b. Calcium gluconate injection
  - c. Sodium chloride infusion.
  - d. Dextrose and Sodium chloride injection/ infusion.
4. **Evaluation of Pharmaceutical formulations (QC tests)**
  - a. Tablets
  - b. Capsules
  - c. Injections
5. **Formulation of two liquid oral preparations and evaluation by assay**
  - a. Solution: Paracetamol Syrup
  - b. Antacid suspensions- Aluminum hydroxide gel
6. **Formulation of semisolids and evaluation by assay**
  - a. Salicylic acid and benzoic acid ointment
  - b. Gel formulation Diclofenac gel
7. **Cosmetic preparations**
  - a. Lipsticks
  - b. Cold cream and vanishing cream
  - c. Clear liquid shampoo
  - d. Tooth paste and tooth powders.
8. **Tablet coating (demonstration)**

Scheme of Practical Examination :

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## Fourth Year

### 4.1 PHARMACOTHERAPEUTICS – III (THEORY)

**Theory : 3 Hrs. /Week**

1. **Scope :** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
2. **Objectives:** At completion of this subject it is expected that students will be able to understand –
  - a. the pathophysiology of selected disease states and the rationale for drug therapy;
  - b. the therapeutic approach to management of these diseases;
  - c. the controversies in drug therapy;
  - d. the importance of preparation of individualised therapeutic plans based on diagnosis;
  - e. needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);
  - f. describe the pathophysiology of selected disease states and explain the rationale for drug therapy;
  - g. to summarize the therapeutic approach to management of these diseases including reference to the latest available evidence;
  - h. to discuss the controversies in drug therapy;
  - i. to discuss the preparation of individualised therapeutic plans based on diagnosis; and
  - j. identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

#### **Text Books**

- a. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication
- b. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange

#### **Reference Books**

- a. Pathologic basis of disease - Robins SL, W.B.Saunders publication
- b. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication
- c. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
- d. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
- e. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
- f. Relevant review articles from recent medical and pharmaceutical literature.

## 4.1 PHARMACOTHERAPEUTICS – III (PRACTICAL)

Practical : 3 Hrs./Week

### Practicals:

Hospital postings for a period of at least 50 hours is required to understand the principles and practice involved in ward round participation and clinical discussion on selection of drug therapy. Students are required to maintain a record of 15 cases observed in the ward and the same should be submitted at the end of the course for evaluation. Each student should present at least two medical cases they have observed and followed in the wards.

**Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases:**

### Title of the topic

- 1 **Gastrointestinal system:** Peptic ulcer disease, Gastro Esophageal Reflux Disease, Inflammatory bowel disease, Liver disorders - Alcoholic liver disease, Viral hepatitis including jaundice, and Drug induced liver disorders.
- 2 **Haematological system:** Anaemias, Venous thromboembolism, Drug induced blood disorders.
- 3 **Nervous system:** Epilepsy, Parkinsonism, Stroke, Alzheimer's disease,
- 4 **Psychiatry disorders:** Schizophrenia, Affective disorders, Anxiety disorders, Sleep disorders, Obsessive Compulsive disorders
- 5 Pain management including Pain pathways, neuralgias, headaches.
- 6 Evidence Based Medicine

### Assignments:

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.

### Format of the assignment:

1. Minimum & Maximum number of pages
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year
4. It shall be computer draft copy
5. Name and signature of the student
6. Time allocated for presentation may be 8+2 Min.

### Scheme of Practical Examination :

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## 4.2 HOSPITAL PHARMACY (THEORY)

**Theory : 2 Hrs. /Week**

1. **Scope:** In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug dispensing, manufacturing of parenteral preparations, drug information, patient counselling, and therapeutic drug monitoring for improved patient care.
2. **Objectives:** Upon completion of the course, the student shall be able to –
  - a. know various drug distribution methods;
  - b. know the professional practice management skills in hospital pharmacies;
  - c. provide unbiased drug information to the doctors;
  - d. know the manufacturing practices of various formulations in hospital set up;
  - e. appreciate the practice based research methods; and
  - f. appreciate the stores management and inventory control.

**Text books: (latest editions)**

- a. Hospital pharmacy by William .E. Hassan
- b. A text book of Hospital Pharmacy by S.H.Merchant & Dr. J.S. Qadry. Revised by R.K.Goyal & R.K. Parikh

**References:**

- a. WHO consultative group report.
- b. R.P.S. Vol.2. Part –B; Pharmacy Practice section.
- c. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.

**3. Lecture wise programme :**

**Topics**

- 1 **Hospital - its Organisation and functions**
- 2 **Hospital pharmacy-Organisation and management**
  - a) Organizational structure-Staff, Infrastructure & work load statistics
  - b) Management of materials and finance
  - c) Roles & responsibilities of hospital pharmacist
- 3 **The Budget – Preparation and implementation**
- 4 **Hospital drug policy**
  - a) Pharmacy and Therapeutic committee (PTC)
  - b) Hospital formulary
  - c) Hospital committees
    - Infection committee
    - Research and ethical committee
  - d) developing therapeutic guidelines
  - e) Hospital pharmacy communication - Newsletter

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.



**5 Hospital pharmacy services**

- a) Procurement & warehousing of drugs and Pharmaceuticals
- b) Inventory control  
Definition, various methods of Inventory Control  
ABC, VED, EOQ, Lead time, safety stock
- c) Drug distribution in the hospital
  - i) Individual prescription method
  - ii) Floor stock method
  - iii) Unit dose drug distribution method
- d) Distribution of Narcotic and other controlled substances
- e) Central sterile supply services – Role of pharmacist

**6 Manufacture of Pharmaceutical preparations**

- a) Sterile formulations – large and small volume parenterals
- b) Manufacture of Ointments, Liquids, and creams
- c) Manufacturing of Tablets, granules, capsules, and powders
- d) Total parenteral nutrition

**7 Continuing professional development**

programs Education and training

**8 Radio Pharmaceuticals – Handling and packaging****9 Professional Relations and practices of hospital pharmacist****4.2 HOSPITAL PHARMACY (PRACTICAL)**

**Practical : 3 Hrs./Week**

1. Assessment of drug interactions in the given prescriptions
2. Manufacture of parenteral formulations, powders.
3. Drug information queries.
4. Inventory control

**List of Assignments:**

1. Design and Management of Hospital pharmacy department for a 300 bedded hospital.
2. Pharmacy and Therapeutics committee – Organization, functions, and limitations.
3. Development of a hospital formulary for 300 bedded teaching hospital
4. Preparation of ABC analysis of drugs sold in one month from the pharmacy.
5. Different phases of clinical trials with elements to be evaluated.
6. Various sources of drug information and systematic approach to provide unbiased drug information.
7. Evaluation of prescriptions generated in hospital for drug interactions and find out the suitable management.

*Nandini*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**Special require ments:**

1. Each college should sign MoU with nearby local hospital having minimum 150 beds for providing necessary training to the students' on hospital pharmacy activities.
2. Well equipped with various resources of drug information.

**Scheme of Practical Examination:**

	<b>Sessionals</b>	<b>Annual</b>
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

### 4.3 CLINICAL PHARMACY (THEORY)

**Theory : 3 Hrs. /Week**

#### 1. Objectives of the Subject :

- Upon completion of the subject student shall be able to (Know, do, appreciate) –
- monitor drug therapy of patient through medication chart review and clinical review;
  - obtain medication history interview and counsel the patients;
  - identify and resolve drug related problems;
  - detect, assess and monitor adverse drug reaction;
  - interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; and
  - retrieve, analyse, interpret and formulate drug or medicine information.

#### Text books (Theory)

- Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia.
- Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
- Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication.
- A text book of Clinical Pharmacy Practice; Essential concepts and skills, Dr.G.Parthasarathi etal, Orient Orient Langram Pvt.Ltd. ISBN8125026

#### References

- Australian drug information -Procedure manual. The Society of Hospital Pharmacists of Australia.
- Clinical Pharmacokinetics - Rowland and Tozer, Williams and Wilkins Publication.
- Pharmaceutical statistics. Practical and clinical applications. Sanford Bolton, Marcel Dekker, Inc.

#### 2. Detailed syllabus and lecture wise schedule:

##### Title of the topic

- Definitions, development and scope of clinical pharmacy**
- Introduction to daily activities of a clinical pharmacist**
  - Drug therapy monitoring (medication chart review, clinical review, pharmacist interventions)
  - Ward round participation
  - Adverse drug reaction management
  - Drug information and poisons information
  - Medication history
  - Patient counseling
  - Drug utilisation evaluation (DUE) and review (DUR)
  - Quality assurance of clinical pharmacy services

*Signature of*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

3. **Patient data analysis**  
The patient's case history, its structure and use in evaluation of drug therapy & Understanding common medical abbreviations and terminologies used in clinical practices.
4. **Clinical laboratory tests used in the evaluation of disease states, and interpretation of test results**
  - a. Haematological, Liver function, Renal function, thyroid function tests
  - b. Tests associated with cardiac disorders
  - c. Fluid and electrolyte balance
  - d. Microbiological culture sensitivity tests
  - e. Pulmonary Function Tests
5. **Drug & Poison information**
  - a. Introduction to drug information resources available
  - b. Systematic approach in answering DI queries
  - c. Critical evaluation of drug information and literature
  - d. Preparation of written and verbal reports
  - e. Establishing a Drug Information Centre
  - f. Poisons information- organization & information resources
6. **Pharmacovigilance**
  - a. Scope, definition and aims of pharmacovigilance
  - b. Adverse drug reactions - Classification, mechanism, predisposing factors, causality assessment [different scales used]
  - c. Reporting, evaluation, monitoring, preventing & management of ADRs
  - d. Role of pharmacist in management of ADR.
7. Communication skills, including patient counselling techniques, medication history interview, presentation of cases.
8. Pharmaceutical care concepts
9. Critical evaluation of biomedical literature
10. Medication errors

### 4.3 CLINICAL PHARMACY (PRACTICAL)

#### Practical : 3 Hrs./Week

Students are expected to perform 15 practicals in the following areas covering the topics dealt in theory class.

- a. Answering drug information questions (4 Nos)
- b. Patient medication counselling (4 Nos)
- c. Case studies related to laboratory investigations (4 Nos)
- d. Patient medication history interview (3 Nos)


**Assignment:**

Students are expected to submit THREE written assignments (1500 – 2000 words) on the topics given to them covering the following areas dealt in theory class.

Drug information, Patient medication history interview, Patient medication counselling, Critical appraisal of recently published articles in the biomedical literature which deals with a drug or therapeutic issue.

**Format of the assignment:**

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

#### 4.4 BIOSTATISTICS AND RESEARCH METHODOLOGY (THEORY)

Theory : 2 Hrs. /Week

##### 1. Detailed syllabus and lecture wise schedule

###### 1 Research Methodology

- a) Types of clinical study designs:  
Case studies, observational studies, interventional studies,
- b) Designing the methodology
- c) Sample size determination and Power of a study  
Determination of sample size for simple comparative experiments, determination of sample size to obtain a confidence interval of specified width, power of a study
- d) Report writing and presentation of data

###### 2 Biostatistics

###### 2.1 a) Introduction

- b) Types of data distribution
- c) Measures describing the central tendency distributions- average, median, mode
- d) Measurement of the spread of data-range, variation of mean, standard deviation, variance, coefficient of variation, standard error of mean.

###### 2.2 Data graphics

Construction and labeling of graphs, histogram, piecharts, scatter plots, semilogarithmic plots

###### 2.3 Basics of testing hypothesis

- a) Null hypothesis, level of significance, power of test, P value, statistical estimation of confidence intervals.
- b) Level of significance (Parametric data)- students t test (paired and unpaired), chi Square test, Analysis of Variance (one-way and two-way)
- c) Level of significance (Non-parametric data)- Sign test, Wilcoxon's signed rank test, Wilcoxon rank sum test, Mann Whitney U test, Kruskal-Wallis test (one way ANOVA)
- d) Linear regression and correlation- Introduction, Pearson's and Spearman's correlation and correlation co-efficient.
- e) Introduction to statistical software: SPSS, Epi Info, SAS.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

#### 2.4 Statistical methods in epidemiology

Incidence and prevalence, relative risk, attributable risk

#### 3. Computer applications in pharmacy

Computer System in Hospital Pharmacy: Patterns of Computer use in Hospital Pharmacy – Patient record database management, Medication order entry – Drug labels and list – Intravenous solution and admixture, patient medication profiles, Inventory control, Management report & Statistics.

Computer In Community Pharmacy

Computerizing the Prescription Dispensing process

Use of Computers for Pharmaceutical Care in community pharmacy

Accounting and General ledger system

Drug Information Retrieval & Storage :

Introduction – Advantages of Computerized Literature

Retrieval Use of Computerized Retrieval

#### Reference books:

- a. Pharmaceutical statistics- practical and clinical applications, Sanford Bolton 3<sup>rd</sup> edition, publisher Marcel Dekker Inc. New York.
- b. Drug Information- A Guide for Pharmacists, Patrick M Malone, Karen L Kier, John E Stanovich , 3<sup>rd</sup> edition, McGraw Hill Publications 2006

## 4.5 BIOPHARMACEUTICS AND PHARMACOKINETICS (THEORY)

Theory : 3 Hrs. /Week

### 1. Biopharmaceutics

1. Introduction to Biopharmaceutics
  - a. Absorption of drugs from gastrointestinal tract.
  - b. Drug Distribution.
  - c. Drug Elimination.

### 2. Pharmacokinetics

2. Introduction to Pharmacokinetics.
  - a. Mathematical model
  - b. Drug levels in blood.
  - c. Pharmacokinetic model
  - d. Compartment models
  - e. Pharmacokinetic study.
3. One compartment open model.
  - a. Intravenous Injection (Bolus)
  - b. Intravenous infusion.
4. Multicompartment models.
  - a. Two compartment open model.
  - b. IV bolus, IV infusion and oral administration
5. Multiple – Dosage Regimens.
  - a. Repetitive Intravenous injections – One Compartment Open Model
  - b. Repetitive Extravascular dosing – One Compartment Open model
  - c. Multiple Dose Regimen – Two Compartment Open Model
6. Nonlinear Pharmacokinetics.
  - a. Introduction
  - b. Factors causing Non-linearity.
  - c. Michaelis- menton method of estimating parameters.
7. Noncompartmental Pharmacokinetics.
  - a. Statistical Moment Theory.
  - b. MRT for various compartment models.
  - c. Physiological Pharmacokinetic model.
8. Bioavailability and Bioequivalence.
  - a. Introduction.
  - b. Bioavailability study protocol.
  - c. Methods of Assessment of Bioavailability



## 4.5 BIOPHARMACEUTICS AND PHARMACOKINETICS (PRACTICAL)

### Practical : 3 Hrs./Week

1. Improvement of dissolution characteristics of slightly soluble drugs by some methods.
2. Comparison of dissolution studies of two different marketed products of same drug.
3. Influence of polymorphism on solubility and dissolution.
4. Protein binding studies of a highly protein bound drug and poorly protein bound drug.
5. Extent of plasma-protein binding studies on the same drug (i.e. highly and poorly protein bound drug) at different concentrations in respect of constant time.
6. Bioavailability studies of some commonly used drugs on animal/human model.
7. Calculation of  $K_a$ ,  $K_e$ ,  $t_{1/2}$ ,  $C_{max}$ , AUC, AUMC, MRT etc. from blood profile data.
8. Calculation of bioavailability from urinary excretion data for two drugs.
9. Calculation of AUC and bioequivalence from the given data for two drugs.
10. In vitro absorption studies.
11. Bioequivalency studies on the different drugs marketed.(eg) Tetracycline, Sulphamethoxazole, Trimethoprim, Aspirin etc., on animals and human volunteers.
12. Absorption studies in animal inverted intestine using various drugs.
13. Effect on contact time on the plasma protein binding of drugs.
14. Studying metabolic pathways for different drugs based on elimination kinetics data.
15. Calculation of elimination half- life for different drugs by using urinary elimination data and blood level data.
16. Determination of renal clearance.

### References:

- a. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi
- b. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania.
- c. Pharmacokinetics: By Milo Gibaldi Donald, R. Merce Dekker Inc.
- d. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
- e. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
- f. Biopharmaceutics; By Swarbrick
- g. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal, Vallabh Prakashan Pitampura, Delhi
- h. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febiger, Philadelphia, 1995.
- i. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
- j. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4<sup>th</sup> edition Revised and expanded by Robert F Notari Marcel Dekker Inc, New York and Basel, 1987.
- k. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James, C. Roylan, Marcel Dekker Inc, New York 1996.

## 4.6 CLINICAL TOXICOLOGY (THEORY)

**Theory : 2 Hrs. /Week**

1. General principles involved in the management of poisoning
2. Antidotes and the clinical applications.
3. Supportive care in clinical Toxicology.
4. Gut Decontamination.
5. Elimination Enhancement.
6. Toxicokinetics.
7. Clinical symptoms and management of acute poisoning with the following agents –
  - a) Pesticide poisoning: organophosphorous compounds, carbamates, organochlorines, pyrethroids.
  - b) Opiates overdose.
  - c) Antidepressants
  - d) Barbiturates and benzodiazepines.
  - e) Alcohol: ethanol, methanol.
  - f) Paracetamol and salicylates.
  - g) Non-steroidal anti- inflammatory drugs.
  - h) Hydrocarbons: Petroleum products and PEG.
  - i) Caustics: inorganic acids and alkali.
  - j) Radiation poisoning
8. Clinical symptoms and management of chronic poisoning with the following agents –  
Heavy metals: Arsenic, lead, mercury, iron, copper
9. Venomous snake bites: Families of venomous snakes, clinical effects of venoms, general management as first aid, early manifestations, complications and snake bite injuries.
10. Plants poisoning. Mushrooms, Mycotoxins.
11. Food poisonings
12. Envenomations – Arthropod bites and stings.

### **Substance abuse:**

Signs and symptoms of substance abuse and treatment of dependence

- a) CNS stimulants :amphetamine
- b) Opioids
- c) CNS depressants
- d) Hallucinogens: LSD
- e) Cannabis group
- f) Tobacco

### **References:**

- a. Matthew J Ellenhorn. ELLENHORN'S MEDICAL TOXICOLOGY – DIAGNOSIS AND TREATMENT OF POISONING. Second edition. Williams and Willkins publication, London
- b. V V Pillay. HANDBOOK OF FORENSIC MEDICINE AND TOXICOLOGY. Thirteenth edition 2003 Paras Publication, Hyderabad

## Fifth year

### 5.1 CLINICAL RESEARCH (THEORY)

Theory : 3 Hrs. /Week

#### 1. Drug development process:

Introduction

Various Approaches to drug discovery

1. Pharmacological
2. Toxicological
3. IND Application
4. Drug characterization
5. Dosage form

#### 2. Clinical development of drug:

1. Introduction to Clinical trials
2. Various phases of clinical trial.
3. Methods of post marketing surveillance
4. Abbreviated New Drug Application submission.
5. Good Clinical Practice – ICH, GCP, Central drug standard control organisation (CDSCO) guidelines
6. Challenges in the implementation of guidelines
7. Ethical guidelines in Clinical Research
8. Composition, responsibilities, procedures of IRB / IEC
9. Overview of regulatory environment in USA, Europe and India.
10. Role and responsibilities of clinical trial personnel as per ICH GCP
  - a. Sponsor
  - b. Investigators
  - c. Clinical research associate
  - d. Auditors
  - e. Contract research coordinators
  - f. Regulatory authority
11. Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)
12. Informed consent Process
13. Data management and its components
14. Safety monitoring in clinical trials.

**References :**

- a. Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
- b. International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.
- c. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
- d. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
- e. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
- f. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
- g. Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## 5.2 PHARMACOEPIDEMIOLOGY AND PHARMACOECONOMICS (THEORY)

**Theory : 3 Hrs. /Week**

### 1. Pharmacoepidemiology :

#### **Definition and scope:**

Origin and evaluation of pharmacoepidemiology need for pharmacoepidemiology, aims and applications.

#### **Measure ment of outcomes in pharmacoepidemiology**

Outcome measure and drug use measures

Prevalence, incidence and incidence rate. Monetary units, number of prescriptions, units of drugs dispensed, defined daily doses and prescribed daily doses, medication adherence measurement

#### **Concept of risk in pharmacoepidemiology**

Measurement of risk, attributable risk and relative risk, time-risk relationship and odds ratio

#### **Pharmacoepidemiological methods**

Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods

Drug utilization review, case reports, case series, surveys of drug use, cross – sectional studies, cohort studies, case control studies, case –cohort studies, meta – analysis studies, spontaneous reporting, prescription event monitoring and record linkage system.

#### **Sources of data for pharmacoeptide miological studies**

Ad Hoc data sources and automated data systems.

#### **Selected special applications of pharmacoepidemiology**

Studies of vaccine safety, hospital pharmacoepidemiology, pharmacoepidemiology and risk management, drug induced birth defects.

### 2. Phrmacoconomics:

#### **Definition, history, needs of pharmacoeconomic evaluations**

Role in formulary management decisions

#### **Pharmacoeconomic evaluation**

Outcome assessment and types of evaluation

Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods: Cost – minimization, cost- benefit, cost – effectiveness, cost utility

### 3. Applications of Pharmacoeconomics

Software and case studies

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

### 5.3 CLINICAL PHARMACOKINETICS AND PHARMACOTHERAPEUTIC DRUG MONITORING (THEORY)

Theory : 2 Hrs. /Week

1. **Introduction to Clinical pharmacokinetics.**
2. **Design of dosage regimens:**  
Nomograms and Tabulations in designing dosage regimen, Conversion from intravenous to oral dosing, Determination of dose and dosing intervals, Drug dosing in the elderly and pediatrics and obese patients.
3. **Pharmacokinetics of Drug Interaction:**
  - a. Pharmacokinetic drug interactions
  - b. Inhibition and Induction of Drug metabolism
  - c. Inhibition of Biliary Excretion.
4. **Therapeutic Drug monitoring:**
  - a. Introduction
  - b. Individualization of drug dosage regimen (Variability – Genetic, Age and Weight, disease, Interacting drugs).
  - c. Indications for TDM. Protocol for TDM.
  - d. Pharmacokinetic/Pharmacodynamic Correlation in drug therapy.
  - e. TDM of drugs used in the following disease conditions: cardiovascular disease, Seizure disorders, Psychiatric conditions, and Organ transplantations.
5. **Dosage adjustment in Renal and hepatic Disease.**
  - a. Renal impairment
  - b. Pharmacokinetic considerations
  - c. General approach for dosage adjustment in Renal disease.
  - d. Measurement of Glomerular Filtration rate and creatinine clearance.
  - e. Dosage adjustment for uremic patients.
  - f. Extracorporeal removal of drugs.
  - g. Effect of Hepatic disease on pharmacokinetics.
6. **Population Pharmacokinetics.**
  - a. Introduction to Bayesian Theory.
  - b. Adaptive method or Dosing with feed back.
  - c. Analysis of Population pharmacokinetic Data.
7. **Pharmacogenetics**
  - a. Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes.
  - b. Genetic Polymorphism in Drug Transport and Drug Targets.
  - c. Pharmacogenetics and Pharmacokinetics/Pharmacodynamic considerations

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501303.

**APPENDIX-B**  
**(See regulation 9)**  
**CONDITIONS TO BE FULFILLED BY THE**  
**ACADEMIC TRAINING INSTITUTION**

- 1) Any authority or institution in India applying to the Pharmacy Council of India for approval of courses of study for Pharm.D. and Pharm.D. (Post Baccalaureate) under sub-section (1) of section 12 of the Pharmacy Act, 1948 shall comply with the infrastructural facilities as prescribed by the Pharmacy Council of India from time to time.
- 2) Pharm.D. and Pharm.D. (Post Baccalaureate) programmes shall be conducted only in those institutions which -
  - a) are approved by the Pharmacy Council of India for B.Pharm course as provided under section 12 of the Pharmacy Act, 1948;
  - b) have 300 bedded hospital attached to it.

**(i) Hospital Details**

1. Institution with their own hospital of minimum 300 beds.
2. Teaching hospital recognised by the Medical Council of India or University, or a Government hospital not below the level of district headquarter hospital with 300 beds with clearly defined Memorandum of Understanding including housing pharmacy practice department with minimum carpet area of 30 square feet per student along with consent to provide the professional manpower to support the programme.
3. Corporate type hospital with minimum 300 beds with clearly defined Memorandum of Understanding including housing pharmacy practice department with minimum carpet area of 30 square feet per student along with consent to provide the professional manpower to support the programme.
4. Number of institutions which can be attached to one hospital shall be restricted by the student pharmacist to bed ratio of 1:10.

**(ii) Speciality**

- a) Tertiary care hospitals are desirable
- b) Medicine[compulsory], and any three specialization of the following
  1. Surgery
  2. Pediatrics
  3. Gynecology and obstetrics
  4. Psychiatry
  5. Skin and VD
  6. Orthopedics

**(iii) Location of the Hospital**

Within the same limits of Corporation or Municipality or Campus with Medical Faculty involvement as adjunct faculty.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

### 3) TEACHING STAFF REQUIREMENT

- i) Staff Pattern : All faculty shall be full time. However part time perceptors in hospital shall be allowed.
- ii) Subject wise specialisation of the Teaching Staff :

S.No.	Subject	Specialisation required
1.	Pharmacy Practice	M.Pharm in Pharmacy Practice or Pharmacology or Pharmaceutics.
2.	Human Anatomy & Physiology	M.Pharm in Pharmacology or Pharmacy practice
3.	Pharmaceutics (Dispensing & General Pharmacy)	M.Pharm in Pharmaceutics
4.	Pharmacognosy-I	M.Pharm in Pharmacognosy
5.	Pharmaceutical Organic Chemistry-I	M.Pharm in Pharmaceutical chemistry or Pharmaceutical Analysis or Quality assurance or Bulk Drug
6.	Pharmaceutical Inorganic Chemistry	M.Pharm in Pharmaceutical chemistry or Pharmaceutical Analysis or Quality assurance or Bulk Drug
7.	Pharmaceutical microbiology	M.Pharm in Pharmaceutics or Pharmaceutical Biotechnology
8.	Pathophysiology	M.Pharm Pharmacy practice or Pharmacology
9.	Applied Biochemistry & Clinical Chemistry	M.Pharm in Pharmacology or Pharmacy practice or Pharmaceutical chemistry
10.	Pharmacology-I	M.Pharm in Pharmacology or Pharmacy practice
11.	Pharmaceutical Jurisprudence	M.Pharm in Pharmaceutics
12.	Pharmacology-II	M.Pharm in Pharmacology or Pharmacy practice
13.	Pharmaceutical Dosage Forms	M.Pharm in Pharmaceutics or Industrial Pharmacy
14.	Pharmacotherapeutics -I, II and III	M.Pharm Pharmacy practice or Pharmacology
15.	Community Pharmacy	M.Pharm in Pharmacy practice or Pharmacology or Pharmaceutics
16.	Hospital Pharmacy	M.Pharm in Pharmacy practice or Pharmacology or Pharmaceutics
17.	Clinical Pharmacy	M.Pharm in Pharmacy practice
18.	Computer Science or Computer Application in pharmacy	MCA
19.	Mathematics	M.Sc. (Maths)

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301



## iii) Teaching Staff :

Department/Division	Name of the post	No.
Department of Pharmaceutics	Professor	1
	Asst. Professor	1
	Lecturer	2
Department of Pharmaceutical Chemistry (Including Pharmaceutical Analysis)	Professor	1
	Asst. Professor	1
	Lecturer	3
Department of Pharmacology	Professor	1
	Asst. Professor	1
	Lecturer	2
Department of Pharmacognosy	Professor	1
	Asst. Professor	1
	Lecturer	1
Department of Pharmacy Practice	Professor	1
	Asst. Professor	2
	Lecturer	3

## iv) Prescribed qualifications and experience for Professor, Assistant Professor, Lecturer and others :

Sl. No.	CADRE	QUALIFICATIONS	EXPERIENCE
1.	Lecturer	i) Basic degree in pharmacy (B.Pharm). ii) Registration as a pharmacist under the Pharmacy Act. iii) First Class Master's degree in appropriate branch of specialization in Pharmacy (M Pharm)	No minimum requirement.
2.	Assistant Professor	i) Basic degree in pharmacy (B.Pharm). ii) Registration as a pharmacist under the Pharmacy Act. iii) Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm)	Three years experience in Teaching or Research at the level of Lecturer or equivalent.

*Manjula J*  
PRINCIPAL

		iv) Ph.D. degree (with First Class degree either at Bachelor's or Master's level) in the appropriate branch of specialization in Pharmacy.	
3.	Professor	<ul style="list-style-type: none"> <li>i) Basic degree in pharmacy (B.Pharm).</li> <li>ii) Registration as a pharmacist under the Pharmacy Act.</li> <li>iii) Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm).</li> <li>iv) Ph.D. degree (with first Class either at Bachelor's or Master's level) in appropriate branch of specialization in Pharmacy.</li> </ul>	<ul style="list-style-type: none"> <li>i) Ten years experience in Teaching or Research.</li> <li>ii) Out of which five years must be as Assistant Professor.</li> </ul>
4.	Director or Principal or Head of institute	<ul style="list-style-type: none"> <li>i) Basic degree in pharmacy (B.Pharm).</li> <li>ii) Registration as a pharmacist under the Pharmacy Act.</li> <li>iii) Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm)</li> <li>iv) Ph.D. degree (with first Class degree either at Bachelor's or Master's level in the appropriate branch of specialization in Pharmacy.</li> </ul>	<ul style="list-style-type: none"> <li>i) Fifteen years experience in Teaching or Research.</li> <li>ii) Out of which five years must be as Professor or above in Pharmacy.</li> </ul> <p>Desirable :</p> <p>Administrative experience in responsible position.</p> <p>The maximum age for holding the post shall be 65 years.</p>

**Note :** If a class or division is not awarded at Master's level, a minimum of 60% marks in aggregate or equivalent cumulative grade point average shall be considered equivalent to first class or division, as the case may be.

*Principal*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

- v) Workload of Faculty : Professor – 8  
hrs. per week Assistant Professor –  
12 hrs. per week Lecturers – 16 hrs.  
per week
- vi) Training of Pharmacy Practice Faculty :
- Teaching staff will be trained as per the module prescribed by the Central Council.
  - Duration of training –Minimum 3 months.
  - Training sites –Institutions running pharmacy practice or Programmes for atleast five years.
  - Trainer –Professor or Assistant Professor with minimum of five years of clinical pharmacy teaching and practice experience.

#### 4) NON-TEACHING STAFF :

Sl.No.	Designation	Required (Minimum)	Required Qualification
1	Laboratory Technician	1 for each Dept	D. Pharm
2	Laboratory Assistants or Laboratory Attenders	1 for each Lab (minimum)	SSLC
3	Office Superintendent	1	Degree
4	Accountant	1	Degree
5	Store keeper	1	D.Pharm or a Bachelor degree recognized by a University or institution.
6	Computer Data Operator	1	BCA or Graduate with Computer Course
7	Office Staff I	1	Degree
8	Office Staff II	2	Degree
9	Peon	2	SSLC
10	Cleaning personnel	Adequate	---
11	Gardener	Adequate	---

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## 5) ACCOMMODATION :

Suitable and sufficient accommodation with adequate ventilation, lighting and other hygienic conditions should be provided to the rooms for Principal or the Head of the department, office, class rooms, library, staff, staff common room, students common room, museum, laboratories, stores, etc.

At least two lecture halls alongwith eight laboratories as specified below should be provided for: —

1. Pharmaceutics and Pharmacokinetics Lab	- 2
2. Life Science (Pharmacology, Physiology, Pathophysiology)	- 2
3. Phytochemistry or Pharmaceutical Chemistry	- 2
4. Pharmacy Practice	- 2
	-----
Total =	8
	-----

In addition to the laboratories, balance room, aseptic room or cabinet, animal house and a machine room shall also be provided.

Floor area of the laboratory should not be less than 30 square feet per student required to work in the laboratory at any given time subject to a minimum of 750 square feet.

Laboratories should be fitted and constructed in a manner that these can be kept reasonably clean. Gas and water fittings, shelves, fuming cupboards be provided wherever necessary.

## 6. EQUIPMENT AND APPARATUS :

### Department wise list of minimum equipments

#### A. DEPARTMENT OF PHARMACOLOGY :

##### I. Equipment:

S.No.	Name	Minimum re quired Nos.
1	Microscopes	15
2	Haemocytometer with Micropipettes	20
3	Sahli's haemocytometer	20
4	Hutchinson's spirometer	01
5	Spygmomanometer	05
6	Stethoscope	05
7	Permanent Slides for various tissues	One pair of each tissue Organs and endocrine glands One slide of each organ system
8	Models for various organs	One model of each organ system
9	Specimen for various organs and systems	One model for each organ system
10	Skeleton and bones	One set of skeleton and one spare bone

*Signature*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryl(V), Keesara(M), Medchal Dist. T.S.-501301.

11	Different Contraceptive Devices and Models	One set of each device
12	Muscle electrodes	01
13	Lucas moist chamber	01
14	Myographic lever	01
15	Stimulator	01
16	Centrifuge	01
17	Digital Balance	01
18	Physical /Chemical Balance	01
19	Sherrington's Kymograph Machine or Polyrite	10
20	Sherrington Drum	10
21	Perspex bath assembly (single unit)	10
22	Aerators	10
23	Computer with LCD	01
24	Software packages for experiment	01
25	Standard graphs of various drugs	Adequate number
26	Actophotometer	01
27	Rotarod	01
28	Pole climbing apparatus	01
29	Analgesiometer (Eddy's hot plate and radiant heat methods)	01
30	Convulsiometer	01
31	Plethysmograph	01
32	Digital pH meter	01

## II. Apparatus:

S.No	Name	Minimum re quired Nos.
1	Folin-Wu tubes	60
2	Dissection Tray and Boards	10
3	Haemostatic artery forceps	10
4	Hypodermic syringes and needles of size 15,24,26G	10
5	Levers, cannulae	20

**NOTE:** Adequate numbe r of glassware commonly used in the laboratory should be provided in each laboratory and departme nt.

## B. DEPARTMENT OF PHARMACOGNOSY :

### I. Equipment:

S.No.	Name	Minimum re quired Nos.
1	Microscope with stage micrometer	15
2	Digital Balancc	02
3	Autoclave	02

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

4	Hot air oven	02
5	B.O.D. incubator	01
6	Refrigerator	01
7	Laminar air flow	01
8	Colony counter	02
9	Zone reader	01
10	Digital pH meter	01
11	Sterility testing unit	01
12	Camera Lucida	15
13	Eye piece micrometer	15
14	Incinerator	01
15	Moisture balance	01
16	Heating mantle	15
17	Flourimeter	01
18	Vacuum pump	02
19	Micropipettes (Single and multi channeled)	02
20	Micro Centrifuge	01
21	Projection Microscope	01

## II. Apparatus:

S.No.	Name	Minimum re quired Nos.
1	Reflux flask with condenser	20
2	Water bath	20
3	Clavengers apparatus	10
4	Soxhlet apparatus	10
6	TLC chamber and sprayer	10
7	Distillation unit	01

**NOTE:** Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.

## C. DEPARTMENT OF PHARMACEUTICAL CHEMISTRY :

### I. Equipment:

S.No.	Name	Minimum re quired Nos.
1	Hot plates	05
2	Oven	03
3	Refrigerator	01
4	Analytical Balances for demonstration	05
5	Digital balance 10mg sensitivity	10
6	Digital Balance (1mg sensitivity)	01
7	Suction pumps	06
8	Muffle Furnace	01

9	Mechanical Stirrers	10
10	Magnetic Stirrers with Thermostat	10
11	Vacuum Pump	01
12	Digital pH meter	01
13	Microwave Oven	02

## II. Apparatus:

S.No.	Name	Minimum required Nos.
1	Distillation Unit	02
2	Reflux flask and condenser single necked	20
3	Reflux flask and condenser double/triple necked	20
4	Burettes	40
5	Arsenic Limit Test Apparatus	20
6	Nessler's Cylinders	40

**NOTE:** Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.

## D. DEPARTMENT OF PHARMACEUTICS :

### I. Equipment:

S.No	Name	Minimum required Nos.
1	Mechanical stirrers	10
2	Homogenizer	05
3	Digital balance	05
4	Microscopes	05
5	Stage and eye piece micrometers	05
6	Brookfield's viscometer	01
7	Tray dryer	01
8	Ball mill	01
9	Sieve shaker with sieve set	01
10	Double cone blender	01
11	Propeller type mechanical agitator	05
12	Autoclave	01
13	Steam distillation still	01
14	Vacuum Pump	01
15	Standard sieves, sieve no. 8, 10, 12, 22, 24, 44, 66, 80	10 sets
16	Tablet punching machine	01
17	Capsule filling machine	01
18	Ampoule washing machine	01
19	Ampoule filling and sealing machine	01

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

20	Tablet disintegration test apparatus IP	01
21	Tablet dissolution test apparatus IP	01
22	Monsanto's hardness tester	01
23	Pfizer type hardness tester	01
24	Friability test apparatus	01
25	Clarity test apparatus	01
26	Ointment filling machine	01
27	Collapsible tube crimping machine	01
28	Tablet coating pan	01
29	Magnetic stirrer, 500ml and 1 liter capacity with speed control	05 EACH 10
30	Digital pH meter	01
31	All purpose equipment with all accessories	01
32	Aseptic Cabinet	01
33	BOD Incubator	02
34	Bottle washing Machine	01
35	Bottle Sealing Machine	01
36	Bulk Density Apparatus	02
37	Conical Percolator (glass/copper/ stainless steel)	10
38	Capsule Counter	02
39	Energy meter	02
40	Hot Plate	02
41	Humidity Control Oven	01
42	Liquid Filling Machine	01
43	Mechanical stirrer with speed regulator	02
44	Precision Melting point Apparatus	01
45	Distillation Unit	01

## II. Apparatus:

S.No	Name	Minimum re quired Nos.
1	Ostwald's viscometer	15
2	Stalagmometer	15
3	Desiccator*	05
4	Suppository moulds	20
5	Buchner Funnels (Small, medium, large)	05 each
6	Filtration assembly	01
7	Permeability Cups	05
8	Andreason's Pipette	03
9	Lipstick moulds	10

**NOTE:** Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.



**E. DEPARTMENT OF PHARMACEUTICAL BIOTECHNOLOGY :**

S.No.	Name	Minimum re quired Nos.
1	Orbital shaker incubator	01
2	Lyophilizer (Desirable)	01
3	Gel Electrophoresis (Vertical and Horizontal)	01
4	Phase contrast/Trinocular Microscope	01
5	Refrigerated Centrifuge	01
6	Fermenters of different capacity (Desirable)	01
7	Tissue culture station	01
8	Laminar airflow unit	01
9	Diagnostic kits to identify infectious agents	01
10	Rheometer	01
11	Viscometer	01
12	Micropipettes (single and multi channeled)	01 each
13	Sonicator	01
14	Respinometer	01
15	BOD Incubator	01
16	Paper Electrophoresis Unit	01
17	Micro Centrifuge	01
18	Incubator water bath	01
19	Autoclave	01
20	Refrigerator	01
21	Filtration Assembly	01
22	Digital pH meter	01

**NOTE:** Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and departme nt.

**F. DEPARTMENT OF PHARMACY PRACTICE :**

**Equipment:**

S.No.	Name	Minimum re quired Nos.
1	Colorimeter	2
2	Microscope	Adequate
3	Permanent slides (skin, kidney, pancreas, smooth muscle, liver etc.,)	Adequate
4	Watch glass	Adequate
5	Centrifuge	1
6	Biochemical reagents for analysis of normal and pathological constituents in urine and blood facilities	Adequate
7	Filtration equipment	2
8	Filling Machine	1
9	Sealing Machine	1

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

10	Autoclave sterilizer	1
11	Membrane filter	1 Unit
12	Sintered glass funnel with complete filtering assemble	Adequate
13	Small disposable membrane filter for IV admixture filtration	Adequate
14	Laminar air flow bench	1
15	Vacuum pump	1
16	Oven	1
17	Surgical dressing	Adequate
18	Incubator	1
19	PH meter	1
20	Disintegration test apparatus	1
21	Hardness tester	1
22	Centrifuge	1
23	Magnetic stirrer	1
24	Thermostatic bath	1

**NOTE:**

1. **Computers and Internet connection (Broadband), six computers for students with internet and staff computers as required.**
2. **Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and the department.**

**G. CENTRAL INSTRUMENTATION ROOM :**

S.No.	Name	Minimum required Nos.
1	Colorimeter	01
2	Digital pH meter	01
3	UV- Visible Spectrophotometer	01
4	Flourimeter	01
5	Digital Balance (1mg sensitivity)	01
6	Nephelo Turbidity meter	01
7	Flame Photometer	01
8	Potentiometer	01
9	Conductivity meter	01
10	Fourier Transform Infra Red Spectrometer (Desirable)	01
11	HPLC	01
12	HPTLC (Desirable)	01
13	Atomic Absorption and Emission spectrophotometer (Desirable)	01
14	Biochemistry Analyzer (Desirable)	01
15	Carbon, Hydrogen, Nitrogen Analyzer (Desirable)	01
16	Deep Freezer (Desirable)	01
17	Ion- Exchanger	01
18	Lyophilizer (Desirable)	01

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-502301.

## **APPENDIX-C**

**(See regulation 16)**

### **INTERNSHIP**

#### **1) SPECIFIC OBJECTIVES :**

- i) to provide patient care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social cultural, economic, and professional issues, emerging technologies, and evolving biomedical, pharmaceutical, social or behavioral or administrative, and clinical sciences that may impact therapeutic outcomes.
- ii) to manage and use resources of the health care system, in cooperation with patients, prescribers, other health care providers, and administrative and supportive personnel, to promote health; to provide, assess, and coordinate safe, accurate, and time-sensitive medication distribution; and to improve therapeutic outcomes of medication use.
- iii) to promote health improvement, wellness, and disease prevention in co-operation with patients, communities, at-risk population, and other members of an interprofessional team of health care providers.
- iv) to demonstrate skills in monitoring of the National Health Programme s and schemes, oriented to provide preventive and promotive health care services to the community.
- v) to develop leadership qualities to function effectively as a member of the health care team organised to deliver the health and family welfare services in existing socio-economic, political and cultural environment.
- vi) to communicate effectively with patients and the community.

#### **2) OTHER DETAILS :**

- i) All parts of the internship shall be done, as far as possible, in institutions in India. In case of any difficulties, the matter may be referred to the Pharmacy Council of India to be considered on merits.
- ii) Where an intern is posted to district hospital for training, there shall be a committee consisting of representatives of the college or university, and the district hospital administration, who shall regulate the training of such trainee. For such trainee a certificate of satisfactory completion of training shall be obtained from the relevant administrative authorities which shall be countersigned by the Principal or Dean of College.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. -501301.

- iii) Every candidate shall be required, after passing the final Pharm.D. or Pharm.D. (Post Baccalaureate) examination as the case may be to undergo compulsory rotational internship to the satisfaction of the College authorities and University concerned for a period of twelve months so as to be eligible for the award of the degree of Pharm.D. or Pharm.D. (Post Baccalaureate) as the case may be.

### 3. ASSESSMENT OF INTERNSHIP :

- i) The intern shall maintain a record of work which is to be verified and certified by the preceptor (teacher practitioner) under whom he works. Apart from scrutiny of the record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude during and at the end of the training. Based on the record of work and date of evaluation, the Dean or Principal shall issue certificate of satisfactory completion of training, following which the university shall award the degree or declare him eligible for it.
- ii) Satisfactory completion of internship shall be determined on the basis of the following:-
- (1) Proficiency of knowledge required for each case management SCORE 0-5
  - (2) The competency in skills expected for providing Clinical Pharmacy Services SCORE 0-5
  - (3) Responsibility, punctuality, work up of case, involvement in patient care SCORE 0-5
  - (4) Ability to work in a team (Behavior with other healthcare professionals including medical doctors, nursing staff and colleagues). SCORE 0-5
  - (5) Initiative, participation in discussions, research aptitude. SCORE 0-5

Poor	Fair	Below Average	Average	Above Average	Excellent
0	1	2	3	4	5

A Score of less than 3 in any of above items will represent unsatisfactory completion of internship.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## Fourth Year

### 4.1 PHARMACOTHERAPEUTICS – III (THEORY)

Theory : 3 Hrs. /Week

1. **Scope :** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
2. **Objectives:** At completion of this subject it is expected that students will be able to understand –
  - a. the pathophysiology of selected disease states and the rationale for drug therapy;
  - b. the therapeutic approach to management of these diseases;
  - c. the controversies in drug therapy;
  - d. the importance of preparation of individualised therapeutic plans based on diagnosis;
  - e. needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);
  - f. describe the pathophysiology of selected disease states and explain the rationale for drug therapy;
  - g. to summarize the therapeutic approach to management of these diseases including reference to the latest available evidence;
  - h. to discuss the controversies in drug therapy;
  - i. to discuss the preparation of individualised therapeutic plans based on diagnosis; and
  - j. identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

#### **Text Books**

- a. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication
- b. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange

#### **Reference Books**

- a. Pathologic basis of disease - Robins SL, W.B.Saunders publication
- b. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication
- c. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
- d. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
- e. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
- f. Relevant review articles from recent medical and pharmaceutical literature.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchn. Dist. T.S.-502302.

#### 4.1 PHARMACOTHERAPEUTICS – III (PRACTICAL)

**Practical : 3 Hrs./Week**

**Practicals:**

Hospital postings for a period of at least 50 hours is required to understand the principles and practice involved in ward round participation and clinical discussion on selection of drug therapy. Students are required to maintain a record of 15 cases observed in the ward and the same should be submitted at the end of the course for evaluation. Each student should present at least two medical cases they have observed and followed in the wards.

**Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases:**

**Title of the topic**

- 1 **Gastrointestinal system:** Peptic ulcer disease, Gastro Esophageal Reflux Disease, Inflammatory bowel disease, Liver disorders - Alcoholic liver disease, Viral hepatitis including jaundice, and Drug induced liver disorders.
- 2 **Haematological system:** Anaemias, Venous thromboembolism, Drug induced blood disorders.
- 3 **Nervous system:** Epilepsy, Parkinsonism, Stroke, Alzheimer's disease,
- 4 **Psychiatry disorders:** Schizophrenia, Affective disorders, Anxiety disorders, Sleep disorders, Obsessive Compulsive disorders
- 5 Pain management including Pain pathways, neuralgias, headaches.
- 6 Evidence Based Medicine

**Assignments:**

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.

**Format of the assignment:**

1. Minimum & Maximum number of pages
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year
4. It shall be computer draft copy
5. Name and signature of the student
6. Time allocated for presentation may be 8+2 Min.

**Scheme of Practical Examination :**

	<b>Sessionals</b>	<b>Annual</b>
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501 204

## 4.2 HOSPITAL PHARMACY (THEORY)

Theory : 2 Hrs. /Week

1. **Scope:** In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug dispensing, manufacturing of parenteral preparations, drug information, patient counselling, and therapeutic drug monitoring for improved patient care.
2. **Objectives:** Upon completion of the course, the student shall be able to –
  - a. know various drug distribution methods;
  - b. know the professional practice management skills in hospital pharmacies;
  - c. provide unbiased drug information to the doctors;
  - d. know the manufacturing practices of various formulations in hospital set up;
  - e. appreciate the practice based research methods; and
  - f. appreciate the stores management and inventory control.

**Text books: (latest editions)**

- a. Hospital pharmacy by William .E. Hassan
- b. A text book of Hospital Pharmacy by S.H.Merchant & Dr. J.S. Qadry. Revised by R.K.Goyal & R.K. Parikh

**References:**

- a. WHO consultative group report.
- b. R.P.S. Vol.2. Part –B; Pharmacy Practice section.
- c. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.

### 3. Lecture wise programme :

**Topics**

- 1 **Hospital - its Organisation and functions**
- 2 **Hospital pharmacy-Organisation and management**
  - a) Organizational structure-Staff, Infrastructure & work load statistics
  - b) Management of materials and finance
  - c) Roles & responsibilities of hospital pharmacist
- 3 **The Budget – Pre paration and imple mentation**
- 4 **Hospital drug policy**
  - a) Pharmacy and Therapeutic committee (PTC)
  - b) Hospital formulary
  - c) Hospital committees
    - Infection committee
    - Research and ethical committee
  - d) developing therapeutic guidelines
  - e) Hospital pharmacy communication - Newsletter

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Geerjani(V), Sivasara(M), Medchal Dist. T.S. -501301.

**5 Hospital pharmacy services**

- a) Procurement & warehousing of drugs and Pharmaceuticals
- b) Inventory control  
Definition, various methods of Inventory Control  
ABC, VED, EOQ, Lead time, safety stock
- c) Drug distribution in the hospital
  - i) Individual prescription method
  - ii) Floor stock method
  - iii) Unit dose drug distribution method
- d) Distribution of Narcotic and other controlled substances
- e) Central sterile supply services – Role of pharmacist

**6 Manufacture of Pharmaceutical preparations**

- a) Sterile formulations – large and small volume parenterals
- b) Manufacture of Ointments, Liquids, and creams
- c) Manufacturing of Tablets, granules, capsules, and powders
- d) Total parenteral nutrition

**7 Continuing professional development programs** Education and training**8 Radio Pharmaceuticals – Handling and packaging****9 Professional Relations and practices of hospital pharmacist****4.2 HOSPITAL PHARMACY (PRACTICAL)****Practical : 3 Hrs./Week**

1. Assessment of drug interactions in the given prescriptions
2. Manufacture of parenteral formulations, powders.
3. Drug information queries.
4. Inventory control

**List of Assignments:**

1. Design and Management of Hospital pharmacy department for a 300 bedded hospital.
2. Pharmacy and Therapeutics committee – Organization, functions, and limitations.
3. Development of a hospital formulary for 300 bedded teaching hospital
4. Preparation of ABC analysis of drugs sold in one month from the pharmacy.
5. Different phases of clinical trials with elements to be evaluated.
6. Various sources of drug information and systematic approach to provide unbiased drug information.
7. Evaluation of prescriptions generated in hospital for drug interactions and find out the suitable management.

  
**PRINCIPAL**  
 Geethanali College of Pharmacy  
 Cheeryal, Secunderabad, Telangana, India. T.S. - 501201.



**Special require ments:**

1. Each college should sign MoU with nearby local hospital having minimum 150 beds for providing necessary training to the students' on hospital pharmacy activities.
2. Well equipped with various resources of drug information.

**Scheme of Practical Examination:**

	<b>Sessionals</b>	<b>Annual</b>
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03hrs</b>	<b>04hrs</b>

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva- voce and record maintenance).

*Principal*  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medinipur Dist. T.S. 501301.

### 4.3 CLINICAL PHARMACY (THEORY)

**Theory : 3 Hrs. /Week**

#### 1. Objectives of the Subject :

Upon completion of the subject student shall be able to (Know, do, appreciate) –

- a. monitor drug therapy of patient through medication chart review and clinical review;
- b. obtain medication history interview and counsel the patients;
- c. identify and resolve drug related problems;
- d. detect, assess and monitor adverse drug reaction;
- e. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; and
- f. retrieve, analyse, interpret and formulate drug or medicine information.

#### Text books (Theory)

- a. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia.
- b. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
- c. Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication.
- d. A text book of Clinical Pharmacy Practice; Essential concepts and skills, Dr.G.Parthasarathi etal, Orient Orient Langram Pvt.Ltd. ISSN8125026

#### References

- a. Australian drug information -Procedure manual. The Society of Hospital Pharmacists of Australia.
- b. Clinical Pharmacokinetics - Rowland and Tozer, Williams and Wilkins Publication.
- c. Pharmaceutical statistics. Practical and clinical applications. Sanford Bolton, Marcel Dekker, Inc.

#### 2. Detailed syllabus and lecture wise schedule:

##### Title of the topic

1. **Definitions, development and scope of clinical pharmacy**
2. **Introduction to daily activities of a clinical pharmacist**
  - a. Drug therapy monitoring (medication chart review, clinical review, pharmacist interventions)
  - b. Ward round participation
  - c. Adverse drug reaction management
  - d. Drug information and poisons information
  - e. Medication history
  - f. Patient counseling
  - g. Drug utilisation evaluation (DUE) and review (DUR)
  - h. Quality assurance of clinical pharmacy services

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S. -501301.

3. **Patient data analysis**  
The patient's case history, its structure and use in evaluation of drug therapy & Understanding common medical abbreviations and terminologies used in clinical practices.
4. **Clinical laboratory tests used in the evaluation of disease states, and interpretation of test results**
  - a. Haematological, Liver function, Renal function, thyroid function tests
  - b. Tests associated with cardiac disorders
  - c. Fluid and electrolyte balance
  - d. Microbiological culture sensitivity tests
  - e. Pulmonary Function Tests
5. **Drug & Poison information**
  - a. Introduction to drug information resources available
  - b. Systematic approach in answering DI queries
  - c. Critical evaluation of drug information and literature
  - d. Preparation of written and verbal reports
  - e. Establishing a Drug Information Centre
  - f. Poisons information- organization & information resources
6. **Pharmacovigilance**
  - a. Scope, definition and aims of pharmacovigilance
  - b. Adverse drug reactions - Classification, mechanism, predisposing factors, causality assessment [different scales used]
  - c. Reporting, evaluation, monitoring, preventing & management of ADRs
  - d. Role of pharmacist in management of ADR.
7. Communication skills, including patient counselling techniques, medication history interview, presentation of cases.
8. Pharmaceutical care concepts
9. Critical evaluation of biomedical literature
10. Medication errors

### 4.3 CLINICAL PHARMACY (PRACTICAL)

**Practical : 3 Hrs./Week**

Students are expected to perform 15 practicals in the following areas covering the topics dealt in theory class.

- a. Answering drug information questions (4 Nos)
- b. Patient medication counselling (4 Nos)
- c. Case studies related to laboratory investigations (4 Nos)
- d. Patient medication history interview (3 Nos)

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301


**Assignment:**

Students are expected to submit THREE written assignments (1500 – 2000 words) on the topics given to them covering the following areas dealt in theory class.

Drug information, Patient medication history interview, Patient medication counselling, Critical appraisal of recently published articles in the biomedical literature which deals with a drug or therapeutic issue.

**Format of the assignment:**

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

#### 4.4 BIOSTATISTICS AND RESEARCH METHODOLOGY (THEORY)

Theory : 2 Hrs. /Week

##### 1. Detailed syllabus and lecture wise schedule

###### 1 Research Methodology

- a) Types of clinical study designs:  
Case studies, observational studies, interventional studies,
- b) Designing the methodology
- c) Sample size determination and Power of a study  
Determination of sample size for simple comparative experiments, determination of sample size to obtain a confidence interval of specified width, power of a study
- d) Report writing and presentation of data

###### 2 Biostatistics

###### 2.1 a) Introduction

- b) Types of data distribution
- c) Measures describing the central tendency distributions- average, median, mode
- d) Measurement of the spread of data-range, variation of mean, standard deviation, variance, coefficient of variation, standard error of mean.

###### 2.2 Data graphics

Construction and labeling of graphs, histogram, piecharts, scatter plots, semilogarithmic plots

###### 2.3 Basics of testing hypothesis

- a) Null hypothesis, level of significance, power of test, P value, statistical estimation of confidence intervals.
- b) Level of significance (Parametric data)- students t test (paired and unpaired), chi Square test, Analysis of Variance (one-way and two-way)
- c) Level of significance (Non-parametric data)- Sign test, Wilcoxon's signed rank test, Wilcoxon rank sum test, Mann Whitney U test, Kruskal-Wallis test (one way ANOVA)
- d) Linear regression and correlation- Introduction, Pearson's and Spearman's correlation and correlation co-efficient.
- e) Introduction to statistical software: SPSS, Epi Info, SAS.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

## 2.4 Statistical methods in epidemiology

Incidence and prevalence, relative risk, attributable risk

## 3. Computer applications in pharmacy

Computer System in Hospital Pharmacy: Patterns of Computer use in Hospital Pharmacy – Patient record database management, Medication order entry – Drug labels and list – Intravenous solution and admixture, patient medication profiles, Inventory control, Management report & Statistics.

Computer In Community Pharmacy

Computerizing the Prescription Dispensing process

Use of Computers for Pharmaceutical Care in community pharmacy

Accounting and General ledger system

Drug Information Retrieval & Storage :

Introduction – Advantages of Computerized Literature

Retrieval Use of Computerized Retrieval

### Reference books:

- a. Pharmaceutical statistics- practical and clinical applications, Sanford Bolton 3<sup>rd</sup> edition, publisher Marcel Dekker Inc. New York.
- b. Drug Information- A Guide for Pharmacists, Patrick M Malone, Karen L Kier, John E Stanovich , 3<sup>rd</sup> edition, McGraw Hill Publications 2006

*Sanjiv K*  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheerayal(V), Keerasara(M), Medchal Dist. T.S.-501301.

## 4.5 BIOPHARMACEUTICS AND PHARMACOKINETICS (THEORY)

Theory : 3 Hrs. /Week

### 1. Biopharmaceutics

1. Introduction to Biopharmaceutics
  - a. Absorption of drugs from gastrointestinal tract.
  - b. Drug Distribution.
  - c. Drug Elimination.

### 2. Pharmacokinetics

2. Introduction to Pharmacokinetics.
  - a. Mathematical model
  - b. Drug levels in blood.
  - c. Pharmacokinetic model
  - d. Compartment models
  - e. Pharmacokinetic study.
3. One compartment open model.
  - a. Intravenous Injection (Bolus)
  - b. Intravenous infusion.
4. Multicompartment models.
  - a. Two compartment open model.
  - b. IV bolus, IV infusion and oral administration
5. Multiple – Dosage Regimens.
  - a. Repetitive Intravenous injections – One Compartment Open Model
  - b. Repetitive Extravascular dosing – One Compartment Open model
  - c. Multiple Dose Regimen – Two Compartment Open Model
6. Nonlinear Pharmacokinetics.
  - a. Introduction
  - b. Factors causing Non-linearity.
  - c. Michaelis-menton method of estimating parameters.
7. Noncompartmental Pharmacokinetics.
  - a. Statistical Moment Theory.
  - b. MRT for various compartment models.
  - c. Physiological Pharmacokinetic model.
8. Bioavailability and Bioequivalence.
  - a. Introduction.
  - b. Bioavailability study protocol.
  - c. Methods of Assessment of Bioavailability

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501304

#### 4.5 BIOPHARMACEUTICS AND PHARMACOKINETICS (PRACTICAL)

##### Practical : 3 Hrs./Week

1. Improvement of dissolution characteristics of slightly soluble drugs by some methods.
2. Comparison of dissolution studies of two different marketed products of same drug.
3. Influence of polymorphism on solubility and dissolution.
4. Protein binding studies of a highly protein bound drug and poorly protein bound drug.
5. Extent of plasma-protein binding studies on the same drug (i.e. highly and poorly protein bound drug) at different concentrations in respect of constant time.
6. Bioavailability studies of some commonly used drugs on animal/human model.
7. Calculation of  $K_a$ ,  $K_e$ ,  $t_{1/2}$ ,  $C_{max}$ , AUC, AUMC, MRT etc. from blood profile data.
8. Calculation of bioavailability from urinary excretion data for two drugs.
9. Calculation of AUC and bioequivalence from the given data for two drugs.
10. In vitro absorption studies.
11. Bioequivalency studies on the different drugs marketed.(eg) Tetracycline, Sulphamethoxazole, Trimethoprim, Aspirin etc., on animals and human volunteers.
12. Absorption studies in animal inverted intestine using various drugs.
13. Effect on contact time on the plasma protein binding of drugs.
14. Studying metabolic pathways for different drugs based on elimination kinetics data.
15. Calculation of elimination half- life for different drugs by using urinary elimination data and blood level data.
16. Determination of renal clearance.

##### References:

- a. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi
- b. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania.
- c. Pharmacokinetics: By Milo Gibaldi Donald, R. Mercei Dekker Inc.
- d. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
- e. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
- f. Biopharmaceutics; By Swarbrick
- g. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmkar and Sunil B.Jaiswal, Vallabh Prakashan Pitampura, Delhi
- h. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
- i. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
- j. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4<sup>th</sup> edition Revised and expanded by Robert F Notari Marcel Dekker Inn, New York and Basel, 1987.
- k. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James, C. Roylan, Marcel Dekker Inc, New York 1996.

*Signature of*  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.



#### 4.6 CLINICAL TOXICOLOGY (THEORY)

**Theory : 2 Hrs. /Week**

1. General principles involved in the management of poisoning
2. Antidotes and the clinical applications.
3. Supportive care in clinical Toxicology.
4. Gut Decontamination.
5. Elimination Enhancement.
6. Toxicokinetics.
7. Clinical symptoms and management of acute poisoning with the following agents –
  - a) Pesticide poisoning: organophosphorous compounds, carbamates, organochlorines, pyrethroids.
  - b) Opiates overdose.
  - c) Antidepressants
  - d) Barbiturates and benzodiazepines.
  - e) Alcohol: ethanol, methanol.
  - f) Paracetamol and salicylates.
  - g) Non-steroidal anti- inflammatory drugs.
  - h) Hydrocarbons: Petroleum products and PEG.
  - i) Caustics: inorganic acids and alkali.
  - j) Radiation poisoning
8. Clinical symptoms and management of chronic poisoning with the following agents –  
Heavy metals: Arsenic, lead, mercury, iron, copper
9. Venomous snake bites: Families of venomous snakes, clinical effects of venoms, general management as first aid, early manifestations, complications and snake bite injuries.
10. Plants poisoning. Mushrooms, Mycotoxins.
11. Food poisonings
12. Envenomations – Arthropod bites and stings.

**Substance abuse:**

Signs and symptoms of substance abuse and treatment of dependence

- a) CNS stimulants :amphetamine
- b) Opioids
- c) CNS depressants
- d) Hallucinogens: LSD
- e) Cannabis group
- f) Tobacco

**References:**

- a. Matthew J Ellenhorn. ELLENHORNS MEDICAL TOXICOLOGY – DIAGNOSIS AND TREATMENT OF POISONING. Second edition. Williams and Willkins publication, London
- b. V V Pillay. HANDBOOK OF FORENSIC MEDICINE AND TOXICOLOGY. Thirteenth edition 2003 Paras Publication, Hyderabad

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara, M., Medchal Dist. T.S.-501301.

## Fifth year

### 5.1 CLINICAL RESEARCH (THEORY)

Theory : 3 Hrs. /Week

#### 1. Drug development process:

Introduction

Various Approaches to drug discovery

1. Pharmacological
2. Toxicological
3. IND Application
4. Drug characterization
5. Dosage form

#### 2. Clinical development of drug:

1. Introduction to Clinical trials
2. Various phases of clinical trial.
3. Methods of post marketing surveillance
4. Abbreviated New Drug Application submission.
5. Good Clinical Practice – ICH, GCP, Central drug standard control organisation (CDSCO) guidelines
6. Challenges in the implementation of guidelines
7. Ethical guidelines in Clinical Research
8. Composition, responsibilities, procedures of IRB / IEC
9. Overview of regulatory environment in USA, Europe and India.
10. Role and responsibilities of clinical trial personnel as per ICH GCP
  - a. Sponsor
  - b. Investigators
  - c. Clinical research associate
  - d. Auditors
  - e. Contract research coordinators
  - f. Regulatory authority
11. Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)
12. Informed consent Process
13. Data management and its components
14. Safety monitoring in clinical trials.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal (M), Keesara (M), Medaka, Dist. T.S. 501301.

**References :**

- a. Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
- b. International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.
- c. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
- d. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
- e. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
- f. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
- g. Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Uthirakottai, Chennai-600 031, India

## 5.2 PHARMACOEPIDEMOLOGY AND PHARMACOECONOMICS (THEORY)

Theory : 3 Hrs. /Week

### 1. Pharmacoepidemiology :

#### Definition and scope:

Origin and evaluation of pharmacoepidemiology need for pharmacoepidemiology, aims and applications.

#### Measurement of outcomes in pharmacoepidemiology

Outcome measure and drug use measures

Prevalence, incidence and incidence rate. Monetary units, number of prescriptions, units of drugs dispensed, defined daily doses and prescribed daily doses, medication adherence measurement

#### Concept of risk in pharmacoepidemiology

Measurement of risk, attributable risk and relative risk, time-risk relationship and odds ratio

#### Pharmacoepidemiological methods

Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods

Drug utilization review, case reports, case series, surveys of drug use, cross – sectional studies, cohort studies, case control studies, case –cohort studies, meta – analysis studies, spontaneous reporting, prescription event monitoring and record linkage system.

#### Sources of data for pharmacoepidemiological studies

Ad Hoc data sources and automated data systems.

#### Selected special applications of pharmacoepidemiology

Studies of vaccine safety, hospital pharmacoepidemiology, pharmacoepidemiology and risk management, drug induced birth defects.

### 2. Phrmacoconomics:

#### Definition, history, needs of pharmaco-economic evaluations

Role in formulary management decisions

#### Pharmaco-economic evaluation

Outcome assessment and types of evaluation

Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods: Cost – minimization, cost- benefit, cost – effectiveness, cost utility

### 3. Applications of Pharmacoconomics


Software and case studies

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keasara(M), Medchal Dist. T.S.-501301.

### 5.3 CLINICAL PHARMACOKINETICS AND PHARMACOTHERAPEUTIC DRUG MONITORING (THEORY)

Theory : 2 Hrs. /Week

1. **Introduction to Clinical pharmacokinetics.**
2. **Design of dosage regimens:**  
Nomograms and Tabulations in designing dosage regimen, Conversion from intravenous to oral dosing, Determination of dose and dosing intervals, Drug dosing in the elderly and pediatrics and obese patients.
3. **Pharmacokinetics of Drug Interaction:**
  - a. Pharmacokinetic drug interactions
  - b. Inhibition and Induction of Drug metabolism
  - c. Inhibition of Biliary Excretion.
4. **Therapeutic Drug monitoring:**
  - a. Introduction
  - b. Individualization of drug dosage regimen (Variability – Genetic, Age and Weight, disease, Interacting drugs).
  - c. Indications for TDM. Protocol for TDM.
  - d. Pharmacokinetic/Pharmacodynamic Correlation in drug therapy.
  - e. TDM of drugs used in the following disease conditions: cardiovascular disease, Seizure disorders, Psychiatric conditions, and Organ transplantations.
5. **Dosage adjustment in Renal and hepatic Disease.**
  - a. Renal impairment
  - b. Pharmacokinetic considerations
  - c. General approach for dosage adjustment in Renal disease.
  - d. Measurement of Glomerular Filtration rate and creatinine clearance.
  - e. Dosage adjustment for uremic patients.
  - f. Extracorporeal removal of drugs.
  - g. Effect of Hepatic disease on pharmacokinetics.
6. **Population Pharmacokinetics.**
  - a. Introduction to Bayesian Theory.
  - b. Adaptive method or Dosing with feed back.
  - c. Analysis of Population pharmacokinetic Data.
7. **Pharmacogenetics**
  - a. Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes.
  - b. Genetic Polymorphism in Drug Transport and Drug Targets.
  - c. Pharmacogenetics and Pharmacokinetics/Pharmacodynamic considerations

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Chittoor (V), Nellore (M), Medical Dist. T.S.-501301.

**APPENDIX-B**  
(See regulation 9)  
**CONDITIONS TO BE FULFILLED BY THE**  
**ACADEMIC TRAINING INSTITUTION**

- 1) Any authority or institution in India applying to the Pharmacy Council of India for approval of courses of study for Pharm.D. and Pharm.D. (Post Baccalaureate) under sub-section (1) of section 12 of the Pharmacy Act, 1948 shall comply with the infrastructural facilities as prescribed by the Pharmacy Council of India from time to time.
- 2) Pharm.D. and Pharm.D. (Post Baccalaureate) programmes shall be conducted only in those institutions which -
  - a) are approved by the Pharmacy Council of India for B.Pharm course as provided under section 12 of the Pharmacy Act, 1948;
  - b) have 300 bedded hospital attached to it.

**(i) Hospital Details**

1. Institution with their own hospital of minimum 300 beds.
2. Teaching hospital recognised by the Medical Council of India or University, or a Government hospital not below the level of district headquarter hospital with 300 beds with clearly defined Memorandum of Understanding including housing pharmacy practice department with minimum carpet area of 30 square feet per student along with consent to provide the professional manpower to support the programme.
3. Corporate type hospital with minimum 300 beds with clearly defined Memorandum of Understanding including housing pharmacy practice department with minimum carpet area of 30 square feet per student along with consent to provide the professional manpower to support the programme.
4. Number of institutions which can be attached to one hospital shall be restricted by the student pharmacist to bed ratio of 1:10.

**(ii) Speciality**

- a) Tertiary care hospitals are desirable
- b) Medicine[compulsory], and any three specialization of the following
  1. Surgery
  2. Pediatrics
  3. Gynecology and obstetrics
  4. Psychiatry
  5. Skin and VD
  6. Orthopedics

**(iii) Location of the Hospital**

Within the same limits of Corporation or Municipality or Campus with Medical Faculty involvement as adjunct faculty.

*Principal*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501202.

### 3) TEACHING STAFF REQUIREMENT

- i) Staff Pattern : All faculty shall be full time. However part time perceptors in hospital shall be allowed.
- ii) Subject wise specialisation of the Teaching Staff :

S.No.	Subject	Specialisation required
1.	Pharmacy Practice	M.Pharm in Pharmacy Practice or Pharmacology or Pharmaceutics.
2.	Human Anatomy & Physiology	M.Pharm in Pharmacology or Pharmacy practice
3.	Pharmaceutics (Dispensing & General Pharmacy)	M.Pharm in Pharmaceutics
4.	Pharmacognosy-I	M.Pharm in Pharmacognosy
5.	Pharmaceutical Organic Chemistry-I	M.Pharm in Pharmaceutical chemistry or Pharmaceutical Analysis or Quality assurance or Bulk Drug
6.	Pharmaceutical Inorganic Chemistry	M.Pharm in Pharmaceutical chemistry or Pharmaceutical Analysis or Quality assurance or Bulk Drug
7.	Pharmaceutical microbiology	M.Pharm in Pharmaceutics or Pharmaceutical Biotechnology
8.	Pathophysiology	M.Pharm Pharmacy practice or Pharmacology
9.	Applied Biochemistry & Clinical Chemistry	M.Pharm in Pharmacology or Pharmacy practice or Pharmaceutical chemistry
10.	Pharmacology-I	M.Pharm in Pharmacology or Pharmacy practice
11.	Pharmaceutical Jurisprudence	M.Pharm in Pharmaceutics
12.	Pharmacology-II	M.Pharm in Pharmacology or Pharmacy practice
13.	Pharmaceutical Dosage Forms	M.Pharm in Pharmaceutics or Industrial Pharmacy
14.	Pharmacotherapeutics -I, II and III	M.Pharm Pharmacy practice or Pharmacology
15.	Community Pharmacy	M.Pharm in Pharmacy practice or Pharmacology or Pharmaceutics
16.	Hospital Pharmacy	M.Pharm in Pharmacy practice or Pharmacology or Pharmaceutics
17.	Clinical Pharmacy	M.Pharm in Pharmacy practice
18.	Computer Science or Computer Application in pharmacy	MCA
19.	Mathematics	M.Sc. (Maths)

## iii) Teaching Staff :

Department/Division	Name of the post	No.
Department of Pharmaceutics	Professor	1
	Asst. Professor	1
	Lecturer	2
Department of Pharmaceutical Chemistry (Including Pharmaceutical Analysis)	Professor	1
	Asst. Professor	1
	Lecturer	3
Department of Pharmacology	Professor	1
	Asst. Professor	1
	Lecturer	2
Department of Pharmacognosy	Professor	1
	Asst. Professor	1
	Lecturer	1
Department of Pharmacy Practice	Professor	1
	Asst. Professor	2
	Lecturer	3

## iv) Prescribed qualifications and experience for Professor, Assistant Professor, Lecturer and others :

Sl. No.	CADRE	QUALIFICATIONS	EXPERIENCE
1.	Lecturer	i) Basic degree in pharmacy (B.Pharm). ii) Registration as a pharmacist under the Pharmacy Act. iii) First Class Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm)	No minimum requirement.
2.	Assistant Professor	i) Basic degree in pharmacy (B.Pharm). ii) Registration as a pharmacist under the Pharmacy Act. iii) Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm)	Three years experience in Teaching or Research at the level of Lecturer or equivalent.

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesera(M), Medchal Dist. T.S.-501.



		iv) Ph.D. degree (with First Class degree either at Bachelor's or Master's level) in the appropriate branch of specialization in Pharmacy.	
3.	Professor	<ul style="list-style-type: none"> <li>i) Basic degree in pharmacy (B.Pharm).</li> <li>ii) Registration as a pharmacist under the Pharmacy Act.</li> <li>iii) Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm).</li> <li>iv) Ph.D. degree (with first Class either at Bachelor's or Master's level) in appropriate branch of specialization in Pharmacy.</li> </ul>	<ul style="list-style-type: none"> <li>i) Ten years experience in Teaching or Research.</li> <li>ii) Out of which five years must be as Assistant Professor.</li> </ul>
4.	Director or Principal or Head of institute	<ul style="list-style-type: none"> <li>i) Basic degree in pharmacy (B.Pharm).</li> <li>ii) Registration as a pharmacist under the Pharmacy Act.</li> <li>iii) Master's degree in appropriate branch of specialization in Pharmacy (M.Pharm)</li> <li>iv) Ph.D. degree (with first Class degree either at Bachelor's or Master's level in the appropriate branch of specialization in Pharmacy.</li> </ul>	<ul style="list-style-type: none"> <li>i) Fifteen years experience in Teaching or Research.</li> <li>ii) Out of which five years must be as Professor or above in Pharmacy.</li> </ul> <p>Desirable :</p> <p>Administrative experience in responsible position.</p> <p>The maximum age for holding the post shall be 65 years.</p>

**Note :** If a class or division is not awarded at Master's level, a minimum of 60% marks in aggregate or equivalent cumulative grade point average shall be considered equivalent to first class or division, as the case may be.

*Signature of*  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Akkayyapeta, Keeravani, Medak Dist. T.S. 501301.

- v) Workload of Faculty : Professor – 8  
hrs. per week Assistant Professor –  
12 hrs. per week Lecturers – 16 hrs.  
per week
- vi) Training of Pharmacy Practice Faculty :
- Teaching staff will be trained as per the module prescribed by the Central Council.
  - Duration of training –Minimum 3 months.
  - Training sites –Institutions running pharmacy practice or Programmes for atleast five years.
  - Trainer –Professor or Assistant Professor with minimum of five years of clinical pharmacy teaching and practice experience.

4) **NON-TEACHING STAFF :**

Sl.No.	Designation	Required (Minimum)	Required Qualification
1	Laboratory Technician	1 for each Dept	D. Pharm
2	Laboratory Assistants or Laboratory Attenders	1 for each Lab (minimum)	SSLC
3	Office Superintendent	1	Degree
4	Accountant	1	Degree
5	Store keeper	1	D.Pharm or a Bachelor degree recognized by a University or institution.
6	Computer Data Operator	1	BCA or Graduate with Computer Course
7	Office Staff I	1	Degree
8	Office Staff II	2	Degree
9	Peon	2	SSLC
10	Cleaning personnel	Adequate	---
11	Gardener	Adequate	---

*Principal*  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501304.

## 5) ACCOMMODATION :

Suitable and sufficient accommodation with adequate ventilation, lighting and other hygienic conditions should be provided to the rooms for Principal or the Head of the department, office, class rooms, library, staff, staff common room, students common room, museum, laboratories, stores, etc.

At least two lecture halls alongwith eight laboratories as specified below should be provided for: —

- |   |     |
|---|-----|
| 1. Pharmaceutics and Pharmacokinetics Lab                   | - 2 |
| 2. Life Science (Pharmacology, Physiology, Pathophysiology) | - 2 |
| 3. Phytochemistry or Pharmaceutical Chemistry               | - 2 |
| 4. Pharmacy Practice  | - 2 |

-----  
Total = 8  
-----

In addition to the laboratories, balance room, aseptic room or cabinet, animal house and a machine room shall also be provided.

Floor area of the laboratory should not be less than 30 square feet per student required to work in the laboratory at any given time subject to a minimum of 750 square feet.

Laboratories should be fitted and constructed in a manner that these can be kept reasonably clean. Gas and water fittings, shelves, fuming cupboards be provided wherever necessary.

## 6. EQUIPMENT AND APPARATUS :

### Department wise list of minimum equipments

#### A. DEPARTMENT OF PHARMACOLOGY :

##### I. Equipment:

S.No.	Name	Minimum re quired Nos.
1	Microscopes	15
2	Haemocytometer with Micropipettes	20
3	Sahli's haemocytometer	20
4	Hutchinson's spirometer	01
5	Spygmomanometer	05
6	Stethoscope	05
7	Permanent Slides for various tissues	One pair of each tissue Organs and endocrine glands One slide of each organ system
8	Models for various organs	One model of each organ system
9	Specimen for various organs and systems	One model for each organ system
10	Skeleton and bones	One set of skeleton and one spare bone

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Kaesara(M), Medchal Dist. T.S.-501301.

11	Different Contraceptive Devices and Models	One set of each device
12	Muscle electrodes	01
13	Lucas moist chamber	01
14	Myographic lever	01
15	Stimulator	01
16	Centrifuge	01
17	Digital Balance	01
18	Physical /Chemical Balance	01
19	Sherrington's Kymograph Machine or Polyrite	10
20	Sherrington Drum	10
21	Perspex bath assembly (single unit)	10
22	Aerators	10
23	Computer with LCD	01
24	Software packages for experiment	01
25	Standard graphs of various drugs	Adequate number
26	Actophotometer	01
27	Rotarod	01
28	Pole climbing apparatus	01
29	Analgesiometer (Eddy's hot plate and radiant heat methods)	01
30	Convulsiometer	01
31	Plethysmograph	01
32	Digital pH meter	01

## II. Apparatus:

S.No	Name	Minimum re quired Nos.
1	Folin-Wu tubes	60
2	Dissection Tray and Boards	10
3	Haemostatic artery forceps	10
4	Hypodermic syringes and needles of size 15,24,26G	10
5	Livers, cannulae	20

**NOTE:** Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.

## B. DEPARTMENT OF PHARMACOGNOSY :

### I. Equipment:

S.No.	Name	Minimum re quired Nos.
1	Microscope with stage micrometer	15
2	Digital Balance	02
3	Autoclave	02

  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Chervyal(V), Keesara(M), Medchal Dist. T.S.-501301

4	Hot air oven	02
5	B.O.D. incubator	01
6	Refrigerator	01
7	Laminar air flow	01
8	Colony counter	02
9	Zone reader	01
10	Digital pH meter	01
11	Sterility testing unit	01
12	Camera Lucida	15
13	Eye piece micrometer	15
14	Incinerator	01
15	Moisture balance	01
16	Heating mantle	15
17	Flourimeter	01
18	Vacuum pump	02
19	Micropipettes (Single and multi channeled)	02
20	Micro Centrifuge	01
21	Projection Microscope	01

## II. Apparatus:

S.No.	Name	Minimum re quired Nos.
1	Reflux flask with condenser	20
2	Water bath	20
3	Clavengers apparatus	10
4	Soxhlet apparatus	10
6	TLC chamber and sprayer	10
7	Distillation unit	01

**NOTE:** Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.

## C. DEPARTMENT OF PHARMACEUTICAL CHEMISTRY :

### I. Equipment:

S.No.	Name	Minimum re quired Nos.
1	Hot plates	05
2	Oven	03
3	Refrigerator	01
4	Analytical Balances for demonstration	05
5	Digital balance 10mg sensitivity	10
6	Digital Balance (1mg sensitivity)	01
7	Suction pumps	06
8	Muffle Furnace	01

*Handwritten Signature*  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keeravaram, Nellore Dist. T.S.-501301.

9	Mechanical Stirrers	10
10	Magnetic Stirrers with Thermostat	10
11	Vacuum Pump	01
12	Digital pH meter	01
13	Microwave Oven	02

## II. Apparatus:


S.No.	Name	Minimum re quired Nos.
1	Distillation Unit	02
2	Reflux flask and condenser single necked	20
3	Reflux flask and condenser double/ triple necked	20
4	Burettes	40
5	Arsenic Limit Test Apparatus	20
6	Nessler's Cylinders	40

**NOTE:** Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.

## D. DEPARTMENT OF PHARMACEUTICS :

### I. Equipment:

S.No	Name	Minimum re quired Nos.
1	Mechanical stirrers	10
2	Homogenizer	05
3	Digital balance	05
4	Microscopes	05
5	Stage and eye piece micrometers	05
6	Brookfield's viscometer	01
7	Tray dryer	01
8	Ball mill	01
9	Sieve shaker with sieve set	01
10	Double cone blender	01
11	Propeller type mechanical agitator	05
12	Autoclave	01
13	Steam distillation still	01
14	Vacuum Pump	01
15	Standard sieves, sieve no. 8, 10, 12, 22, 24, 44, 66, 80	10 sets
16	Tablet punching machine	01
17	Capsule filling machine	01
18	Ampoule washing machine	01
19	Ampoule filling and sealing machine	01

  
**PRINCIPAL**  
 Goethanji College of Pharmacy  
 Cheerayal, Hyderabad, India. T.S. 2020-21.

20	Tablet disintegration test apparatus IP	01
21	Tablet dissolution test apparatus IP	01
22	Monsanto's hardness tester	01
23	Pfizer type hardness tester	01
24	Friability test apparatus	01
25	Clarity test apparatus	01
26	Ointment filling machine	01
27	Collapsible tube crimping machine	01
28	Tablet coating pan	01
29	Magnetic stirrer, 500ml and 1 liter capacity with speed control	05 EACH 10
30	Digital pH meter	01
31	All purpose equipment with all accessories	01
32	Aseptic Cabinet	01
33	BOD Incubator	02
34	Bottle washing Machine	01
35	Bottle Sealing Machine	01
36	Bulk Density Apparatus	02
37	Conical Percolator (glass/copper/stainless steel)	10
38	Capsule Counter	02
39	Energy meter	02
40	Hot Plate	02
41	Humidity Control Oven	01
42	Liquid Filling Machine	01
43	Mechanical stirrer with speed regulator	02
44	Precision Melting point Apparatus	01
45	Distillation Unit	01

## II. Apparatus:

S.No	Name	Minimum re quired Nos.
1	Ostwald's viscometer	15
2	Stalagmometer	15
3	Desiccator*	05
4	Suppository moulds	20
5	Buchner Funnels (Small, medium, large)	05 each
6	Filtration assembly	01
7	Permeability Cups	05
8	Andreason's Pipette	03
9	Lipstick moulds	10

**NOTE:** Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and department.

*Principal*  
**PRINCIPAL**  
 Grethanjali College of Pharmacy  
 Changanassery, Kerala


**E. DEPARTMENT OF PHARMACEUTICAL BIOTECHNOLOGY :**

S.No.	Name	Minimum re quired Nos.
1	Orbital shaker incubator	01
2	Lyophilizer (Desirable)	01
3	Gel Electrophoresis (Vertical and Horizontal)	01
4	Phase contrast/Trinocular Microscope	01
5	Refrigerated Centrifuge	01
6	Fermenters of different capacity (Desirable)	01
7	Tissue culture station	01
8	Laminar airflow unit	01
9	Diagnostic kits to identify infectious agents	01
10	Rheometer	01
11	Viscometer	01
12	Micropipettes (single and multi channeled)	01 each
13	Sonicator	01
14	Respinometer	01
15	BOD Incubator	01
16	Paper Electrophoresis Unit	01
17	Micro Centrifuge	01
18	Incubator water bath	01
19	Autoclave	01
20	Refrigerator	01
21	Filtration Assembly	01
22	Digital pH meter	01

**NOTE:** Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and departme nt.

**F. DEPARTMENT OF PHARMACY PRACTICE :****Equipment:**

S.No.	Name	Minimum re quired Nos.
1	Colorimeter	2
2	Microscope	Adequate
3	Permanent slides (skin, kidney, pancreas, smooth muscle, liver etc.,)	Adequate
4	Watch glass	Adequate
5	Centrifuge	1
6	Biochemical reagents for analysis of normal and pathological constituents in urine and blood facilities	Adequate
7	Filtration equipment	2
8	Filling Machine	1
9	Sealing Machine	1

  
**PRINCIPAL**  
 Geetha  
 Cheeruvu  
 Cheeruvu



10	Autoclave sterilizer	1
11	Membrane filter	1 Unit
12	Sintered glass funnel with complete filtering assemble	Adequate
13	Small disposable membrane filter for IV admixture filtration	Adequate
14	Laminar air flow bench	1
15	Vacuum pump	1
16	Oven	1
17	Surgical dressing	Adequate
18	Incubator	1
19	PH meter	1
20	Disintegration test apparatus	1
21	Hardness tester	1
22	Centrifuge	1
23	Magnetic stirrer	1
24	Thermostatic bath	1

**NOTE:**

1. Computers and Internet connection (Broadband), six computers for students with internet and staff computers as required.
2. Adequate number of glassware commonly used in the laboratory should be provided in each laboratory and the department.

**G. CENTRAL INSTRUMENTATION ROOM :**

S.No.	Name	Minimum required Nos.
1	Colorimeter	01
2	Digital pH meter	01
3	UV- Visible Spectrophotometer	01
4	Flourimeter	01
5	Digital Balance (1mg sensitivity)	01
6	Nephelo Turbidity meter	01
7	Flame Photometer	01
8	Potentiometer	01
9	Conductivity meter	01
10	Fourier Transform Infra Red Spectrometer (Desirable)	01
11	HPLC	01
12	HPTLC (Desirable)	01
13	Atomic Absorption and Emission spectrophotometer (Desirable)	01
14	Biochemistry Analyzer (Desirable)	01
15	Carbon, Hydrogen, Nitrogen Analyzer (Desirable)	01
16	Deep Freezer (Desirable)	01
17	Ion- Exchanger	01
18	Lyophilizer (Desirable)	01

## APPENDIX-C

(See regulation 16)

### INTERNSHIP

#### 1) SPECIFIC OBJECTIVES :

- i) to provide patient care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social cultural, economic, and professional issues, emerging technologies, and evolving biomedical, pharmaceutical, social or behavioral or administrative, and clinical sciences that may impact therapeutic outcomes.
- ii) to manage and use resources of the health care system, in cooperation with patients, prescribers, other health care providers, and administrative and supportive personnel, to promote health; to provide, assess, and coordinate safe, accurate, and time-sensitive medication distribution; and to improve therapeutic outcomes of medication use.
- iii) to promote health improvement, wellness, and disease prevention in co-operation with patients, communities, at-risk population, and other members of an interprofessional team of health care providers.
- iv) to demonstrate skills in monitoring of the National Health Programme s and schemes, oriented to provide preventive and promotive health care services to the community.
- v) to develop leadership qualities to function effectively as a member of the health care team organised to deliver the health and family welfare services in existing socio-economic, political and cultural environment.
- vi) to communicate effectively with patients and the community.

#### 2) OTHER DETAILS :

- i) All parts of the internship shall be done, as far as possible, in institutions in India. In case of any difficulties, the matter may be referred to the Pharmacy Council of India to be considered on merits.
- ii) Where an intern is posted to district hospital for training, there shall be a committee consisting of representatives of the college or university, and the district hospital administration, who shall regulate the training of such trainee. For such trainee a certificate of satisfactory completion of training shall be obtained from the relevant administrative authorities which shall be countersigned by the Principal or Dean of College.

*Santhosh K*  
PRINCIPAL  
Geethanjali College of Pharmacy  
(Aareyval (W), Keerasur (W), Nandial Dist: T.S. 501302)

- iii) Every candidate shall be required, after passing the final Pharm.D. or Pharm.D. (Post Baccalaureate) examination as the case may be to undergo compulsory rotational internship to the satisfaction of the College authorities and University concerned for a period of twelve months so as to be eligible for the award of the degree of Pharm.D. or Pharm.D. (Post Baccalaureate) as the case may be.

### 3. ASSESSMENT OF INTERNSHIP :

- i) The intern shall maintain a record of work which is to be verified and certified by the preceptor (teacher practitioner) under whom he works. Apart from scrutiny of the record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude during and at the end of the training. Based on the record of work and date of evaluation, the Dean or Principal shall issue certificate of satisfactory completion of training, following which the university shall award the degree or declare him eligible for it.
- ii) Satisfactory completion of internship shall be determined on the basis of the following:-
- (1) Proficiency of knowledge required for each case management SCORE 0-5
  - (2) The competency in skills expected for providing Clinical Pharmacy Services SCORE 0-5
  - (3) Responsibility, punctuality, work up of case, involvement in patient care SCORE 0-5
  - (4) Ability to work in a team (Behavior with other healthcare professionals including medical doctors, nursing staff and colleagues). SCORE 0-5
  - (5) Initiative, participation in discussions, research aptitude. SCORE 0-5

Poor	Fair	Below Average	Average	Above Average	Excellent
0	1	2	3	4	5

A Score of less than 3 in any of above items will represent unsatisfactory completion of internship.

*Signature of*  
**PRINCIPAL**  
 Principal, M. Pharmacy  
 Government College of Pharmacy  
**PRINCIPAL**

**APPENDIX-D**  
(See regulation 17)  
**CONDITIONS TO BE FULFILLED BY**  
**THE EXAMINING AUTHORITY**

1. The Examining Authority shall be a statutory Indian University constituted by the Central Government/State Government/Union Territory Administration. It shall ensure that discipline and decorum of the examinations are strictly observed at the examination centers.
2. It shall permit the Inspector or Inspectors of the Pharmacy Council of India to visit and inspect the examinations.
3. It shall provide:-
  - (a) adequate rooms with necessary furniture for holding written examinations;
  - (b) well-equipped laboratories for holding practical examinations;
  - (c) an adequate number of qualified and responsible examiners and staff to conduct and invigilate the examinations; and
  - (d) such other facilities as may be necessary for efficient and proper conduct of examinations.
4. It shall, if so required by a candidate, furnish the statement of marks secured by a candidate in the examinations after payment of prescribed fee, if any, to the Examining Authority.
5. It shall appoint examiners whose qualifications should be similar to those of the teachers in the respective subjects as shown in Appendix-B.
6. In pursuance of sub-section (3) of section 12 of the Pharmacy Act, 1948, the Examining Authority shall communicate to the Secretary, Pharmacy Council of India, not less than six weeks in advance the dates fixed for examinations, the time-table for such examinations, so as to enable the Council to arrange for inspection of the examinations.
7. The Examining Authority shall ensure that examiners for conducting examination for Pharm.D. and Pharm.D. (Post Baccalaureate) programmes shall be persons possessing pharmacy qualification and are actually involved in the teaching of the Pharm.D. and Pharm.D. (Post Baccalaureate) programmes in an approved institution.

*Signature of*  
Principal  
Cheerla (V), Narsaraopeta, Medchal Dist. T.S. 501302.

(ARCHNA MUDGAL)  
Registrar cum Secretary  
Pharmacy Council of India  
New Delhi – 110002

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Pharmacy (PHARMACEUTICS / PHARMACEUTICAL TECHNOLOGY)

COURSE STRUCTURE AND SYLLABUS

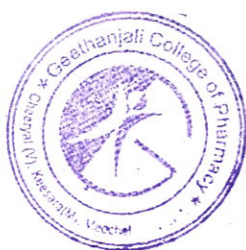
Effective from Academic Year 2017-18 Admitted Batch

I Year – I Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course I	Advanced Physical Pharmaceutics	25	75	4	--	4
Core Course II	Modern Pharmaceutics-I	25	75	4	--	4
Core Course III	Applied Biopharmaceutics and Pharmacokinetics	25	75	4	--	4
Core Elective I	1. Modern Pharmaceutical Analytical Techniques 2. Intellectual Property Rights	25	75	4	--	4
Open Elective I	1. Pharmacoepidemiology and Pharmacoeconomics 2. Drug Regulatory Affairs 3. Herbal Cosmetics Technology 4. Pharmaceutical Validation 5. Pharmaceutical Management	25	75	4	--	4
Laboratory I	Advanced physical Pharmaceutics Lab	25	75	---	6	3
Laboratory II	Applied Biopharmaceutics and Pharmacokinetics Lab	25	75	--	6	3
Seminar I	Seminar	100	--	--	4	2
<b>Total Credits</b>		<b>275</b>	<b>525</b>	<b>20</b>	<b>16</b>	<b>28</b>

I Year – II Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Advanced Drug Delivery Systems	25	75	4	--	4
Core Course V	Industrial Pharmacy	25	75	4	--	4
Core Course VI	Modern Pharmaceutics-II	25	75	4	--	4
Core Elective II	1. Biostatistics And Research Methodology 2. Stability of Drugs and Dosage Forms	25	75	4	--	4
Open Elective II	1. Screening Methods in Pharmacology 2. Nano Based Drug Delivery Systems 3. Nutraceuticals 4. Entrepreneurship management 5. Clinical Research And Pharmacovigilance	25	75	4	--	4
Laboratory III	Advanced Drug Delivery Systems Lab	25	75	---	6	3
Laboratory IV	Modern Pharmaceutics Lab	25	75	--	6	3
Seminar II	Seminar	100	--	--	4	2
<b>Total Credits</b>		<b>275</b>	<b>525</b>	<b>20</b>	<b>16</b>	<b>28</b>



*Signature*  
**PRINCIPAL**  
 Geethanjali College of Pharmacy  
 Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

II Year - I Semester

Course Title	Int. marks	Ext. marks	L	P	C
Comprehensive Viva-Voce	--	100	--	--	4
Project work Review II	100	--	--	24	12
<b>Total Credits</b>	<b>100</b>	<b>100</b>	<b>--</b>	<b>24</b>	<b>16</b>

II Year - II Semester

Course Title	Int. marks	Ext. marks	L	P	C
Project work Review III	100	--	--	8	4
Project Evaluation (Viva-Voce)	--	100	--	16	12
<b>Total Credits</b>	<b>100</b>	<b>100</b>	<b>--</b>	<b>24</b>	<b>16</b>

\$ For Project review I, please refer 7.9 in R17 Academic Regulations



*Signature*

**PRINCIPAL**  
Geethanjali College of Pharmacy  
Keesara (V), Keesara (M), Nalgonda Dist. T.S. - 501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (Pharmaceutics/Pharmaceutical Technology)

ADVANCED PHYSICAL PHARMACEUTICS (Core course - I)

**Course Objective:** The students shall apply the principles of physical and chemical properties of particle science, polymer science and their use in pharmaceutical dosage forms. They also learn the compression and consolidation parameters for powders and granules. Students also learn about the rheology, disperse systems, dissolution and solubility related parameters for dosage forms.

**Course Outcome:** The students will learn particle size analysis method, solid dispersion, physics of tablets, polymer classification and its applications, student will also practice the stability calculations, shelf life calculations and accelerated stability studies. They also understand the rheology, absorption related to liquids and semi-solid dosage forms with advances. They also know the factors affecting the dissolution and solubility in related to invitro/invivo correlations.

**UNIT - I**

**Polymer science:** Classification, properties and characterization of polymers, phase separation, polymers in solid state, preparation of polymer solution, application of polymers in pharmaceutical formulations. Mechanism of biodegradation of biodegradable polymers including controlled drug delivery systems, Mucoadhesive, Hydrodynamically balanced and Transdermal Systems.

**UNIT - II**

**Physics of tablet compression:** Basic principles of interactions, compression and consolidation, compression and consolidation under high loads, effect of friction, distribution of forces in compaction, force volume relationships, Heckel plots, compaction profiles, energy involved in compaction, Measurement of compression with strain gauges, compression pressure-QA parameters.

**UNIT - III**

**Kinetics and drug stability:** Stability calculations, rate equations, complex order kinetics, Factors influencing stability, strategy of stability testing, method of stabilization, method of accelerated stability testing in dosage forms, temperature and humidity control, physical stability testing of pharmaceutical products. Photodecomposition and solid state decomposition.

**UNIT - IV**

**Viscoelasticity:** Theoretical consideration, instrumentation, rheological properties of disperse systems and semisolids. Oscillatory testing, Creep measurement.

**Characterization of API and excipients:**

Differential Scanning Calorimetry: Principle, thermal transitions, advantages, disadvantages, instrumentation, applications, and interpretations

X Ray Diffraction methods: Origin of x-rays, applications, advantages, disadvantages, instrumentation, applications, and interpretations..

**UNIT - V**

**Dissolution and solubility:** Solubility and solubilization of nonelectrolytes, solubilization by the use of surfactants, cosolvents, complexation, drug derivatisation and solid state manipulation, Mechanisms of Drug release - dissolution, diffusion (Matrix and Reservoir) and swelling controlled (Peppas Model) and dissolution equipment.

**TEXT BOOKS:**

1. Physical Pharmacy, 4<sup>th</sup> Edition by Alfred Martin.



*Handwritten signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Geethanjali, Keesara (M), Medchal Dist. T.S. - 501303

2. Theory and Practice of Tablets – Lachman Vol.4
3. Pharmaceutical Dosage forms – Disperse systems Vol. I & II
4. Cartenson "Drug Stability, Marcel Decker Solid state properties, Marcel Dekker.
5. Industrial Pharmacy - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

**REFERENCE BOOKS:**

1. Dispersive systems I, II, and III
2. Robinson. Controlled Drug Delivery Systems

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. 501301.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

**MODERN PHARMACEUTICS – I (Core course II)**

**Course Objectives:** Students will know the preformulation studies, methodology, different excipients used in solid dosage forms and their evaluation with references to production technologies. The students also know the optimization techniques and their applications in pharmaceutical industries.

**Course Outcome:** Students shall explain the preformulation parameters, apply ICH guidelines, and evaluate drug, drug excipients compatibility. Students also explain about formulation and development, use of excipients in tablets, powders, capsules, micro-encapsules and coating techniques. They also learn and apply the statistical design in different formulations.

**UNIT - I**

**Preformulation studies:** Goals of Preformulation, preformulation parameters, Polymorphs and Amorphous forms, selection of drugs- solubility, partition coefficient, salt forms, humidity, solid state properties, Particle Size Analysis (Laser Diffraction and Dynamic Light Scattering) drug-excipient compatibility, flow properties, format and content of reports of preformulation, preformulation stability studies (ICH)

**UNIT - II**

**Formulation development of solid dosage forms – I:** New materials, excipients science - diluents, disintegrants, super disintegrants, etc, evaluation of functional properties of excipients, co-processed materials, methods of preparation and evaluation.

**UNIT - III**

**Formulation development of solid dosage forms– II:** Coating, coating machines, coating techniques in tablet technology for product development, computerization, inprocess control of tablets, formulation development and manufacture of powder dosage forms for internal use.  
**Microencapsulation-** types, methodology, problems encountered.

**UNIT - IV**

**Formulation development of soft and hard gelatin capsules:** Introduction, production and methods of manufacture, filling equipment, and filling operations, formulations, finishing, special techniques, advances in capsule manufacture, machines, processing, and control including pharmaceutical aspects, physical stability, and packaging.

**UNIT - V**

**Optimization techniques in pharmaceutical formulation and processing:** Introduction, optimization parameters, statistical design, response surface method, contour diagrams, factorial design, partial factorial design, simplex methods, mixture designs, Placket Burhan method, Box Benken method, applications in pharmaceutical formulation.

**TEXT BOOKS**


1. Pharmaceutics - The Science of Dosage form design by ME Aulton.
2. Pharmaceutical Dosage forms - Tablets (Vol I, II and III) by Lieberman, Lachman and Schwartz.
3. Pharmaceutical Dosage forms - Capsules (Vol I, II and III) by Avis, Lieberman and Lachman.
4. Pharmaceutical Dosage forms – Disperse systems (Vol I, II and III) by Avis, Lieberman and Lachman.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
6. Pharmaceutical statistics by Bolton

**RECOMMENDED BOOKS:**

1. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
2. Remington's Science and Practice of Pharmacy by A. Gennaro.
3. Ansel's Pharmaceutical Dosage form and Drug delivery system by Loyd V. Allen, Jr. Nicholas G. Popovich, Howard C. Ansel.
4. Generic Drug Product Development by Leon Shargel and Isadore Kanfer.
5. Dispensing for Pharmaceutical Students by SJ Carter.
6. Industrial Pharmacy - Selected Topics , CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

APPLIED BIOPHARMACEUTICS AND PHARMACOKINETICS (Core course - III)

**Course Objective:** The student shall learn about bioavailability, bioequivalence and factor affecting bioavailability. They also learn the pharmacokinetic parameter like drug disposition, absorption, non-linear and time dependant pharmacokinetics. They also understand about the drug interactions & problems, practice associated in pharmacokinetic parameters calculations.

**Course Outcome:** students will be able to express factors affecting the bioavailability and stability of dosage form; they also learn the bioequivalence studies and protocols for bioequivalent studies. They also evaluate the parameters for the disposition, absorption and Michaelis-Menton constants for non-linear kinetics.

**UNIT - I**

1. Biological and metabolic factors affecting bioavailability, complexation, dissolution - techniques of enhancing dissolution.
2. Formulation factors affecting bioavailability of drugs in dosage forms of tablets, capsules, parenterals, liquid orals and topical dosage forms.
3. **Bioavailability:** Importance, dose dependency, AUC, rate and extent, assessment, blood and urine samples, single dose and multiple dose studies, Invitro Invivo Correlation analysis and Levels of Correlations.
4. **Bioequivalence:** Importance equivalency concepts, biowaivers, study designs, protocol, transformation of data, Statistical Criteria as per the Regulations.

**UNIT - II**

**Pharmacokinetics – Drug Disposition:** compartment models: One, two and non-compartmental approaches to pharmacokinetics. Recent trends, merits and limitations of these approaches. Application of these models to determine the various pharmacokinetic parameters pertaining to:

- a. Distribution: Apparent volume of distribution and its determination. factors affecting.
- b. Metabolism: Metabolic rate constant, Factors affecting Metabolism
- c. Elimination: Over all apparent elimination rate constant, and half life.

All the above under the following conditions:

1. Intravenous infusion
  2. Multiple dose injections
- d. Noninvasive methods of estimating pharmacokinetics parameters with emphasis on salivary and urinary samples.
  - e. Concept of clearance: organ, total clearance, hepatic clearance, lung clearance and renal clearance.

**UNIT - III**

**Pharmacokinetics – Absorption:** Rate constants – Zero order, first order, Models of experimental study of absorption (in silico, in vitro, in situ and in vivo) – Absorption half lives, method of residuals, Wagner – Nelson method, Loo - Reigleman method, Analysis of kinetics from urine samples. Pharmacokinetic parameters determination pertaining to: Multiple dosage oral administration

**UNIT - IV**

**Non-linear pharmacokinetics:** Concepts of linear and non-linear pharmacokinetics, Michaelis-Menton kinetics characteristics. Basic kinetic parameters, possible causes of non-induction, non-linear binding, and non-linearity of pharmacological responses.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**Clinical Pharmacokinetics:** Altered kinetics in pregnancy, child birth, infants and geriatrics. kinetics in GI disease, malabsorption syndrome, liver, cardiac, renal and pulmonary disease states.

#### UNIT - V

**Time dependent pharmacokinetics:** Introduction, classification, physiologically induced time dependency: Chronopharmacokinetics - principles, drugs- (amino glycosides, NSAIDS, antihypertensive drug) chemically induced dependency.

**Drug Interactions:** Kinetics of drug interaction, study of drug-drug interaction mediated through absorption, distribution, metabolism and elimination, mechanisms of interaction and consequence.

❖ Numerical problems associated with all units, if any.

#### TEXT BOOKS:

1. Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi.
2. Learn Shargel and ABC yu, Applied Biopharmacokinetics and
3. Biopharmaceutics and Pharmacokinetics by C.V.S. Subrahmanyam, Vallabh Prakashan. 2010.
4. Basic biopharmaceutics, Sulnil S. Jambhekar and Philip J Brean.
5. Text book of Biopharmaceutics and Clinical Pharmacokinetics by Niazi Sarfaraz

#### RECOMMENDED BOOKS:

1. Bio-Pharmaceutics and Pharmacokinetics by V. Venkateshwarlu.
2. Pharmacokinetics. Biopharmaceutics and Clinical pharmacy by Robert E. Notari.
3. Biopharmaceutics and Clinical Pharmacokinetics - An Introduction by Robert E. Notari.
4. Drug drug interactions, scientific and regulatory perspectives by Alber P. G

*Sanjiv*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)**

**MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (Core Elective - I)**

**Course Objective:** The course is designed to impart the knowledge in the field of Pharmaceutical Analysis. The various modern analytical techniques like UV-Visible, IR, NMR, MS, GC, HPLC, different chromatographic methods and other important topics are taught to enable the students to understand and apply the principles involved in the determination of different bulk drugs and their formulation. In addition to the theoretical aspects, the basic practical knowledge relevant to the analysis is also imparted.

**Course Outcome:** The appreciable knowledge will be gained by the students in the Modern Analytical Techniques and can apply the theories in the Analysis of various bulk drugs and their formulations. The students will also be in a position to apply their knowledge in developing the new methods for the determination and validate the procedures

**UNIT - I**

**Introduction to chromatography and classification of chromatographic methods based on the mechanism of separation**

- a. Column Chromatography: Adsorption and partition, theory, preparation, procedure and methods of detection
- b. Thin Layer Chromatography: Theory, preparation, procedures, detection of compounds
- c. Paper Chromatography: Theory, different techniques employed, filter papers used, qualitative and quantitative detection
- d. Counter – current extraction, solid phase extraction techniques, gel filtration

**UNIT - II**

- a. Gas chromatography: Introduction, fundamentals, instrumentation, columns: preparation and operation, detection, dramatization.
- b. HPLC: Principles and instrumentation, solvents and columns used, detection and applications
- c. HPTLC: Theory and principle, instrumentation, elution techniques and pharmaceutical applications

**UNIT - III**

- a. UV-Visible spectroscopy: Introduction, electromagnetic spectrum, absorbance laws and limitations, instrumentation-design and working principle, chromophore concept, auxochromes, Wood-Fisher rules for calculating absorption maximum, applications of UV-Visible spectroscopy
- b. IR spectroscopy: Basic principles-Molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, sampling techniques, instrumentation, interpretation of spectra, FT-IR, theory and applications

**UNIT - IV**

Mass spectroscopy: Theory, ionization techniques: electron impact ionization, chemical ionization, field ionization, fast atom bombardment, plasma desorption, fragmentation process: types of fission, resolution, GC/MS, interpretation of spectra and applications for identification and structure determination

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

#### UNIT - V

NMR: Theory, instrumentation, chemical shift, shielding and deshielding effects, splitting of signals, spin-spin coupling, proton exchange reactions, coupling constant(J), nuclear overhauser effect(NOE), <sup>13</sup>CNMR spectra and its applications, 2D-NMR, COSY and applications in pharmacy

#### REFERENCES:

1. Instrumental Methods of Chemical Analysis by B. K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth
12. Indian Pharmacopoeia 2007
13. High Performance thin layer chromatography for the analysis of medicinal plants by Eike Reich, Anne Schibli
14. Introduction to instrumental analysis by Robert. D. Braun

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. 501 501.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

INTELLECTUAL PROPERTY RIGHTS (Core Elective - I)

**Course Objective:** Various types of Intellectual Property Rights Patentable Subject History of Indian Patent Protection, Patent filing procedure in India, Opposition- pre-grant opposition and post-grant opposition, Patent filing procedure under PCT, advantages, patent search and literature and Salient features of Indian Patents are discussed in detail.

**Course Outcome:** The clear information about the patent laws, intellectual property rights and drug regulation in India and abroad is gained by the students.

**UNIT - I**

Introduction, Types of Intellectual Property Rights (Patents, Trademarks, Copyrights, Geographical Indications Industrial Designs and Trade secrets), Patentable Subject Matter (Novelty, Non-Obviousness, Utility, enablement and Best mode),

**UNIT - II**

- a. History of Indian Patent Protection, Rationale behind Patent System, Objectives and Advantages of Patent System, and future challenges. Indian Patents Act 1970, Definitions and Key Terminology, Types of Patent applications, Inventions not patentable (section 3 and 4).
- b. Patent filing procedure in India (Patent Prosecution), Specifications (Provisional and Complete), Claims- types of claims and legal importance of claims, Grant of patent, Rights of Patentee and co-owners
- c. Opposition- pre-grant opposition and post-grant opposition, Anticipation, Infringement, Compulsory Licensing, revocation of patents, and power of Controller.
- d. Patent filing procedure under PCT, advantages, patent search and literature

**UNIT - III**

- a. Salient features of Indian Patents (Amendments) Act 1999, 2002 and 2005. US and European Patent System,
- b. Background, Salient Features and Impact of International Treaties / Conventions like
  1. Paris Convention, Berne convention
  2. World Trade Organization (WTO)
  3. World Intellectual Property Organization (WIPO)
  4. Trade Related Aspects of Intellectual Property Rights (TRIPS)
  5. Patent Co-operation Treaty (PCT), Madrid Protocol

**UNIT - IV**

- a. PCT Application procedure and review procedure
- b. National phase application procedure for US & EU
- c. Patent prosecution procedure in US and EU
- d. WIPO and its role in IPR
- e. Hatch- Waxman provision for IPR

**UNIT - V**

- a. Patent in validation process in India, US and Europe
- b. IPR related to copyright, trade mark, trade secret and geographical indication.
- c. Patent application writing
- d. Claim construction and claims.

**RECOMMENDED BOOKS:**

1. Research Methodology concepts and cases by Depak Chawla, Neena Sondhi
2. Draft manual of Patent Practice and Procedure -2008 , The Patent Office, India
3. Manual of Patent Office Practice and Procedure -2010
4. Original Laws Published by Govt. of India
5. Protection of Industrial Property rights by P. Das and Gokul Das
6. Law and Drugs, Law Publications by S.N. Katju
7. Laws of drugs in India, Hussain
8. New drug approval process, 5<sup>th</sup> edition, by Guarino
9. Commercial Manual on Drugs and Cosmetics 2004, 2<sup>nd</sup> edition
10. Drugs and Cosmetics act by Vijay Malik
11. Good Manufacturing Practices for Pharmaceuticals, S.H. Wiling, Vol. 78, Marcel Decker.
12. [fda.org](http://fda.org), [wipo.int](http://wipo.int), [patentlawlinks.com](http://patentlawlinks.com), [hc-sc.gc.ca](http://hc-sc.gc.ca), [ich.org](http://ich.org), [cder.org](http://cder.org)
13. Current good manufacturing practices for pharmaceuticals by Manohar A. Potdar

*Sanjiv K*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
(Cheerayal(V), Keesara(M), Medchal Dist. T.S. 501301)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

PHARMACOEPIDEMOLOGY & PHARMACOECONOMICS (Open Elective – I)

**Course Objective:**

This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

**Course Outcome:** Upon completion of this course it is expected that students shall be able to:

- Understand the various epidemiological methods and their applications
- Understand the fundamental principles of Pharmacoeconomics.
- Identify and determine relevant cost and consequences associated with pharmacy products and services.
- Perform the key Pharmacoeconomics analysis methods
- Understand the Pharmacoeconomic decision analysis methods and its applications.
- Describe current Pharmacoeconomic methods and issues.
- Understand the applications of Pharmacoeconomics to various pharmacy settings.

**UNIT- I**

**Introduction to Pharmacoepidemiology:**

Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio

**UNIT- II**

**Pharmacoepidemiological Methods:**

Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

**UNIT- III**

**Introduction to Pharmacoeconomics:**

Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs. Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost Effective Ratio, Average Cost Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.

**UNIT- IV**

**Pharmacoeconomic evaluations:**

Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA), Cost Benefit Analysis (CBA), Cost

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA).

#### UNIT - V

##### **Definition, Steps involved, Applications, Advantages and disadvantages of the following:**

Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures. Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in pharmacoeconomic analysis, Applications of pharmacoeconomics.

#### REFERENCES:

1. Rascati K L. Essentials of Pharmacoeconomics, Woulters Kluwer Lippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modelling for Health Economic Evaluation, Oxford University Press, London.
4. K G Revikumar, Pharmacoepidemiology and Pharmacoeconomics Concepts and Practices.
5. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programmes Oxford University Press, London.
6. George E Mackinnon III. Understanding health outcomes and pharmacoeconomics.
7. Graker, Dennis. Pharmacoeconomics and outcomes.
8. Walley, Pharmacoeconomics.
9. Pharmacoeconomic – ed. by Nowakowska – University of Medical Sciences, Poznan.
10. Relevant review articles from recent medical and pharmaceutical literature
11. Guru Prasad Mohanta and P K Manna, Textbook of Pharmacovigilance Concepts and Practice

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheerjal(V), Keusara(M), Medchal Dist. T.S. - 501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M.Pharm. (Pharmaceutics/Pharmaceutical Technology)

DRUG REGULATORY AFFAIRS (Open Elective – I)

**Course Objective:** The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

**Course Outcomes:**

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authorization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

**UNIT - I**

A study of regulatory aspects that affect drug product design, manufacture and distribution in India with special emphasis on the detailed study of the following Acts (with latest amendments)

**UNIT - II**

The Drugs and Cosmetics Act, 1940 and Rules there under. Recent amendments to Drugs and Cosmetic Act and other relevant rules.

Drugs (Price Control) Order in force. Loan license (contract manufacture). Certification and licensing procedures.

**UNIT - III**

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act; Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

**UNIT - IV**

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.

Quality, safety and legislation for cosmetic products and herbal products.

**UNIT - V**

**Governing Regulatory Bodies across the globe.**

Country Authority Submission

- a. U.S Food & Drug Administration USDMF
- b. Canada Therapeutic Product Directorate DMF
- c. Europe
  - 1) European Medicines Agency (EMA/ National Authorities) EDMF
  - 2) European Directorate for Quality of Medicines CEP/COS & Health Care Products
- d. Product Filing
- e. Responding Regulatory Deficiencies
- f. Final Approval Procedure

Preparation, review, and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keosara(M), Medchal Dist. T.S.-501301

**TEXT AND REFERENCE BOOKS:**

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

*Signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
(Neeraj(V), Keesara(M), Medchal Dist. T.S. 500088)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics and Pharmaceutical Technology)

HERBAL COSMETICS TECHNOLOGY (Open Elective - I)

**Course Objective:**

The topics helps the students to get exposed to processes involved in the manufacturing of herbal cosmetics including the skin and hair care herbal products preparation and their evaluation

**Course Outcome:** Students will learn about the raw materials used in herbal cosmetics and get exposed to various preparations herbal cosmetics.

**UNIT - I**

- a) Introduction, historical background and present status of Herbal cosmetics
- b) Processes used in the manufacture of cosmetics-Emulsification, Mixing, compaction, Moulding, Packing. Raw materials used in preparation of herbal cosmetics
- c) Machinery and Equipment for Cosmetics: Cream, Liquid, Powder and emulsion making machinery
- d) Quality, safety and efficacy of Herbal cosmetics

**UNIT - II**

**Skin care Products:** Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like Creams, Lotions, Lipsticks, face packs. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

**UNIT - III**

**Hair care Products:** Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like hair dyes, creams, Lotions, Jels, oils and Shampoos. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

**UNIT - IV**

A brief account of following herbals or herb extracts or herbal products of cosmetic importance such as *Acacia concinna* pods, Aloe Vera, Almond oil, Neem, *Citrus aurantium* peels, Henna, Turmeric, Liquorice, Olive oil, tea tree oil and wheat germ oil with special emphasis on their source, active principles and cosmetic properties.

**UNIT - V**

- a) General Principles of Quality control and standardization of cosmetics-Raw material control, Packaging material control, finished product control, Shelf testing.
- b) Natural colorants : Biological Source, coloring principles, chemical nature and usage of the following Annato, Cochineal, Caramel, Henna, Indigo, Madder, Saffron , Turmeric
- c) Flavors and Perfumes : Sandal wood oil, Orange oil, Lemon oil, Vanilla, Palmarosa, geranium oil

**REFERENCES:**

1. Cosmetics- Formulation, Manufacturing and Quality control –P.P. Sharma
2. Herbal Cosmetics Hand Book- H. Panda
3. Herbal Cosmetics by P. K Chattopadhyay
4. The Complete Technology Book on Herbal Perfumes and Cosmetics by H. Panda

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem. M. Pharm. (Pharmaceutics/ Pharmaceutical Technology)

PHARMACEUTICAL VALIDATION (Open Elective – I)

**Course Objective:**

The main purpose of the subject is to understand about validation and how it can be applied to industry and thus to improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

**Course Outcome:** Upon completion of the subject student shall be able to

- Explain the aspect of validation
- Carryout validation of manufacturing processes
- Apply the knowledge of validation to instruments and equipments
- Validate the manufacturing facilities

**UNIT - I**

**Introduction:** Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan.

**UNIT - II**

**Qualification:** User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Installation Qualification, Operational Qualification, Performance Qualification, Re- Qualification (Maintaining status-Calibration Preventive Maintenance, Change management), Qualification of Manufacturing Equipments, Qualification of Analytical Instruments and Laboratory equipments.

**UNIT - III**

**Qualification of analytical instruments:** Electronic balance, Ph meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC

**Qualification of Glassware:** Volumetric flask, pipette, Measuring cylinder, beakers and burette.

**UNIT - IV**

**Validation of Utility systems:** Pharmaceutical Water System & pure steam, HVAC system, Compressed air and nitrogen.

**Cleaning Validation:** Cleaning Validation - Cleaning Method development, Validation and validation of analytical method used in cleaning. Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP).

**UNIT - V**

**Analytical method validation:** General principles, Validation of analytical method as per ICH guidelines and USP.

**REFERENCES:**

1. B. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.
4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco, (Marcel Dekker).

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501301

5. Michael Levin, Pharmaceutical Process Scale-Up, Drugs and Pharm. Sci. Series, Vol. 157, 2nd Ed., Marcel Dekker Inc., N.Y.
6. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
7. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
8. Validation of Pharmaceutical Processes: Sterile Products, Frederick J. Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker, 2nd Ed.
9. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam, Y.C. Lee, Yue. Zhang, Wiley Inter Science.

*Sanjiv*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medak(T), Dist. (S. 591301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

PHARMACEUTICAL MANAGEMENT (Open Elective – I)

**Course Objective:** The topics which are present in the pharmaceutical management are very much useful to the students in personality development become a perfect pharma professional.

**Course Outcomes:**

- These topics are useful for the students to know how to manage a pharma industry and its various departments viz QA, QC, RA, Production etc.
- Along with this it aids the students to develop leadership qualities, communication & interpersonal skills, decisions making, motivation, organization & various managerial functions & professional skills required for a dynamic professional.
- Management helps to understand the concept of managerial control, its levels & role, importance in pharma industry

**UNIT - I**

Pharmaceutical Management: Meaning, Evolution-scientific, administrative and human relation approach. Process of management: Planning, organizing, staffing, directing, coordinating and controlling—a preliminary idea of concepts, processes and techniques.

**UNIT - II**

Fundamental concepts of production, financial, personal, legal and marketing functions with special reference to Pharmaceutical Management. Introduction to budgeting, costing, accounting, auditing, and budgetary control. Entrepreneurship development.

**UNIT - III**

Understanding organizations: Meaning, process, types of organization structures and departmentation, line/staff authority, promoting organizational culture. Organizations, pharmaceutical services and functioning of hospital pharmacy, bulk drug unit, formulation unit, Ayurvedic and Unani manufacturing units and testing labs etc.

**UNIT - IV**

**Professional Managers;** Tasks, responsibilities and skills needed. Leadership; Styles and managing change. Decision Making; Types, procedures, evaluation and selection of alternatives, decision making under various situations. Management information and decision support systems and time management.

**Personnel Management:** Job Analysis, recruitment, selection, orientation and training, performance appraisal and compensation. Retrenchment, lay off and discharge.

**UNIT - V**

Management of Industrial Relations: Industrial disputes, settlement of disputes through various routes such as bargaining, etc.

Motivational aspects, theories of motivation, group dynamics, rewards and incentives, interpersonal skills, significance of communication, its processes, measures for effective communication, conflict management. Stress management.

**TEXT AND REFERENCE BOOKS:**

1. Marketing Management by Philip Kotlar; Prentice-Hall of India Ltd., New Delhi.
2. Management and Organization by Louis A. Allen; McGraw Hill, Tokyo.

*Geethanjali*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheerjal(V), Keesara(M), Medchal Dist. T.S.-501301.



3. Corporate Strategy by Ansoff, H.T.; McGraw Hill, New York.
4. Modern Management by Hempran David R.; McGraw Hill, New York.
5. Management by Stoner and Freeman; Prentice Hall, New Delhi.
6. Motivation and Personality by Maslow, Abraham, Harper & Row, New York.
7. Management of Organizational Behavior, Utilizing the Human Resources by Harcey, Paul and Blanchard Kenneth; Prentice Hall of India, New Delhi
8. Organization Structure, Process and out comes V<sup>th</sup> Edition Richard. H. Hall
9. Principles and Methods of Pharmacy Management III rd Edition Harry A. Smith.
10. Management "Global Perspective Heinz Wehrich, Harold Koontz by Tata Mcgraw Hill".
11. Personnel Management and Industrial Relations by P. C. Tripathi.

*Geethanjali*  
Geethanjali Concy Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (Pharmaceutics/Pharmaceutical Technology)

ADVANCED PHYSICAL PHARMACEUTICS LAB

**List of experiments**

1. Determinates of molecular weight of some selected polymers.
2. Preparation and evaluation of solid dispersions (Immediate release and sustained release)
3. Accelerated stability testing of Aspirin Tablets
4. Stability evaluation of Aspirin at various pH and temperature conditions
5. Determination of 1st order and 2<sup>nd</sup> order rate constant. Half life by Acid / Alkali hydrolysis
6. Preparation and evaluation of multiple emulsions
7. Preparation and evaluation of  $\beta$ -cyclodextrin complexes of some drugs.
8. Generation of dissolution profiles of few dosage forms and application of the data into various kinetic equations. Calculation of Hixon-crowell dissolution rate constant
9. Preparation and dissolution study of paracetamol tablets and comparison with the marketed product.
10. Study of solubility and dissolution for few drugs and their respective salts.
11. Study of drug release from commercial suspension and emulsion dosage forms
12. Viscosity measurement of Newtonian and Non-Newtonian liquids

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.: 501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M.Pharm. (Pharmaceutics/Pharmaceutical Technology)

APPLIED BIOPHARMACEUTICS AND PHARMACOKINETICS LAB

List of experiments

1. Intrinsic dissolution (1 exp)
2. Analysis of dissolution by various data-kinetic modelling.
3. Dissolution of immediate release, sustained release and delayed release.
4. Evaluation of drug-protein binding analysis
5. Assignment of numerical problems, one compartment and two compartment disposition, method of residuals, AUC and evaluation of pharmacokinetic parameters.
6. Calculation of  $K_a$ (absorption rate constant ) absorption curve- Wagner nelson method , Loo-Riegel method.
7. Calculation of pharmacokinetics parameters of one compartment oral data and two compartment IV data.
8. Constuction of IVIVE from the data
9. Calculation of Urinary Pharmacokinetics
10. Permeation studies of Franz diffusion cell
11. Drug Release from semisolids by Agargel method or Franz diffusion cell.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. -501301.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)**

**ADVANCED DRUG DELIVERY SYSTEMS (Core course - IV)**

**Course Objective:** The students shall know the pharmacokinetic and pharmacodynamic on the basis of CDDS. They also know the design evaluation and application related to oral, parenteral, transdermal, implants, bioadhesives and targeted drug delivery systems.

**Course Outcomes:**

Students will know the fabrication, design, evaluation and application of above drug delivery systems.

**UNIT I**

Fundamentals of controlled drug delivery systems, pharmacokinetic and pharmacodynamic basis of controlled drug delivery. Design, fabrication, evaluation and applications of the following controlled releasing systems

- a. Controlled release oral drug delivery systems
- b. Parenteral controlled release drug delivery systems

**UNIT II**

Design, fabrication, evaluation and applications of the following

- a) Implantable Therapeutic systems
- b) Transdermal delivery systems
- c) Ocular and Intrauterine delivery systems
- d) Vaccine delivery : Delivery systems used to promote uptake, absorption enhancers, oral immunization, controlled release microparticles form vaccine development

**UNIT III**

Biochemical and molecular biology approaches to controlled drug delivery of

- a. Bioadhesive drug delivery systems
- b. Nasal drug delivery systems
- c. Drug delivery to Colon

**UNIT IV**

Biochemical and molecular biology approaches to control drug delivery of

- a. Liposomes
- b. Niosomes
- c. Microspheres
- d. Nanoparticles
- e. Resealed erythrocytes

**UNIT V**

Drug targeting to particular organs

- a. Delivery to lungs
- b. Delivery to the brain and problems involved
- c. Drug targeting in neoplasms

**Text Books**

1. Novel Drug Delivery System by Yie W. Chien.
2. Controlled Drug Delivery by Joseph R. Robinson and Vincent H. L. Lee.
3. Controlled and Novel Drug Delivery Systems by N. K. Jain.
4. Targeted and Controlled Drug Delivery (Novel carrier systems) by S. P. Vyas and Khar.



*Handwritten signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerlyal(V), Keesara(M), Medchal Dist. T.S.-501301.

5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes..
6. Advances in Drug Delivery, Vol 1, 2, 3 by Y. Madhusudan Rao, A. V. Jithan
7. Oral Drug Delivery Technology, 2<sup>nd</sup> ed, by Aukunuru Jithan



*Signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Keerthi Nagar, Medchal Dist. T.S. 502001

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)**

**INDUSTRIAL PHARMACY (Core course - V)**

**Course Objectives:** The students shall learn the theory of unit operations, machinery, materials of constructions, qualification of equipments and its utility. The students shall also understand about the objectives and principles of GMP, TQM and effluent analysis and specifications. They also understand the regulatory basis for the validation of analytical methods related to solids, sterile and liquid dosage forms

**Course Outcome:** The students will explain the machinery involved in milling, mixing, filtration, drying and packing material constructions used in the production of pharmaceutical materials. They also learn salient features of GMP, TQM applicable in industry. They also understand the effluent treatments and prevent the pollution. They also should evaluate the validation of analytical methods and processes

**UNIT I**

**Pharmaceutical unit operations:** A detailed study involving machinery and theory of Pharmaceutical unit operations like milling, mixing, filtration, and drying.

**UNIT II**

- a. Materials of construction of pharmaceutical equipment and packaging materials: Study of the principles, production techniques in the large scale production of tablets, capsules, suspensions, liquid pharmaceuticals, ophthalmic products, and sterile products.
- b. Qualification of equipment (IQ, OQ, PQ)

**UNIT III**

**Production management:** Production organization, objectives and policies of good manufacturing practices, layout of buildings, services, equipments and their maintenance, material management, handling and transportation, inventory management and control, production and planning control, Sales forecasting, budget and cost control, industrial and personal relationship. Total Quality Management (TQM)

**UNIT IV**

**Effluent Testing and Treatment:** Effluent analysis, specifications, and preventive measures water of pollution, solid pollution, air pollution, and sound pollution.

**UNIT V**

**Validation:** Regulatory basis, validation of analytical methods, and process, in solid dosage forms, sterile products, and liquid dosage forms.

**TEXT BOOKS:**

1. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
2. Good Manufacturing Practice for Pharmaceuticals by Sidney H. Willig.
3. Pharmaceutical Process validation by Robert A. Nash, Alfred H. Wachter.
4. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
5. Pharmaceutical production management, C. V. S. Subrahmanyam, Vallabh Prakash.

**REFERENCE BOOKS:**

1. Unit operations of Chemical Engineering by Warren L. McCabe, Julian C. Smith, Peter Harriott.



*Suresh*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Theerthaj(V), Keerasani(M), Medical Dist. T.S.-501301.

2. Remington's Science and Practice of Pharmacy by A. Gennaro.
3. Bentley's Text book of Pharmaceutics by EA Rawlins.
4. CGMP, H.P.P. Sharma



*Signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
(Cheerayal(V), Keesara(M), Medchal Dist. T.S.-502301)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)**

**MODERN PHARMACEUTICS - II (Core course - VI)**

**Course Objective:** The students shall understand about the pilot plant and their scale up techniques for manufacturing of tablets capsules, suspensions, emulsions and semisolids. The students also learn the filling of capsules, compression machines, sterilizers for formulation of parenterals and also understand the properties of propellants, DPI, MDI and their quality control. The students also understand about the cosmetics and nutraceuticals.

**Course Outcomes:** students will understand the planning of pilot plant techniques used for all pharmaceutical dosage forms such as tablets, capsules, parenterals, aerosols, cosmetics and nutraceuticals.

**UNIT I**

**Pilot plant scale-up techniques used in pharmaceutical manufacturing**

- a) **Pilot plant:** Technology transfer from R&D to pilot plant to pilot scale considerations of steps involved with manufacture, layout design, facility, equipment selection of tablets, capsules, suspensions, emulsions & semisolids.
- b) **Scale up:** Importance, Scale up process-size reduction, mixing, blending, granulation, compression, coating involved in tablets, capsules & liquid-liquid mixing.

**UNIT II**

**Formulation development of parenteral dosage forms:** Advances in materials and production techniques, filling machines, sterilizers, product layout.

**UNIT III**

**Pharmaceutical Aerosols:** Advances in propellants, metered dose inhaler designs, dry powder inhalers, selection of containers and formulation aspects in aerosols formulation, manufacture and quality control.

**UNIT IV**

**Cosmetics:** Formulation approaches, preparation & method of manufacturing labeling & Q.C. of anti ageing products, sun screen lotion and fairness creams.

**Nutraceuticals:**

- a) Introduction, source, manufacture, and analysis of glucosamine and cartinine.
- b) Monographs: General and specific properties of glucosamine & cartinine.
- c) A brief overview of role of nutraceuticals in cancer prevention & cardio vascular disorders.


**UNIT V**

**Aseptic processing operation**

- a) Introduction, contamination control, microbial environmental monitoring, microbiological testing of water, microbiological air testing, characterization of aseptic process, media and incubation condition, theoretical evaluation of aseptic operations.
- b) Air handling systems: Study of AHUs, humidity & temperature control.

**TEXT BOOKS:**

1. Pharmaceutics - The Science of Dosage form design by ME Aulton.
2. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
3. Remington's Science and Practice of Pharmacy by A. Gennaro.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



4. Ansel's Pharmaceutical Dosage form and Drug delivery system by Loyd V. Allen, Jr. Nicholas G. Popovich, Howard C. Ansel.
5. Pharmaceutical Dosage forms - Parenterals (Vol I, II and III) by Avis, Lieberman and Lachman.
6. Scale up techniques – Pharmaceutical process by Michael Levin, Marcel Dekker

**RECOMMENDED BOOKS:**

1. Bentley's Text Book of Pharmaceutics by EA Rawlins.
2. Generic Drug Product Development by Leon Shargel.
3. Dispensing for Pharmaceutical Students by SJ Carter.
4. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
5. Nutraceuticals, 2nd edition by Brian lock wood.
6. Industrial Pharmacy - Selected Topics , CVS Subramanyam and J Thimmasetty, Vallabh Prakashan Delhi - 2013

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerya(V), Keesara(M), Medchal Dist. T.S.-501301.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)**

**BIOSTATISTICS AND RESEARCH METHODOLOGY (Core Elective - II)**

**Course Objective:** The student shall know the introduction, scope of biostatistics and Research work, calculation and present of the data. It also informs the students, how the present research work writing and correlating.

**Course Outcome:** The student will be known the Biostatistics arrangement, presentation and formation of tables and charts. They also know the correlation and regression & application of different methods, analysis of data and also learn how to write dissertation, thesis and Research paper.

**UNIT I**

Introduction and scope of biostatistics: Use of statistics in Pharmacy. Population and Sample collection. Stages of research, types of data and methods of data collections. Data arrangement and presentation, formation of table and charts.

**UNIT II**

**Measures of central tendency:** computation of means, median and mode from grouped and ungrouped data.

**Measure of dispersion:** computation of variance, standard deviation, standard error and their coefficients.

**UNIT III**

**Measures of Correlation and Regression:** Experimental designing, planning of an experiment, replication, and randomization. Probit analysis.

**Probability rules:** Binomial, Poison and Normal distribution.

**Hypothesis testing:** Student 't' test, Chi square test, Analysis of Variance (ANOVA): 1-way, 2-way, 3-ways

**UNIT IV**

Developing a research question, Resources for research question,

Literature Review: Traditional Qualitative Review,

Meta-Analysis—A Quantitative Review

Preparation of Research Proposal

Variables—Definition of Variable, Types of variables (Dependent and Independent variables, Confounded variables), Measurement of variables, Types of measurement scales and their comparison. Reliability and Validity of Measurements.

**UNIT V**

The research report paper writing/ thesis writing

Different parts of the research paper

1. Title-Title of project with authors' name
2. Abstract – Statement of the problem, Background list in brief and purpose and scope
3. Key words
4. Methodology- subject, apparatus, instrumentation and procedure
5. Results – tables, graphs figure and statistical presentation
6. Discussion support or non-support of hypothesis, practical and theoretical implications
7. Conclusion
8. Acknowledgements

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal (T), Kacaram (M), Madchal Dist. T.S.-501301.

9. References
10. Errata
11. Importance of Spell check for entire projects
12. Uses of footnotes

**TEXT BOOKS:**

1. Deepak Chawla Neena Sondhi, Research Methodology Concepts and Cases, Vikas books publishers
2. Donald H. McBurney -Theresa L. White "Research Methods" (Cengage learning India Pvt. Ltd)

**REFERENCE BOOKS:**

1. Remington's Pharmaceutical Sciences
2. Theory & Practice of Industrial Pharmacy by Lachman
3. Statistics for business and economics 3<sup>rd</sup> edition by Vikas books publications
4. Biostatistics & Computer applications by GN Rao and NK Tiwari
5. Sokal, R.R. and Rohlf, F.J. 1987. An Introduction to Biostatistics. W.H. Freeman and Company.
6. Bailey, N.T.J. 1981. Statistical Methods in Biology. English University Press.
7. Mitchell, K. and Glover, T. 2001. Introduction to Biostatistics. McGraw Hill, Publishing Co.
8. Biostatistics and Computer Applications by G.N. Rao and N.K. Tiwari
9. Fundamentals of Biostatistics by Khan and Khanum
10. Research Methodology by R K Khanna bis and Suvasis Saha
11. Research methods and Quantity methods by G. N. Rao
12. A practical approach to PG dissertation.

  
**PRINCIPAL**  
Goethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)**

**STABILITY OF DRUGS AND DOSAGE FORMS (Core Elective - II)**

**Course Objective:** These topics are designed impart a specialized knowledge to preserve the properties of drugs and dosage forms during manufacture storage and shelf life. The understanding of properties and evaluation of stability during storage, by solution and solid state against several factors of degradation

**Course Outcome:** The students should describe the evaluation of stability of solutions, solids, and formulations against adverse conditions. The students should be able to suggest the measures to retain stability and storage conditions for retaining the efficacy of the products.

**UNIT - I**

**Drug decomposition mechanisms:**

1. Hydrolysis and acyltransfers: Nature of reaction, structure and utility, stabilization of Pharmaceutical examples.
2. Oxidation: Nature of oxidation, kinetics of oxidation, oxidation pathways of pharmaceutical, Interest Inhibition of oxidation
3. Photolysis: Energetics of photolysis, kinetics photolysis, photolytic reactions of pharmaceutical interest, prevention of photolytic reactions.

**UNIT - II**

Solid state chemical decomposition: Kinetic of solids state decomposition, Pharmaceutical examples of solid state decomposition, Pure drugs, drug excipient and drug-drug interaction in solid state, methods of stabilization.

Physical stability testing of dosage forms:

1. Solids – tablets, capsules, powder and granules
2. Disperse systems
3. Microbial decomposition
4. Over-view, physical stability of novel drug carriers, liposomes, niosomes, nano-particles.

**UNIT - III**

Identification and quantitative determination of preservatives, Antioxidants, colouring materials, emulsifiers, and stabilizers in Pharmaceutical formulation.

Analysis of drugs from biological samples including, selection of biological sample, extraction of drugs by various methods as LLE, SPE and Membrane filtration. Factors affecting extraction of drugs.

**UNIT - IV**

General method of analysis to determine the quality of raw materials used in cosmetic industry. .. Indian Standard Specifications (ISI) laid down for sampling and testing of various cosmetics in finished form by the Bureau of Indian Standards.

**UNIT - V**

Methods of analysis to determine the quality of cosmetics in the finished forms such as Hair care products, Skin care products, Baby care products, Dental products, Personal hygiene products, Colour cosmetics, Ethnic products, Colour makeup preparation, Lipsticks, Hair setting lotions and Eye shadows. Toxicity testing in cosmetics and Safety and Legislation of Cosmetic products.

Stability studies: Concept of stability studies.

- a) cGMP& ICH guidelines for Accelerated stability Testing.
- b) Interaction of containers & closure Compatibility Testing.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Gheerjalli (V), Keeravani (M), Medchal Dist. T.S. - 501301

#### REFERENCE BOOKS:

1. Comprehensive Pharmacy Review 5th Edition by Leon Shargel, Alan H. Mutnick, Paul F. Souney, Larry N. Sawnsen – 2004.
2. H. Beckett and J. B. Stenlake Practical Pharmaceutical Chemistry, Part I and Part II, 4th Edition. 3. G. H. Jeffery, J. Basset, J. Mendham, R. C. Denny (Rev. by) Vogels Text Book of Quantitative Chemical Analysis, 5th Edition 1989, ELBS.
3. The Controller of Publications; New Delhi, Govt. of India, Indian Pharmacopoeia, Vol. I and Vol. II - 2010.
4. J. B. Wilkinson and R. J. Moore: Herry's Cosmeticology; Longman Scientific and Technical Publishers, Singapore.
5. P. D. Sethi; Quantitative Analysis of Drugs in Pharmaceutical Formulations, 3rd Edition - 1997,
6. Classification of cosmetics raw materials and adjuncts IS 3958 of Indian Standards Institution (BIS).
7. Cosmetic and toilet goods – methods of sampling IS 3958 of Indian Standards Institution (BIS).
8. Methods of sampling and test for various cosmetics as laid down by Bureau of Indian Standards.
9. Drug stability: Principles and practices by Jens T. Carstensen
10. Stability Testing of Drug Products by W. Grimm. 12. Stability of Drugs and Dosage Forms by Yoshioka and Stella.

*nanjini H*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S. 501504.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)**

**SCREENING METHODS IN PHARMACOLOGY (Open Elective - II)**

**Course Objective:** The students are going to study about various techniques for screening of drugs for various pharmacological activities and guide lines for handling animals and human and animal ethics for screening of drugs.

**Course Outcome:** The expected outcomes are students will know how to handle animals and know about various techniques for screening of drugs for different pharmacological activities, guidelines and regulations for screening new drug molecules on animals.

**UNIT I**

Care Handling and breeding techniques of laboratory animals, Regulations for laboratory animals, CPCSEA guidelines, alternatives to animal studies, Good laboratory Practices.

**UNIT II**

Bioassays: Basic principles of Biological standardization: Methods used in the bio-assay of Rabbits Vaccine, Oxytocin, Tetanus Antitoxin and Diphtheria Vaccine. Test for pyrogens.

**UNIT III**

Toxicity tests: OECD guidelines, determination of LD50, acute, sub-acute and chronic toxicity studies.

**UNIT IV**

Organization of screening for the Pharmacological activity of new substances with emphasis on the evaluation of cardiac and anti-diabetic activities.

**UNIT V**

Organization of screening for the Pharmacological activity of new substances with emphasis on the evaluation of psychopharmacological, anti-inflammatory and analgesic activities.

**TEXT BOOKS:**

1. Screening methods in Pharmacology, Vol.-1&2 by Robert .A. Turner and Peter Hebborn.
2. Drug discovery and evaluation by H. G. Vogel and W. H .Vogel, Springer-Verlag, Berlin Heidelberg.
3. Handbook of experimental pharmacology by S. K. Kulkarni, Vallabh Prakashan, Delhi.

**REFERENCE BOOKS:**

1. ICH of technical requirements for registration of pharmaceuticals for human use, ICH harmonized tripartite guidelines - Guidelines for good clinical practice, E6, May 1996.
2. Good clinical practice - Guidelines for Clinical trials on pharmaceutical products in India, Central drug standard control organization, New Delhi, Minister of Health- 2001.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Ghosepally(V), Keerthi(N), Medchal Dist. T.S. - 501204

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)**

**NANO BASED DRUG DELIVERY SYSTEMS (Open Elective - II)**

**Course Objective** - To develop expertise regarding suitability and evaluation of nanomaterials, able to apply the properties to the fabrication of nanopharmaceutical, evaluate the intensity of dosage forms and availability for targeting and controlled delivery.

**Course Outcomes** – The students should be able to select the right kind of materials, able to develop nano formulations with appropriate technologies, evaluate the product related test and for identified diseases

**UNIT I – Introduction to Nanotechnology**

- Definition of nanotechnology
- History of nanotechnology
- Unique properties of nanomaterials
- Role of size and size distribution of nanoparticles properties, classification.

**UNIT II – Synthesis of Nanomaterials**

- a) Physical, chemical and biological Methods
- b) Methods for synthesis of
  - Gold nanoparticles
  - Magnetic nanoparticles
  - Polymeric nanoparticles
  - Self – assembly structures such as liposomes, micelles, aquasomes and nanoemulsions

**UNIT III – Biomedical applications of Nanotechnology**

- a) Nanotechnology products used for in vitro diagnostics
- b) Improvements to medical or molecular imaging using nanotechnology
- c) Targeted nanomaterials for diagnostic and therapeutic purpose

**UNIT IV**

Design of nanomaterials for drug delivery, pulmonary and nasal drug delivery, nanomaterials for cancer therapy and cardiovascular diseases. Localized drug delivery systems.

**UNIT V**

Characterization including the principles, size reduction, analysis of nanoparticles, size, PDI, size separation, stability, methods of analysis regarding integrity and release of drugs

**RECOMMENDED BOOKS:**

1. Nanomedicine and Nanoproducts: Applications, Disposition and Toxicology in the Human body, Eiki Igarashi, CRC press. 2015
2. Nanotechnology and Drug Delivery Volume one and two: Nanoplatfroms in Drug Delivery, Jose L. Arias, CRC press
3. Nano: The Essentials: Understanding Nanoscience and Nanotechnology, T.Pradeep, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
4. Nanocrystals: Synthesis, Properties and Applications, C. N. R. Rao, P. J. Thomas and G.U. Kulakarni, Springer (2007)
5. Nanostructures and Nanomaterials: Synthesis, Properties and Application, Guozhong Gao, Imperial College Press(2004)

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.

6. Nanochemistry: A Classical Approach to Nanomaterials – Royal Society for Chemistry, Cambridge, UK (2005)
7. Nanocomposite science and technology, pulickel M. Ajayan, Linda S. Schadler, paul V. Braun, Wiley-VCH Verlag, Weiheim (2003)
8. Nanoscale materials in chemistry, Edited by Kenneth J. Klabunde, John Wiley & Sons, 2009
9. Nanoparticles as Drug carriers, Vladimir P Torchiling, Imperial College Press, USA, 2006

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerajali(V), Keesara(M), Medchal Dist, T.S.-501304



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)**

**NUTRACEUTICALS (Open Elective - II)**

**Course Objectives:** The students will expose to characteristic features of various phytochemicals as nutraceuticals in various diseased conditions and also know the role of antioxidant in free radical induced disease conditions and will expose to various food laws and regulations

**Course Outcome:** Helps the student to understand the importance of Nutraceuticals in various common problems with the concept of free radicals.

**UNIT I**

- a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer etc.
- b. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods:  
Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

**UNIT II**

Phytochemicals as nutraceuticals: Occurrence and characteristic features(chemical nature medicinal benefits) of following

- a) Carotenoids-  $\alpha$  and  $\beta$ -Carotene, Lycopene, Xanthophylls, lutein
- b) Sulfides: Diallylsulfides, Allyltrisulfide.
- c) Polyphenolics: Resveratrol
- d) Flavonoids- Rutin, Naringin, Quercetin, Anthocyanidins, catechins, Flavones
- e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum
- f) Phytoestrogens : Isoflavones, daidzein, Geobustan, lignans
- g) Tocopherols

**UNIT III**

- a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.
- b) Measurement of free radicals: Lipid peroxidation products, lipid hydroperoxide, malondialdehyde.

**UNIT IV**

- a. Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.
- b. Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E,  $\alpha$ - Lipoic acid, melatonin  
Synthetic antioxidants: Butylatedhydroxy Toluene, Butylatedhydroxy Anisole.

**UNIT V**

**Food Laws and Regulations;** FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.

**Regulations and Claims** – Current Products: Label Claims, Nutrient Content Claims, Health Claims, Dietary Supplements Claims

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501303.

#### REFERENCES:

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and nutraceuticals in preventing diseases by K. T Agusti and P. Faizal: BS Publication.
3. Advanced Nutritional Therapies by Cooper. K. A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F. Balch and Phyllis A. Balch 2<sup>nd</sup> Edn. Avery Publishing Group, NY (1997).
6. G. Gibson and C. Williams Editors *2000 Functional foods* Woodhead Publ. Co. London.
7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
8. Labuza, T. P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional Foods* M. K. Sachmidl and T. P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition. Lea and Febiger

*Signature*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Kaesara(M), Medchal Dist. T.S.-501301.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year –II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)**

**ENTREPRENEURSHIP MANAGEMENT (Open Elective - II)**

**Course Objective:** This course is designed to impart knowledge and skills necessary to train the students on entrepreneurship management.

**Course Outcome:** On completion of this course it is expected that students will be able to understand,

- The Role of enterprise in national and global economy
- Dynamics of motivation and concepts of entrepreneurship
- Demands and challenges of Growth Strategies And Networking

**UNIT I**

Conceptual Frame Work: Concept need and process in entrepreneurship development. Role of enterprise in national and global economy. Types of enterprise – Merits and Demerits. Government policies and schemes for enterprise development. Institutional support in enterprise development and management.

**UNIT II**

Entrepreneur: Entrepreneurial motivation – dynamics of motivation. Entrepreneurial competency – Concepts. Developing Entrepreneurial competencies - requirements and understanding the process of entrepreneurship development, self-awareness, interpersonal skills, creativity, assertiveness, achievement, factors affecting entrepreneur role.

**UNIT III**

Launching And Organizing An Enterprise: Environment scanning – Information, sources, schemes of assistance, problems. Enterprise selection, market assessment, enterprise feasibility study, SWOT Analysis. Resource mobilization -finance, technology, raw material, site and manpower. Costing and marketing management and quality control. Feedback, monitoring, and evaluation.

**UNIT IV**

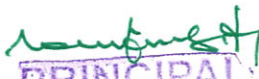
Growth Strategies And Networking: Performance appraisal and assessment. Profitability and control measures, demands and challenges. Need for diversification. Future Growth – Techniques of expansion and diversification, vision strategies. Concept and dynamics. Methods, Joint venture, co-ordination and feasibility study.

**UNIT V**

Preparing Project Proposal to Start on New Enterprise Project work – Feasibility report; Planning, resource mobilization and implementation.

**TEXT AND REFERENCE BOOKS:**

1. Akhauri, M.M.P.(1990): Entrepreneurship for Women in India, NIESBUD, New Delhi.
2. Hisrich, R. D & Brush, C.G.(1996) The Women Entrepreneurs, D.C. Health & Co., Toronto.
3. Hisrich, R. D., and Peters, M.P. (1995): Entrepreneurship – Starting, Developing and Managing a New Enterprise, Richard D., Inwin, INC, USA.
4. Meredith, G. G. etal (1982): Practice of Entrepreneurship, ILO, Geneva.
5. Patel, V.C. (1987): Women Entrepreneurship – Developing New Entrepreneurs, Ahmedabad EDII
6. Arya kumar.(2012): Entrepreneurship- Creating and Leading an Entrepreneurial Organization, Pearson

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Mettara Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)

CLINICAL RESEARCH AND PHARMACOVIGILANCE (Open Elective - II)

**Course Objective:** This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing, and reporting of clinical trials. This subject also focuses on global scenario of pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in pre-clinical, clinical phases of drug development and post market surveillance.

**Course Outcome:** Upon completion of the course, the student shall be able to,

- Explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in pharmacovigilance

**UNIT - I**

**Regulatory Perspectives of Clinical Trials:** Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR, Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process

**UNIT - II**

**Clinical Trials: Types and Design:** Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management.

**UNIT - III**

**Clinical Trial Documentation:** Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. predictability and preventability assessment. Management of adverse drug reactions; Terminologies of ADR.

**UNIT- IV**

**Basic aspects, terminologies, and establishment of pharmacovigilance:**

History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, Establishing pharmacovigilance centres in Hospitals, Industry and National programmes related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance.

*Signature of*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501304

## UNIT - V

### Methods, ADR reporting and tools used in pharmacovigilance:

International classification of diseases, International Nonproprietary names for drugs, Passive and Active surveillance, Comparative observational studies, targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for evaluating medication safety Data.

### REFERENCES:

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice. E6; May 1996.230
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
8. Textbook of PHarmacovigilance: Concept and Practice. G. P. Mohanta and P. K. Manna. 2016, Pharma Med Press.
9. A textbook of Clinical Pharmacy Practice: Essential Concepts and Skills. Second Edition, 2012, University Press

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)

ADVANCED DRUG DELIVERY SYSTEMS LAB

List of Experiments

1. Study on diffusion of drugs through various polymeric membranes (2 experiments)
2. Formulation and evaluation of sustained release oral matrix tablet (2 experiments)
3. Formulation and evaluation of sustained release oral reservoir system. (2 experiments)
4. Formulation and evaluation of microspheres / microencapsules (2 experiments)
5. Study of in-vitro dissolution of various SR products in market (2 experiments)
6. Formulation and evaluation of transdermal films (2 experiments)
7. Formulation and evaluation mucoadhesive system (2 experiments)
8. Preparation and evaluation enteric coated pellets / tablets. (2 experiments)

*Sanjiv*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Greeraj(V), Keesara(V), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (Pharmaceutics/ Pharmaceutical Technology)

MODERN PHARMACEUTICS LAB

List of Experiments

1. Preparation of four different types of semisolid forms and evaluation of their performance using in vitro diffusion method
2. Evaluation of test sterility for commercial preparations including sterile water for injection and antibiotic injection.
3. Collecting samples of environment of aseptic room and counting the colonies
4. Validation of one unit operation (eg. Mixing) and development of protocol.
5. Comparative evaluation of different marketed products (tablets) of the same API
6. Dissolution studies of drug in three different bio relevant dissolution media
7. Stability study testing of tablet dosage forms (Any two products)

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Madchal Dist. T.S. 501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Pharmacy (PHARMACEUTICAL ANALYSIS & QUALITY ASSURANCE) / (QUALITY ASSURANCE)

COURSE STRUCTURE AND SYLLABUS  
Effective from Academic Year 2017-18 Admitted Batch

I Year – I Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course I	Advanced Pharmaceutical Analysis	25	75	4	--	4
Core Course II	Food Analysis	25	75	4	--	4
Core Course III	Modern Pharmaceutical Analytical Techniques	25	75	4	--	4
Core Elective I	1. Pharmaceutical Validation 2. Intellectual Property Rights	25	75	4	--	4
Open Elective I	1. Drug Regulatory Affairs 2. Pharmacoepidemiology and Pharmacoeconomics 3. Pharmaceutical Management 4. Herbal Cosmetics Technology 5. Pharmaceutical Formulation Technology	25	75	4	--	4
Laboratory I	Modern Pharmaceutical Analytical Techniques Lab	25	75	-	-6	3
Laboratory II	Advanced Pharmaceutical Analysis Lab	25	75	--	6	3
Seminar I	Seminar	100	--	--	4	2
<b>Total Credits</b>		<b>275</b>	<b>525</b>	<b>20</b>	<b>16</b>	<b>28</b>

I Year – II Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Advanced Instrumental Analysis	25	75	4	--	4
Core Course V	Quality Control and Quality Assurance	25	75	4	--	4
Core Course VI	Modern Bio analytical Techniques	25	75	4	--	4
Core Elective II	1. Biostatistics And Research Methodology 2. Spectral Analysis	25	75	4	--	4
Open Elective II	1. Screening Methods in Pharmacology 2. Stability of Drugs and Dosage Forms 3. Entrepreneurship management 4. Nano Based Drug Delivery Systems 5. Herbal & Cosmetics Analysis	25	75	4	--	4
Laboratory III	Advanced Instrumental Analysis Lab	25	75	-	6	4
Laboratory IV	Quality Control and Quality Assurance Lab	25	75	--	6	2
Seminar II	Seminar	100	--	--	4	2
<b>Total Credits</b>		<b>275</b>	<b>525</b>	<b>20</b>	<b>16</b>	<b>28</b>



*Signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Uthayal(V), Keesara(M), Medchal Dist. T.S.-501301



II Year - I Semester

Course Title	Int. marks	Ext. marks	L	P	C
Comprehensive Viva-Voce	--	100	--	--	4
Project work Review II	100	--	--	24	12
<b>Total Credits</b>	<b>100</b>	<b>100</b>	<b>--</b>	<b>24</b>	<b>16</b>

II Year - II Semester

Course Title	Int. marks	Ext. marks	L	P	C
Project work Review III	100	--	--	8	4
Project Evaluation (Viva-Voce)	--	100	--	16	12
<b>Total Credits</b>	<b>100</b>	<b>100</b>	<b>--</b>	<b>24</b>	<b>16</b>

\$ For Project review I, please refer 7.9 in R17 Academic Regulations

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PAQA /QA)

ADVANCED PHARMACEUTICAL ANALYSIS (Core course-I)

**Course Objective:** The principles and procedures for the determination of various pharmaceutical bulk drugs and their formulations belonging to different categories are discussed in detail. The applications of the important reagents like MBTH, FC, PDAB etc. in the determination of the pharmaceuticals are also discussed.

**Course Outcome:** The quantitative determination of various organic compounds is clearly understood. The spectral analysis, dissolution parameters and microbial assays are also learned.

**UNIT - I**

Principles and procedures involved in the determination of the official compounds in IP with the following analytical techniques

- |                        |                          |
|------------------------|--------------------------|
| A. Non-aqueous         | C. Complexometric        |
| B. Oxidation-reduction | D. Diazotization methods |

**UNIT - II**

A detailed study of the principles and procedures involved in the quantitative determination of the following organic functional groups

- |                |                         |
|----------------|-------------------------|
| A. Amines      | C. Carbonyl compounds   |
| B. Esters      | D. Hydroxy and carboxyl |
| E. Amino Acids |                         |

**UNIT - III**

- a. **Reference Standards:** Types, preparation methods and uses.
- b. Principles and procedures involved in using the following reagents in the determination of pharmaceutical dosage forms official in IP
- MBTH (3-methyl-2-benzothiazolone hydrazone)
  - F.C. Reagent (Folin-Ciocalteu)
  - PDAB (*para*-Dimethyl Amino Benzaldehyde)
  - 2, 3, 5 - *tri*Phenyltetrazolium salt
  - 2,6 *di*-ChloroquinoneChlorimide
  - N* - (1-naphthyl) ethylenediaminedihydrochloride (B.M. Reagent)
  - Carr – Price Reagent
  - 2,4 - DNP

**UNIT - IV**

- a. **Atomic Absorption Spectrometry (AAS):** Principle, instrumentation, sample automation techniques, interferences. Elemental analysis such as determination of Sodium, Potassium, Calcium, Chlorine, Bromine and Iodine.
- b. **Radio chemical methods including RIA:** Radio Active Isotopes, tagging of compounds, Labeled Reagents, Isotope dilution Analysis, Scintillation counter, RIA.

**UNIT - V**

- a. **Dissolution Tests :** Types of Dissolution apparatus, dissolution test requirements for immediate release, delayed release, extended release dosage forms, coated ,uncoated, enteric coated, gelatin capsules etc..



*Handwritten signature in green ink*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Geethanjali (V), Keerasidoli (M), Medchal Dist, T.S., 501303

- b. **Microbiological assays and Biological tests:** Antimicrobial effectiveness testing, microbial limit tests, sterility test. Antibiotics-microbial assays, bacterial endotoxins test.

**TEXT BOOKS**

1. Pharmaceutical Chemistry by Becket and Stanlake
2. Pharmaceutical Analysis by Higuchi, Bechmman and Hassan
3. Instrumental Methods of Chemical Analysis By B.K. Sharma
4. A Text Book of Pharmaceutical Analysis by Kennenth A. Connors

**REFERENCES:**

1. Remington's Pharmaceutical Sciences by Alfonso and Gennaro
2. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P.D. Sethi
3. Indian Pharmacopoeia 2010
4. Journals (Indian Drugs, IJPS etc.)

*Geethanjali*  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PAQA / QA)

FOOD ANALYSIS (Core course–II)

**Course Objective:**

This course is designed to impart knowledge on analysis of food constituents and finished food products. The course includes application of instrumental analysis in the determination of pesticides in variety of food products.

**Course Outcome:** At completion of this course student shall be able to understand various analytical techniques in the determination of

- Food constituents
- Food additives
- Finished food products
- Pesticides in food
- And also student shall have the knowledge on food regulations and legislations

**UNIT - I**

- Carbohydrates:** Classification and properties of food carbohydrates, General methods of analysis of food carbohydrates,
- Proteins:** Chemistry and classification of amino acids and proteins, Physico-Chemical properties of protein and their structure, general methods of analysis of proteins and amino acids

**UNIT - II**

**Lipids:** Classification, general methods of analysis, refining of fats and oils; hydrogenation of vegetable oils, Determination of adulteration in fats and oils,

**UNIT - III**

- Quality Control of Excipients:** Tests related to excipients such as bulk density, tapped density, particle size distribution, pH, moisture content, viscosity (dynamic), loss on drying, ash content, conductivity.
- Excipients of interest:** disintegrating agents, binders, emulsifiers, viscosity modifiers and preservatives including preservative challenge test.

**UNIT - IV**

**Vitamins:** Classification of vitamins, methods of analysis of vitamins, Principles of microbial assay of vitamins of B-series

**UNIT - V**

In process quality control tests carried on the following dosage forms

- A. Tablets                      B. Capsules                      C. Parenterals                      D. Liquid Orals

**TEXT BOOKS:**

1. Pharmaceutical Chemistry by Beckett and Stanlake
2. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P.D.Sethi
3. Pharmaceutical Analysis by Higuchi, Bechman and Hassan
4. Theory and Practice of Industrial Pharmacy by Lieberman and Lachman
5. Ahuja S, Alsante KM. Handbook of isolation and characterization of impurities in pharmaceuticals. Academic press, California, 2003

*Geethanjali*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerlyal(V), Keesara(M), Medchal Dist. T.S.-501301.

**REFERENCE BOOKS:**

1. Remington's Pharmaceutical Sciences by Alfonso and Gennaro
2. David Pearson. The Chemical Analysis of Foods, 7<sup>th</sup> ed., Churchill Livingstone, Edinburgh, 1976.
3. Nielsen S. Introduction to the chemical analysis of foods. Jones & Bartlett Publishers, Boston, 1974
4. Indian Pharmacopoeia 2012

*Geethanjali*  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PAQA / QA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (Core course - III)

**Course Objective:** The course is designed to impart the knowledge in the field of Pharmaceutical Analysis. The various modern analytical techniques like UV-Visible, IR, NMR, Mass, GC, HPLC, different chromatographic methods and other important topics are taught to enable the students to understand and apply the principles involved in the determination of different bulk drugs and their formulation. In addition to the theoretical aspects, the basic practical knowledge relevant to the analysis is also imparted.

**Course Outcome:** Appreciable knowledge will be gained by the students in the Modern Analytical Techniques and can apply the theories in the Analysis of various bulk drugs and their formulations. The students will also be in a position to apply their knowledge in developing the new methods for the determination and validate the procedures.

**UNIT - I**

**Introduction to chromatography and classification of chromatographic methods based on the mechanism of separation**

- a. Column Chromatography: Adsorption and partition, theory, preparation, procedure and methods of detection
- b. Thin Layer Chromatography: Theory, preparation, procedures, detection of compounds
- c. Paper Chromatography: Theory, different techniques employed, filter papers used, qualitative and quantitative detection
- d. Counter – current extraction, solid phase extraction techniques, gel filtration

**UNIT - II**

- a. **Gas chromatography:** Introduction, fundamentals, instrumentation, columns: preparation and operation, detection, dramatization.
- b. **HPLC:** Principles and instrumentation, solvents and columns used, detection and applications
- c. **HPTLC:** Theory and principle, instrumentation, elution techniques and pharmaceutical applications

**UNIT - III**

- a. **UV-Visible spectroscopy:** Introduction, electromagnetic spectrum, absorbance laws and limitations, instrumentation-design and working principle, chromophore concept, auxochromes, Wood-Fisher rules for calculating absorption maximum, applications of UV-Visible spectroscopy
- b. **IR spectroscopy:** Basic principles-Molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, sampling techniques, instrumentation, interpretation of spectra, FT-IR, theory and applications

**UNIT - IV**

**Mass spectroscopy:** Theory, ionization techniques: electron impact ionization, chemical ionization, field ionization, fast atom bombardment, plasma desorption, fragmentation process: types of fission, resolution, GC/MS, interpretation of spectra and applications for identification and structure determination.


  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.

#### UNIT - V

NMR: Theory, instrumentation, chemical shift, shielding and deshielding effects, splitting of signals, spin-spin coupling, proton exchange reactions, coupling constant(J), nuclear overhauser effect(NOE),  $^{13}\text{C}$ . NMR spectra and its applications, 2D-NMR, COSY and applications in pharmacy.

#### REFERENCES:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth
12. Indian Pharmacopoeia 2007
13. High Performance thin layer chromatography for the analysis of medicinal plants by Eike Reich, Anne Schibli
14. Introduction to instrumental analysis by Robert. D. Braun

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PAQA / QA)

PHARMACEUTICAL VALIDATION (Core Elective - I)

**Course Objective:** The main purpose of the subject is to understand about validation and how it can be applied to industry and thus to improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

**Course Outcome:** Upon completion of the subject student shall be able to

- Explain the aspect of validation
- Carryout validation of manufacturing processes
- Apply the knowledge of validation to instruments and equipments
- Validate the manufacturing facilities

**UNIT - I**

**Introduction:** Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan.

**UNIT - II**

**Qualification:** User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Installation Qualification, Operational Qualification, Performance Qualification, Re - Qualification (Maintaining status-Calibration Preventive Maintenance, Change management), Qualification of Manufacturing Equipments, Qualification of Analytical Instruments and Laboratory equipments.

**UNIT - III**

**Qualification of analytical instruments:** Electronic balance, Ph meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC

**Qualification of Glassware:** Volumetric flask, pipette, Measuring cylinder, beakers and burette.

**UNIT - IV**

**Validation of Utility systems:** Pharmaceutical Water System & pure steam, HVAC system, Compressed air and nitrogen.

**Cleaning Validation:** Cleaning Validation - Cleaning Method development, Validation and validation of analytical method used in cleaning. Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP).

**UNIT - V**

**Analytical method validation:** General principles, Validation of analytical method as per ICH guidelines and USP.

**REFERENCES:**

1. B. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.
4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco, (Marcel Dekker).



5. Michael Levin, Pharmaceutical Process Scale-Up, Drugs and Pharm. Sci. Series, Vol. 157, 2nd Ed., Marcel Dekker Inc., N.Y.
6. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
7. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
8. Validation of Pharmaceutical Processes: Sterile Products, Frederick J. Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker, 2nd Ed.
9. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam, Y.C. Lee, Yue. Zhang, Wiley Inter Science.

*Signature*  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PAQA / QA)

INTELLECTUAL PROPERTY RIGHTS (Core Elective – I)

**Course Objective:** Various types of Intellectual Property Rights Patentable Subject History of Indian Patent Protection, Patent filing procedure in India, Opposition- pre-grant opposition and post-grant opposition, Patent filing procedure under PCT, advantages, patent search and literature and Salient features of Indian Patents are discussed in detail.

**Course Outcome:** The clear information about the patent laws, intellectual property rights and drug regulation in India and abroad is gained by the students.

**UNIT - I**

Introduction, Types of Intellectual Property Rights (Patents, Trademarks, Copyrights, Geographical Indications Industrial Designs and Trade secrets), Patentable Subject Matter (Novelty, Non-Obviousness, Utility, enablement and Best mode),

**UNIT - II**

- a. History of Indian Patent Protection, Rationale behind Patent System, Objectives and Advantages of Patent System, and future challenges. Indian Patents Act 1970, Definitions and Key Terminology, Types of Patent applications, Inventions not patentable (section 3 and 4).
- b. Patent filing procedure in India (Patent Prosecution), Specifications (Provisional and Complete), Claims- types of claims and legal importance of claims, Grant of patent, Rights of Patentee and co-owners
- c. Opposition- pre-grant opposition and post-grant opposition, Anticipation, Infringement, Compulsory Licensing, revocation of patents, and power of Controller.
- d. Patent filing procedure under PCT, advantages, patent search and literature

**UNIT - III**


- a. Salient features of Indian Patents (Amendments) Act 1999, 2002 and 2005. US and European Patent System,
- b. Background, Salient Features and Impact of International Treaties / Conventions like
  1. Paris Convention, Berne convention
  2. World Trade Organization (WTO)
  3. World Intellectual Property Organization (WIPO)
  4. Trade Related Aspects of Intellectual Property Rights (TRIPS)
  5. Patent Co-operation Treaty (PCT), Madrid Protocol

**UNIT - IV**

- a. PCT Application procedure and review procedure
- b. National phase application procedure for US& EU
- c. Patent prosecution procedure in US and EU
- d. WIPO and its role in IPR
- e. Hatch- Waxman provision for IPR

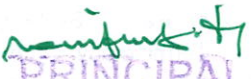
**UNIT - V**

- b. Patent in validation process in India, US and Europe
- c. IPR related to copyright, trade mark, trade secret and geographical indication.
- d. Patent application writing
- e. Claim construction and claims.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.

**RECOMMENDED BOOKS:**

1. Research Methodology concepts and cases by Depak Chawla, Neena Sondhi
2. Draft manual of Patent Practice and Procedure -2008 , The Patent Office, India
3. Manual of Patent Office Practice and Procedure -2010
4. Original Laws Published by Govt. of India
5. Protection of Industrial Property rights by P. Das and Gokul Das
6. Law and Drugs, Law Publications by S. N. Katju
7. Laws of drugs in India, Hussain
8. New drug approval process, 5<sup>th</sup> edition, by Guarino
9. Commercial Manual on Drugs and Cosmetics 2004, 2<sup>nd</sup> edition
10. Drugs and Cosmetics act by Vijay Malik
11. Good Manufacturing Practices for Pharmaceuticals, S.H. Wiling, Vol. 78, Marcel Decker.
12. fda.org,wipo.int,patentlawlinks.com, hc-sc.gc.ca,ich.org,cder.org
13. Current good manufacturing practices for pharmaceuticals by Manohar A. Potdar
14. Pharmaceutical Regulatory affairs –selected topics. CVS subhramanyam and J Thimma settee. Delhi, Vallabha Prakasham, 2012

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (PAQA / QA)

DRUG REGULATORY AFFAIRS (Open Elective - I)

**Course Objective:** The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

**Course Outcomes:**

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authorization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

**UNIT - I**

A study of regulatory aspects that affect drug product design, manufacture and distribution in India with special emphasis on the detailed study of the following Acts (with latest amendments)

**UNIT - II**

The Drugs and Cosmetics Act, 1940 and Rules there under. Recent amendments to Drugs and Cosmetic Act and other relevant rules.

Drugs (Price Control) Order in force. Loan license (contract manufacture). Certification and licensing procedures.

**UNIT - III**

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act; Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

**UNIT - IV**

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.

Quality, safety and legislation for cosmetic products and herbal products.

**UNIT - V**

**Governing Regulatory Bodies across the globe.**

Country Authority Submission


- a. U.S Food & Drug Administration USDMF
- b. Canada Therapeutic Product Directorate DMF
- c. Europe
  - 1) European Medicines Agency (EMEA/ National Authorities) EDMF
  - 2) European Directorate for Quality of Medicines CEP/COS & Health Care Products
- d. Product Filing
- e. Responding Regulatory Deficiencies
- f. Final Approval Procedure

Preparation, review, and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

**TEXT AND REFERENCE BOOKS:**

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (PAQA / QA)

PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS (Open Elective –I)

**Course Objective:**

This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

**Course Outcome:** Upon completion of this course it is expected that students shall be able to:

- Understand the various epidemiological methods and their applications
- Understand the fundamental principles of Pharmacoeconomics.
- Identify and determine relevant cost and consequences associated with pharmacy products and services.
- Perform the key Pharmacoeconomics analysis methods
- Understand the Pharmacoeconomic decision analysis methods and its applications.
- Describe current Pharmacoeconomic methods and issues.
- Understand the applications of Pharmacoeconomics to various pharmacy settings.

**UNIT- I**

**Introduction to Pharmacoepidemiology:**

Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio

**UNIT- II**

**Pharmacoepidemiological Methods:**

Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

**UNIT- III**

**Introduction to Pharmacoeconomics:**

Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs. Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost Effective Ratio, Average Cost Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.

**UNIT- IV**

**Pharmacoeconomic evaluations:**

Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA), Cost Benefit Analysis (CBA), Cost

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301.

Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA).

#### UNIT - V

##### **Definition, Steps involved, Applications, Advantages and disadvantages of the following:**

Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures. Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in pharmacoeconomic analysis, Applications of pharmacoeconomics.

#### REFERENCES:

1. Rascati K L. Essentials of Pharmacoeconomics, Wouters Kluwer Lippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modelling for Health Economic Evaluation, Oxford University Press, London.
4. K G Revikumar, Pharmacoepidemiology and Pharmacoeconomics Concepts and Practices.
5. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programmes Oxford University Press, London.
6. George E Mackinnon III. Understanding health outcomes and pharmacoeconomics.
7. Graker, Dennis. Pharmacoeconomics and outcomes.
8. Walley, Pharmacoeconomics.
9. Pharmacoeconomic – ed. by Nowakowska – University of Medical Sciences, Poznan.
10. Relevant review articles from recent medical and pharmaceutical literature
11. Guru Prasad Mohanta and P K Manna, Textbook of Pharmacovigilance Concepts and Practice

*Sanjiv K*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (PAQA / QA)

PHARMACEUTICAL MANAGEMENT (Open Elective – I)

**Course Objective:** The topics which are present in the pharmaceutical management are very much useful to the students in personality development become a perfect pharma professional.

**Course Outcomes:**

- These topics are useful for the students to know how to manage a pharma industry and its various departments viz QA, QC, RA, Production etc.
- Along with this it aids the students to develop leadership qualities, communication & interpersonal skills, decisions making, motivation, organization & various managerial functions & professional skills required for a dynamic professional.
- Management helps to understand the concept of managerial control, its levels & role, importance in pharma industry

**UNIT - I**

Pharmaceutical Management: Meaning, Evolution-scientific, administrative and human relation approach. Process of management: Planning, organizing, staffing, directing, coordinating and controlling—a preliminary idea of concepts, processes and techniques.

**UNIT - II**

Fundamental concepts of production, financial, personal, legal and marketing functions with special reference to Pharmaceutical Management. Introduction to budgeting, costing, accounting, auditing, and budgetary control. Entrepreneurship development.

**UNIT - III**

Understanding organizations: Meaning, process, types of organization structures and departmentation, line/staff authority, promoting organizational culture. Organizations, pharmaceutical services and functioning of hospital pharmacy, bulk drug unit, formulation unit, Ayurvedic and Unani manufacturing units and testing labs etc.

**UNIT - IV**

**Professional Managers;** Tasks, responsibilities and skills needed. Leadership; Styles and managing change. Decision Making; Types, procedures, evaluation and selection of alternatives, decision making under various situations. Management information and decision support systems and time management.

**Personnel Management:** Job Analysis, recruitment, selection, orientation and training, performance appraisal and compensation. Retrenchment, lay off and discharge.

**UNIT - V**

Management of Industrial Relations: Industrial disputes, settlement of disputes through various routes such as bargaining, etc.

Motivational aspects, theories of motivation, group dynamics, rewards and incentives, interpersonal skills, significance of communication, its processes, measures for effective communication, conflict management. Stress management.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



**TEXT AND REFERENCE BOOKS:**

1. Marketing Management by Philip Kotlar; Prentice-Hall of India Ltd., New Delhi.
2. Management and Organization by Louis A. Allen; McGraw Hill, Tokyo.
3. Corporate Strategy by Ansoff, H.T.; McGraw Hill, New York.
4. Modern Management by Hempran David R.; McGraw Hill, New York.
5. Management by Stoner and Freeman; Prentice Hall, New Delhi.
6. Motivation and Personality by Maslow, Abraham, Harper & Row, New York.
7. Management of Organizational Behavior, Utilizing the Human Resources by Harcey, Paul and Blanchard Kenneth; Prentice Hall of India, New Delhi
8. Organization Structure, Process and out comes V<sup>th</sup> Edition Richard. H. Hall
9. Principles and Methods of Pharmacy Management III<sup>rd</sup> Edition Harry A. Smith.
10. Management "Global Perspective Heinz Weihrich, Harold Koontz by Tata Mcgraw Hill".
11. Personnel Management and Industrial Relations by P. C. Tripathi.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (PAQA / QA)

HERBAL COSMETICS TECHNOLOGY (Open Elective - I)

**Course Objective:**

The topics helps the students to get exposed to processes involved in the manufacturing of herbal cosmetics including the skin and hair care herbal products preparation and their evaluation

**Course Outcome:** Students will learn about the raw materials used in herbal cosmetics and get exposed to various preparations herbal cosmetics.

**UNIT - I**

- a) Introduction, historical background and present status of Herbal cosmetics
- b) Processes used in the manufacture of cosmetics-Emulsification, Mixing, compaction, Moulding, Packing. Raw materials used in preparation of herbal cosmetics
- c) Machinery and Equipment for Cosmetics: Cream, Liquid, Powder and emulsion making machinery
- d) Quality, safety and efficacy of Herbal cosmetics

**UNIT - II**

**Skin care Products:** Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like Creams, Lotions, Lipsticks, face packs. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

**UNIT - III**

**Hair care Products:** Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like hair dyes, creams, Lotions, Jels, oils and Shampoos. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

**UNIT - IV**

A brief account of following herbals or herb extracts or herbal products of cosmetic importance such as *Acacia concinna* pods, Aloe Vera, Almond oil, Neem, *Citrus aurantium* peels, Henna, Turmeric, Liquorice, Olive oil, tea tree oil and wheat germ oil with special emphasis on their source, active principles and cosmetic properties.

**UNIT - V**

- a) General Principles of Quality control and standardization of cosmetics-Raw material control, Packaging material control, finished product control, Shelf testing.
- b) Natural colorants : Biological Source, coloring principles, chemical nature and usage of the following Annato, Cochineal, Caramel, Henna, Indigo, Madder, Saffron , Turmeric
- c) Flavors and Perfumes : Sandal wood oil, Orange oil, Lemon oil, Vanilla, Palmarosa, geranium oil

**REFERENCES:**

1. Cosmetics- Formulation, Manufacturing and Quality control –P.P. Sharma
2. Herbal Cosmetics Hand Book- H. Panda
3. Herbal Cosmetics by P. K Chattopadhyay
4. The Complete Technology Book on Herbal Perfumes and Cosmetics by H. Panda

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (PAQA / QA)

PHARMACEUTICAL FORMULATION TECHNOLOGY (Open Elective – I)

**Course Objectives:** Students will know the preformulation studies, methodology, different excipients used in solid dosage forms and their evaluation with references to production technologies. The students also know the optimization techniques and their applications in pharmaceutical industries.

**Course Outcome:** Students shall explain the preformulation parameters, apply ICH guidelines and evaluate drug, drug excipients compatibility. Students also explain about formulation and development, use of excipients in tablets, powders, capsules, micro-encapsules and coating techniques. They also learn and apply the statistical design in different formulations.

**Unit - I:**

**Preformulation:** Goals of preformulation, solid state manipulation and characterization. pH dependent solubility of drug, equilibrium solubility, intrinsic dissolution of drug, particle size distribution.

**Flow of Powders:** Physical properties and importance. Angle of repose, Carr's index, compressibility, bulk density, tapped density.

**Unit - II:**

Excipients used in various dosage forms like tablets, capsules, emulsions, suspensions, semisolids and sterile products. Knowledge of packing materials. Drug- excipient compatibility- Drug stability, factors affecting stability, stabilization methods.

**Unit - III:**

**Tablets:** Types of tablets, granulation methods, highlighting operations such as mixing, drying, milling, blending, lubrication and compression.

**Tablet coating:** Types of coating, steps involved in coating process- pan coating and fluid bed coating and problems associated with coating.

**Hard Gelatin Capsules:** General principles and steps involved in the production of drug loaded hard gelatin capsules, filling operation, filling of powders, granules and pellets.

**Unit - IV:**

**Dissolution:** Principles of dissolution, factors influencing dissolution, official methods and apparatus. Dissolution of immediate release, controlled release and delayed release products.

**Unit - V:**

**Stability testing:** Chemical degradation and preventive measures. Various stability testing conditions and use of stabilizers in packing

**TEXT BOOKS:**

1. Pharmaceutics - The Science of Dosage form design by ME Aulton.
2. Pharmaceutical Dosage forms - Tablets (Vol I, II and III) by Lieberman, Lachman and Schwartz.
3. Pharmaceutical Dosage forms - Capsules (Vol I, II and III) by Avis, Lieberman and Lachman.
4. Pharmaceutical Dosage forms – Disperse systems (Vol I, II and III) by Avis, Lieberman and Lachman.
5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
6. Pharmaceutical statistics by Bolton

*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerayal(V), Keesara(M), Medchal Dist. T.S.-501301. 20

7. Industrial Pharmacy - Selected Topics , CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

**REFERENCE BOOKS:**

1. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
2. Remington's Science and Practice of Pharmacy by A. Gennaro.
3. Ansel's Pharmaceutical Dosage form and Drug delivery system by Loyd V. Allen, Jr. Nicholas G. Popovich, Howard C. Ansel.
4. Generic Drug Product Development by Leon Shargel and Isadore Kanfer.
5. Dispensing for Pharmaceutical Students by SJ Carter.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (PAQA / QA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES LAB

**List of experiments:**

1. Colorimetry / UV / Visible, Spectroscopy, scanning of few compounds for UV-absorption, calculation of Assay / content uniformity / % of drug release (2-3 experiments.)
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiment base on HPLC (Isocratic and gradient) Techniques – (2 experiments)
4. Incompatibility studies, identification and functional groups – Determination by FTIR (2 experiments)
5. Separation and calculation of Rf values by using paper chromatography, TLC, HPTLC Technique (2-3 experiments)
6. Calibration of glasswares
7. Calibration of pH meter
8. Calibration of UV-Visible spectrophotometer
9. Calibration of FTIR spectrophotometer
10. Calibration of HPLC instrument

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (PAQA / QA)

ADVANCED PHARMACEUTICAL ANALYSIS LAB

List of experiments

1. Determination of official compounds by Non-aqueous titrations
2. Determination of drugs containing di and trivalent metal ions by complexometric titrations
3. Determination of sulfa drugs by diazotization
4. Determination of Vitamin C by redox titration
5. Quantitative determination of hydroxyl group.
6. Quantitative determination of amino group
7. Colorimetric determination of drugs by using different reagents
8. Quantitative determination of pharmaceutical dosage forms belonging to alkaloids, antibiotics, vitamins, glycosides and steroids

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

ADVANCED INSTRUMENTAL ANALYSIS (Core Course - IV)

**Course Objectives:** This subject deals with various hyphenated analytical instrumental techniques for identification, characterization, and quantification of drugs. Instruments dealt are LC-MS, GC-MS, and hyphenated techniques.

**Course Outcome:** By the completion of topics the students will come out with the thorough knowledge of various spectral aspects of X-Ray, IR, SEM, ORD etc which help them in further projects works and also industrial opportunities.

**UNIT - I**

**X-Ray diffraction methods:** Origin of X-rays, basic aspects of crystals, X-ray crystallography, miller indices, rotating crystal techniques, single crystal diffraction, powder diffraction, structural elucidation and applications.

**UNIT - II**

- Biochromatography:** Size exclusion chromatography, ion exchange chromatography, ion pair chromatography, affinity chromatography general principles, stationary phases and mobile phases.
- Super critical fluid chromatography:** Principles, instrumentation, pharmaceutical applications.
- Raman:** Principle (absorption, diffraction, scattering and emission of wave, molecular interaction), instrumentation (Dispersive Raman, FT-Raman), advantage and disadvantage, pharmaceutical applications including detection of counterfeit

**UNIT - III**

Capillary electrophoresis: Overview of CE in pharmaceutical analysis, basic configuration, CE characteristics, principles of CE, methods and modes of CE. General considerations and method Development in CE,

**UNIT - IV**

- DSC:** Principle, thermal transitions, instrumentation (Heat flux and power- compensation designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, Sources of errors) and their influence, advantages and disadvantages, pharmaceutical applications.
- DTA:** Principle, instrumentation, advantage and disadvantage, pharmaceutical application, derivative differential thermal analysis (DDTA).
- TGA:** Principle, instrumentation, factors affecting results, advantages and disadvantages, pharmaceutical application.

**UNIT - V**

- Scanning electron microscope (SEM):** Principles, Instrumentation and applications.
- Optical Rotatory Dispersion (ORD), Circular Dichroism, Cotton effect, Octane rule and applications.

**REFERENCES:**

- Instrumental Methods of Chemical Analysis by B.K Sharma
- Organic spectroscopy by Y.R Sharma
- A Text book of Pharmaceutical Analysis by Kerrenth A. Connors



*Signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Geethanjali, Hyderabad (M), Medchal Dist. T.S. 501304.

4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth
12. Spectroscopy by Donald L Pavia, Gary M Lampman, George S Kriz, James A Vyvyan



*Principal*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeruvu, Keeravani, Medchal Dist. T.S-500301.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

QUALITY CONTROL AND QUALITY ASSURANCE (Core Course - V)

**Course Objectives:** This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications, GLP and regulatory affairs.

**Course Outcome:** The study of this subject builds the confidence in the minds on the students to develop and formulate high quality pharmaceutical products.

**UNIT I**

- Impurity and stability studies:** Definition, classification of impurities in drug Substance or Active Pharmaceutical Ingredients and quantification of impurities as per ICH guidelines.
- Impurities in new drug products:** Rationale for the reporting and control of degradation products, reporting degradation products content of batches, listing of degradation products in specifications, qualification of degradation products
- Impurities in residual solvents:** General principles, classification of residual solvents, Analytical Procedures, limits of residual solvents, reporting levels of residual solvents

**UNIT II**

- Concepts of Quality Assurance, Total Quality Management, Philosophy of GMP and cGMP
- Guidelines for Quality Assurance of Human Blood Products and large volume parenterals.

**UNIT III**

- Organization and personnel, responsibilities, training hygiene
- Premises:** Location, design, plan Layout, construction, maintenance and sanitations, environmental control, sterile areas, control of contamination.
- Equipments:** Selection, purchase specifications, maintenance, clean in place, sterilize in place – Raw – materials: Purchase specifications, maintenance of stores, selection of vendors, controls and raw materials.

**UNIT IV**

- Packaging and labeling controls, line clearance and other packaging materials.
- Quality Control Laboratory: Responsibilities, good laboratory practices, routine controls, instruments, protocols, non-clinical testing, controls on animal house, data generation, and storage.

**UNIT V**

Manufacture and controls on dosage forms

- Manufacturing documents, Master Formula, Batch Formula, Records, Standard Operating Procedures,
- In process quality control on various dosage forms sterile and biological products, standard operating procedures for various operations like cleaning, filling drying, compression, coating, disinfection, sterilization, membrane filtration etc.

**TEXT BOOKS:**

- The International Pharmacopoeia Vol 1,2,3,4, 3<sup>rd</sup> edition General Methods of Analysis Quality Specifications for Pharmaceutical Substances, Excipients, Dosage Forms.
- Quality Assurance of Pharmaceuticals. A Compendium of Guidelines and Related Material Vol. 1 and Vol. 2, WHO 2007)
- GMP by Mehra



*Signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Jeevavalli, Keesara(M), Medchal Dist. T.S.-501301.

4. Pharmaceutical Process Validation by Berry and Nash
5. How to Practice GMP's – P.P. Sharma

**REFERENCES BOOKS:**

1. Basic Tests for Pharmaceutical Substances - WHO (1991)
2. The Drugs and Cosmetic Act 1940 by Vijay Malik
3. Q.A. Manual by D.H. Shah
4. SOP Guidelines by D.H. Shah
5. Quality Assurance Guide by OPPI
6. Good Manufacturing-Practices for Pharmaceuticals, by Graham Bunn and Joseph 6<sup>th</sup> Ed. D. Nally (Dec 26, 2006)



*Signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Keeravalli (V), Keesara (M), Medchal Dist. T.S. 501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

MODERN BIO-ANALYTICAL TECHNIQUES (Core course - VI)

**Course Objectives:** This subject is designed to provide detailed knowledge about the importance of analysis of drugs in biological matrices.

**Course Outcomes:** Upon completion of the course, the student shall be able to understand

- Extraction of drugs from biological samples
- Separation of drugs from biological samples using different techniques
- Guidelines for BA/BE studies

**UNIT I**

Extraction of drugs and metabolites from biological matrices: General need, principle and procedure involved in the Bioanalytical methods such as Protein precipitation, Liquid-Liquid extraction and Solid phase extraction and other novel sample preparation approach.

**UNIT II**

**Biopharmaceutical Consideration:** Introduction, Biopharmaceutical Factors Affecting Drug Bioavailability, In Vitro: Dissolution and Drug Release Testing, Alternative Methods of Dissolution Testing Transport models, Biopharmaceutics Classification System. Solubility: Experimental Methods. Permeability: In-vitro, in-situ and In-vivo methods.

**UNIT III**

**Bioanalysis and bioanalytical method validation:**

- a. Types of body fluids, requirement of analysis, matrix effects, non-biological analytical samples.
- b. Bioanalytical method validation: USFDA and EMEA guidelines. Acceptance criteria in comparison to non-biological samples.

**UNIT IV**

**Pre-Formulation:**

A consideration of following characteristics of medicinal agents in their dosage form:

**Physical characteristics-**

Particle size, polymorphism, crystal form, solubility, Interfacial tension, Salt formation, Wetting of solids, flow characteristics, compressibility, and Partition coefficient.

**Chemical Characteristics-**


**Degradation:** Hydrolytic, oxidative, reductive and photolytic, Drug - Excipient Compatibility studies.

**UNIT V**

- a. **Automation and computer-aided analysis, LIMS:** The concept of auto samplers and high throughput analysis, computer controlled instrumentation and networked laboratory. Peculiarities of laboratory information management systems (LIMS).
- b. **Drug Product Performance, In Vivo:** Purpose of Bioavailability Studies, Bioavailability and Bioequivalence Studies, Clinical Significance of Bioequivalence Studies.

**REFERENCES:**

1. Analysis of drugs in Biological fluids - Joseph Chamberlain, 2nd Edition. CRC Press, New York. 1995.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Pharmaceutical Analysis - Higuchi, Brochman and Hassen, 2nd Edition, Wiley – Interscience Publications, 1961.
4. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series
5. Practical HPLC method Development – Snyder, Kirkland, Glaich, 2<sup>nd</sup> Edition, John Wiley & Sons, New Jersey. USA.
6. Chromatographic Analysis of Pharmaceuticals – John A Adamovics, 2<sup>nd</sup> Edition, Marcel Dekker, Newyork, USA. 1997.
7. Chromatographic methods in clinical chemistry & Toxicology – Roger L Bertholf, Ruth E Winecker, John Wiley & Sons, New Jercy, USA. 2007.
8. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol.69, Marcel Dekker Series, 1995.
9. Good laboratory Practice Regulations – Allen F. Hirsch, Volume 38, Marcel Dekker Series, 1989.
10. ICH, USFDA & CDSCO Guidelines, Palmer

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

BIOSTATISTICS AND RESEARCH METHODOLOGY (Core Elective – II)

**Course Objective:** The student shall know the introduction, scope of biostatistics and Research work, calculation and present of the data. It also informs the students, how the present research work writing and correlating.

**Course Outcome:** The student will be known the Biostatistics arrangement, presentation and formation of tables and charts. They also know the correlation and regression & application of different methods, analysis of data and also learn how to write dissertation, thesis and Research paper.

**UNIT I**

Introduction and scope of biostatistics: Use of statistics in Pharmacy. Population and Sample collection. Stages of research, types of data and methods of data collections. Data arrangement and presentation, formation of table and charts.

**UNIT II**

**Measures of central tendency:** computation of means, median and mode from grouped and ungrouped data.

**Measure of dispersion:** computation of variance, standard deviation, standard error and their coefficients.

**UNIT III**

**Measures of Correlation and Regression:** Experimental designing, planning of an experiment, replication, and randomization. Probit analysis.

**Probability rules:** Binomial, Poisson and Normal distribution.

**Hypothesis testing:** Student't' test, Chi square test, Analysis of Variance (ANOVA): 1-way, 2-way, 3-ways

**UNIT IV**

Developing a research question, Resources for research question,

Literature Review: Traditional Qualitative Review,

Meta-Analysis—A Quantitative Review

Preparation of Research Proposal


Variables—Definition of Variable, Types of variables (Dependent and Independent variables, Confounded variables), Measurement of variables, Types of measurement scales and their comparison. Reliability and Validity of Measurements.

**UNIT V**

The research report paper writing/ thesis writing

Different parts of the research paper

1. Title—Title of project with authors' name
2. Abstract – Statement of the problem, Background list in brief and purpose and scope
3. Key words
4. Methodology- subject, apparatus, instrumentation and procedure
5. Results – tables, graphs figure and statistical presentation
6. Discussion support or non-support of hypothesis, practical and theoretical implications
7. Conclusion
8. Acknowledgements

  
PRINCIPAL  
Geethanjali College of Pharmacy 9  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301

9. References
10. Errata
11. Importance of Spell check for entire projects
12. Uses of footnotes

**TEXT BOOKS:**

1. Deepak Chawla Neena Sondhi, Research Methodology Concepts and Cases, Vikas books publishers
2. Donald H. McBurney -Theresa L. White "Research Methods" (Cengage learning India Pvt. Ltd)

**REFERENCE BOOKS:**

1. Remington's Pharmaceutical Sciences
2. Theory & Practice of Industrial Pharmacy by Lachman
3. Statistics for business and economics 3<sup>rd</sup> edition by Vikas books publications
4. Biostatistics & Computer applications by G N Rao and N K Tiwari
5. Sokal, R.R. and Rohlf, F.J. 1987. An Introduction to Biostatistics. W.H. Freeman and Company.
6. Bailey, N.T.J. 1981. Statistical Methods in Biology. English University Press.
7. Mitchell, K. and Glover, T. 2001. Introduction to Biostatistics. McGraw Hill, Publishing Co.
8. Biostatistics and Computer Applications by G.N. Rao and N.K. Tiwari
9. Fundamentals of Biostatistics by Khan and Khanum
10. Research Methodology by R K Khanna bis and Suvasis Saha
11. Research methods and Quantity methods by G. N. Rao
12. A practical approach to PG dissertation.

  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist, T.S.-501301.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year – II Sem M. Pharm (PAQA/QA)**  
**SPECTRAL ANALYSIS (Core Elective - II)**

**Course Objective:** The students will acquire the knowledge about the various aspects of X-Ray diffraction methods, all types of IR methods, particle sizing methods, also DSC, DTA, TGA etc

**Course Outcome:** By the completion of topics the students will come out with the thorough knowledge of various spectral aspects of X-Ray, IR, SEM, ORD etc which help them in further projects works and also industrial opportunities.

**UNIT - I**

**X-Ray diffraction methods:** Origin of X-rays, basic aspects of crystals, X-ray crystallography, miller indices, rotating crystal techniques, single crystal diffraction, power diffraction, structural elucidation, and applications.

**UNIT - II**

- a. **FT-NIR:** Principle (overtones, combinations, fermi resonance, interferences etc.), instrumentation (dispersion spectrometer and FT-NIR), advantage, and disadvantage, qualitative and quantitative applications, including PAT and non-destructive analysis.
- b. **ATR:** Principle (total internal reflection, evanescent wave, etc.), instrumentation (ATR crystal, IR beam), advantages, and disadvantages, pharmaceutical applications.

**UNIT - III**

**Electrometric Techniques:** Principle, instrumentation and applications of Potentiometer, Amperometer, Conductometer and Polarography.

**UNIT - IV**

- a. **Spectrofluorimetry:** Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analyzed by fluorimetry), Quenchers, Instrumentation, and Applications of fluorescence spectrophotometer.
- b. **Flame emission spectroscopy and Atomic absorption spectroscopy:** Principle, Instrumentation, Interferences, and applications.

**UNIT - V**

**FT- Raman:** Principle (absorption, diffraction, scattering and emission of wave, molecular interaction), instrumentation (Dispersive Raman, FT-Raman), advantage and disadvantage, pharmaceutical applications including detection of counterfeit

**REFERENCES:**

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth
12. Spectroscopy by Donald L Pavia, Gary M Lampman, George S Kriz, James A Vyvyan

*Signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301-11

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

SCREENING METHODS IN PHARMACOLOGY (Open Elective - II)

**Course Objective:** The students are going to study about various techniques for screening of drugs for various pharmacological activities and guide lines for handling animals and human and animal ethics for screening of drugs.

**Course Outcome:** The expected outcomes are students will know how to handle animals and know about various techniques for screening of drugs for different pharmacological activities, guidelines, and regulations for screening new drug molecules on animals.

**UNIT I**

Care Handling and breeding techniques of laboratory animals, Regulations for laboratory animals, CPCSEA guidelines, alternatives to animal studies, Good laboratory Practices.

**UNIT II**

Bioassays: Basic principles of Biological standardization: Methods used in the bio-assay of Rabbits Vaccine, Oxytocin, Tetanus Antitoxin and Diphtheria Vaccine. Test for pyrogens.

**UNIT III**

Toxicity tests: OECD guidelines, determination of LD50, acute, sub-acute and chronic toxicity studies.

**UNIT IV**

Organization of screening for the Pharmacological activity of new substances with emphasis on the evaluation of cardiac and anti-diabetic activities.

**UNIT V**


Organization of screening for the Pharmacological activity of new substances with emphasis on the evaluation of psychopharmacological, anti-inflammatory and analgesic activities.

**TEXT BOOKS:**

1. Screening methods in Pharmacology, Vol.-1&2 by Robert .A. Turner and Peter Hebborn.
2. Drug discovery and evaluation by H. G. Vogel and W. H. Vogel, Springer-Verlag, Berlin Heidelberg.
3. Handbook of experimental pharmacology by S.K. Kulkarni, Vallabh Prakashan, Delhi.

**REFERENCE BOOKS:**

1. ICH of technical requirements for registration of pharmaceuticals for human use, ICH harmonized tripartite guidelines - Guidelines for good clinical practice, E6, May 1996.
2. Good clinical practice - Guidelines for Clinical trials on pharmaceutical products in India, Central drug standard control organization, New Delhi, Minister of Health- 2001.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

STABILITY OF DRUGS AND DOSAGE FORMS (Open Elective - II)

**Course Objective:** These topics are designed impart a specialized knowledge to preserve the properties of drugs and dosage forms during manufacture storage and shelf life. The understanding of properties and evaluation of stability during storage, by solution and solid state against several factors of degradation

**Course Outcome:** The students should describe the evaluation of stability of solutions, solids, and formulations against adverse conditions. The students should be able to suggest the measures to retain stability and storage conditions for retaining the efficacy of the products.

**UNIT - I**

**Drug decomposition mechanisms:**

1. Hydrolysis and acyltransfers: Nature of reaction, structure and utility, stabilization of Pharmaceutical examples.
2. Oxidation: Nature of oxidation, kinetics of oxidation, oxidation pathways of pharmaceutical, Interest Inhibition of oxidation
3. Photolysis: Energetics of photolysis, kinetics photolysis, photolytic reactions of pharmaceutical interest, prevention of photolytic reactions.

**UNIT - II**

Solid state chemical decomposition: Kinetic of solids state decomposition, Pharmaceutical examples of solid state decomposition, Pure drugs, drug excipient and drug-drug interaction in solid state, methods of stabilization.

Physical stability testing of dosage forms:

1. Solids – tablets, capsules, powder and granules
2. Disperse systems
3. Microbial decomposition
4. Over-view, physical stability of novel drug carriers, liposomes, niosomes, nano-particles.

**UNIT - III**

Identification and quantitative determination of preservatives, Antioxidants, colouring materials, emulsifiers, and stabilizers in Pharmaceutical formulation.

Analysis of drugs from biological samples including, selection of biological sample, extraction of drugs by various methods as LLE, SPE and Membrane filtration. Factors affecting extraction of drugs.

**UNIT - IV**

General method of analysis to determine the quality of raw materials used in cosmetic industry. .. Indian Standard Specifications (ISI) laid down for sampling and testing of various cosmetics in finished form by the Bureau of Indian Standards.

**UNIT - V**

Methods of analysis to determine the quality of cosmetics in the finished forms such as Hair care products, Skin care products, Baby care products, Dental products, Personal hygiene products, Colour cosmetics, Ethnic products, Colour makeup preparation, Lipsticks, Hair setting lotions and Eye shadows. Toxicity testing in cosmetics and Safety and Legislation of Cosmetic products.

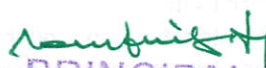
Stability studies: Concept of stability studies.

- a) cGMP& ICH guidelines for Accelerated stability Testing.
- b) Interaction of containers & closure Compatibility Testing.

*Geethanjali*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheerla(V), Keesara(M), Medchal Dist. T.S.-501301. 13

**REFERENCE BOOKS:**

1. Comprehensive Pharmacy Review 5th Edition by Leon Shargel, Alan H. Mutnick, Paul F. Souney, Larry N. Sawanson – 2004.
2. H. Beckett and J. B. Stenlake Practical Pharmaceutical Chemistry, Part I and Part II, 4th Edition. 3. G. H. Jeffery, J. Basset, J. Mendham, R. C. Denny (Rev. by) Vogels Text Book of Quantitative Chemical Analysis, 5th Edition 1989, ELBS.
3. The Controller of Publications; New Delhi, Govt. of India, Indian Pharmacopoeia, Vol. I and Vol. II - 2010.
4. J. B. Wilkinson and R. J. Moore: Herry's Cosmeticology, Longman Scientific and Technical Publishers, Singapore.
5. P. D. Sethi; Quantitative Analysis of Drugs in Pharmaceutical Formulations, 3rd Edition - 1997,
6. Classification of cosmetics raw materials and adjuncts IS 3958 of Indian Standards Institution (BIS).
7. Cosmetic and toilet goods – methods of sampling IS 3958 of Indian Standards Institution (BIS).
8. Methods of sampling and test for various cosmetics as laid down by Bureau of Indian Standards.
9. Drug stability: Principles and practices by Jens T. Carstensen
10. Stability Testing of Drug Products by W. Grimm. 12. Stability of Drugs and Dosage Forms by Yoshioka and Stella.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

ENTREPRENEURSHIP MANAGEMENT (Open Elective - II)

**Course Objective:** This course is designed to impart knowledge and skills necessary to train the Students on entrepreneurship management.

**Course Outcome:** On completion of this course it is expected that students will be able to understand,

- The Role of enterprise in national and global economy
- Dynamics of motivation and concepts of entrepreneurship
- Demands and challenges of Growth Strategies And Networking

**UNIT I**

Conceptual Frame Work: Concept need and process in entrepreneurship development. Role of enterprise in national and global economy. Types of enterprise – Merits and Demerits. Government policies and schemes for enterprise development. Institutional support in enterprise development and management.

**UNIT II**

Entrepreneur: Entrepreneurial motivation – dynamics of motivation. Entrepreneurial competency – Concepts. Developing Entrepreneurial competencies - requirements and understanding the process of entrepreneurship development, self-awareness, interpersonal skills, creativity, assertiveness, achievement, factors affecting entrepreneur role.

**UNIT III**

Launching And Organising An Enterprise: Environment scanning – Information, sources, schemes of assistance, problems. Enterprise selection, market assessment, enterprise feasibility study, SWOT Analysis. Resource mobilisation -finance, technology, raw material, site and manpower. Costing and marketing management and quality control. Feedback, monitoring and evaluation.

**UNIT IV**

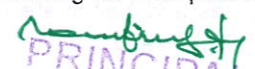
Growth Strategies And Networking: Performance appraisal and assessment. Profitability and control measures, demands and challenges. Need for diversification. Future Growth – Techniques of expansion and diversification, vision strategies. Concept and dynamics. Methods, Joint venture, co-ordination and feasibility study.

**UNIT V**

Preparing Project Proposal to Start on New Enterprise Project work – Feasibility report; Planning, resource mobilization and implementation.

**TEXT AND REFERENCE BOOKS:**

1. Akhauri, M. M. P. (1990): Entrepreneurship for Women in India, NIESBUD, New Delhi.
2. Hisrich, R. D & Brush, C.G.(1996) The Women Entrepreneurs, D.C. Health & Co., Toronto.
3. Hisrich, R.D. and Peters, M.P. (1995): Entrepreneurship – Starting Developing and Managing a New Enterprise, Richard D., Inwin, INC, USA.
4. Meredith, G. G. etal (1982): Practice of Entrepreneurship, ILO, Geneva.
5. Patel, V.C. (1987): Women Entrepreneurship – Developing New Entrepreneurs, Ahmedabad EDII
6. Arya kumar.(2012): Entrepreneurship- Creating and Leading an Entrepreneurial Organization, Pearson

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

NANO BASED DRUG DELIVERY SYSTEMS (Open Elective – II)

**Course Objective** - To develop expertise regarding suitability and evaluation of nanomaterials, able to apply the properties to the fabrication of nanopharmaceutical, evaluate the intensity of dosage forms and availability for targeting and controlled delivery.

**Course Outcomes** – The students should be able to select the right kind of materials, able to develop nano formulations with appropriate technologies, evaluate the product related test and for identified diseases

**UNIT I – Introduction to Nanotechnology**

- Definition of nanotechnology
- History of nanotechnology
- Unique properties of nanomaterials
- Role of size and size distribution of nanoparticles properties, classification.

**UNIT II – Synthesis of Nanomaterials**

- a) Physical, chemical and biological Methods
- b) Methods for synthesis of
  - Gold nanoparticles
  - Magnetic nanoparticles
  - Polymeric nanoparticles
  - Self – assembly structures such as liposomes, micelles, aquasomes and nanoemulsions

**UNIT III – Biomedical applications of Nanotechnology**

- a) Nanotechnology products used for in vitro diagnostics
- b) Improvements to medical or molecular imaging using nanotechnology
- c) Targeted nanomaterials for diagnostic and therapeutic purpose

**UNIT IV**

Design of nanomaterials for drug delivery, pulmonary and nasal drug delivery, nanomaterials for cancer therapy and cardiovascular diseases. Localized drug delivery systems.

**UNIT V**

Characterization including the principles, size reduction, analysis of nanoparticles, size, PDI, size separation, stability, methods of analysis regarding integrity and release of drugs

**RECOMMENDED BOOKS:**

1. Nanomedicine and Nanoproducts: Applications, Disposition and Toxicology in the Human body, Eiki Igarashi, CRC press. 2015
2. Nanotechnology and Drug Delivery Volume one and two: Nanoplatfoms in Drug Delivery, Jose L. Arias, CRC press
3. Nano: The Essentials: Understanding Nanoscience and Nanotechnology, T.Pradeep, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
4. Nanocrystals: Synthesis, Properties and Applications, C. N. R. Rao, P. J. Thomas and G.U. Kulakarni, Springer (2007)
5. Nanostructures and Nanomaterials: Synthesis, Properties and Application, Guozhong Gao, Imperial College Press(2004)

  
PRINCIPAL

16

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

6. Nanochemistry: A Classical Approach to Nanomaterials – Royal Society for Chemistry, Cambridge, UK (2005)
7. Nanocomposite science and technology, pulickel M. Ajayan, Linda S. Schadler, paul V. Braun, Wiley-VCH Verlag, Weiheim (2003)
8. Nanoscale materials in chemistry, Edited by Kenneth J. Klabunde, John Wiley & Sons, 2009
9. Nanoparticles as Drug carriers, Vladimir P Torchiling, Imperial College Press, USA, 2006

University Updates

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheerla(V), Keasare(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

HERBAL AND COSMETICS ANALYSIS (Open Elective - II)

**Course Objectives:** This course is designed to impart knowledge on analysis of herbal products. Regulatory requirements; herbal drug interaction with monographs. Performance evaluation of cosmetic products is included for the better understanding of the equipments used in cosmetic industries for the purpose.

**Course Outcomes:** At completion of this course student shall be able to understand

- Determination of herbal remedies and regulations
- Analysis of natural products and monographs
- Determination of Herbal drug-drug interaction
- Principles of performance evaluation of cosmetic products.

**UNIT I**

Herbal remedies- Toxicity and Regulations: Herbals vs Conventional drugs, Efficacy of herbal medicine products, Validation of Herbal Therapies, Pharmacodynamic and Pharmacokinetic issues. Herbal drug standardization: WHO and AYUSH guidelines.

**UNIT II**

Adulteration and Deterioration: Introduction, types of adulteration/substitution of herbal drugs, Causes and Measure of adulteration, Sampling Procedures, Determination of Foreign Matter, DNA Finger printing techniques in identification of drugs of natural origin, heavy metals, pesticide residues, phototoxin and microbial contamination in herbal formulations.  
Regulatory requirements for setting herbal drug industry: Global marketing management, Indian and international patent law as applicable herbal drugs and natural products and its protocol.

**UNIT III**

Testing of natural products and drugs: Effect of herbal medicine on clinical laboratory testing, Adulterant Screening using modern analytical instruments, Regulation and dispensing of herbal drugs, Stability testing of natural products, protocol. Monographs of Herbal drugs: Study of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic Pharmacopoeia, American herbal Pharmacopoeia, British herbal Pharmacopoeia, Siddha and Unani Pharmacopoeia, WHO guidelines in quality assessment of herbal drugs.

**UNIT IV**

Herbal drug-drug interaction: WHO and AYUSH guidelines for safety monitoring of natural medicine, Spontaneous reporting schemes for bio drug adverse reactions, bio drug-drug and biodrug-food interactions with suitable examples. Challenges in monitoring the safety of herbal medicines.

**UNIT V**

Evaluation of cosmetic products: Determination of acid value, ester value, saponification value, iodine value, peroxide value, rancidity, moisture, ash, volatile matter, heavy metals, fineness of powder, density, viscosity of cosmetic raw materials and finished products. Study of quality of raw materials and general methods of analysis of raw material used in cosmetic manufacture as per BIS.  
Indian Standard specification laid down for sampling and testing of various cosmetics in finished forms such as baby care products, skin care products, dental products, personal hygiene preparations, lips sticks. Hair products and skin creams by the Bureau Indian Standards.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301

## REFERENCES

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Quality Control Methods for Medicinal Plant, WHO, Geneva
4. Pharmacognosy & Pharmacobiotechnology by Ashutosh Kar
5. Essential of Pharmacognosy by Dr. S. H. Ansari
6. Cosmetics – Formulation, Manufacturing and Quality Control, P.P. Sharma, 4th edition, Vandana Publications Pvt. Ltd., Delhi
7. Indian Standard specification, for raw materials, BIS, New Delhi.
8. Indian Standard specification for 28 finished cosmetics BIS, New Delhi
9. Harry's Cosmeticology 8th edition
10. Suppliers catalogue on specialized cosmetic excipients
11. Wilkinson, Moore, seventh edition, George Godwin. Poucher's Perfumes, Cosmetics, and Soaps
12. Hilda Butler, 10th Edition, Kluwer Academic Publishers. Handbook of Cosmetic Science and Technology, 3rd Edition

*Principal*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

ADVANCED INSTRUMENTAL ANALYSIS LAB

List of Experiments

1. Determination of bulk Drugs and formulations by UV-Visible, HPLC, GC etc. methods
2. Determination of total chloride in thiamine HCl
3. Detection and determination of preservatives, antioxidants and colourants in pharmaceutical preparations
4. Determination of chlorides and sulphates by Nephelo -Turbidimetry
5. Determination of moisture content in sorbitol, sodium citrate, ampicillin etc.
6. Assays of official compounds by Fluorimetry
7. Determination of compounds of sodium, potassium and calcium by Flame photometry.

(Note: Minimum of two experiments covering each of the above mentioned topics)

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PAQA/QA)

QUALITY CONTROL AND QUALITY ASSURANCE LAB

**List of Experiments**

1. QC tests for tablets and capsules (minimum 3 experiments)
2. QC tests for oral liquids and parenterals (minimum 3 experiments)
3. Forced degradation studies of some drugs.
4. Interpretation of spectras by IR, NMR and MASS
5. Estimation of drugs by specified colorimetric reagents
6. Assay of drug formulations using UV-Spectrophotometer (Any four)
7. Demonstration of functional groups of the given samples by IR Spectrophotometer.
8. Physicochemical tests for water
9. Solubility studies of weakly acidic and weakly basic drugs.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Pharmacy (PHARMACEUTICAL MANAGEMENT AND REGULATORY AFFAIRS)

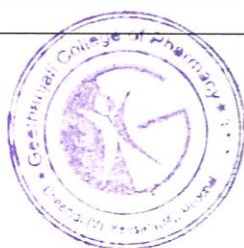
COURSE STRUCTURE AND SYLLABUS  
Effective from Academic Year 2017-18 Admitted Batch

I Year – I Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course I	Pharmaceutical Management –I (General and Personnel)	25	75	4	--	4
Core Course II	Drug Regulatory Affairs	25	75	4	--	4
Core Course III	Modern Pharmaceutical Analytical Techniques	25	75	4	--	4
Core Elective I	1. Total Quality Management 2. Intellectual Property Rights	25	75	4	--	4
Open Elective I	1. Pharmacoepidemiology and Pharmacoeconomics 2. Herbal Cosmetics Technology 3. Phytochemistry 4. Pharmaceutical Formulation technology 5. Pharmaceutical Validation	25	75	4	--	4
Laboratory I	Modern Pharmaceutical Analytical Techniques Lab	25	75	--	6	3
Laboratory II	Pharmaceutical Management Lab	25	75	--	6	3
Seminar I	Seminar	50	--	--	4	2
<b>Total Credits</b>				<b>20</b>	<b>16</b>	<b>28</b>

I Year – II Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Pharmaceutical Management –II (Production, Marketing, Finance and Project)	25	75	4	--	4
Core Course V	Analytical Method Validation and Copyrights and Trademarks	25	75	4	--	4
Core Course VI	Pharmaceutical Market Research and Analysis	25	75	4	--	4
Core Elective II	1. Biostatistics And Research Methodology 2. Stability of Drugs and Dosage Forms	25	75	4	--	4
Open Elective II	1. Screening Methods in Pharmacology 2. Nano Based Drug Delivery Systems 3. Nutraceuticals 4. Advanced Drug Delivery Systems 5. Clinical Research and Pharmacovigilance	25	75	4	--	4
Laboratory III	Analytical Method Validation Lab	25	75	--	6	3
Laboratory IV	Pharmaceutical Market Research and Analysis Lab	25	75	--	6	3
Seminar II	Seminar	50	--	--	4	2
<b>Total Credits</b>				<b>20</b>	<b>16</b>	<b>28</b>



*Signature of*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Keesara(V), Keesara(M), Medchal Dist. T.S.-501301.

**II Year - I Semester**

Course Title	Int. marks	Ext. marks	L	P	C
Comprehensive Viva-Voce	--	100	--	--	4
Project work Review I	50	--	--	24	12
<b>Total Credits</b>			--	24	<b>16</b>

**II Year - II Semester**

Course Title	Int. marks	Ext. marks	L	P	C
Project work Review II	50	--	--	8	4
Project Evaluation (Viva-Voce)	--	150	--	16	12
<b>Total Credits</b>			--	24	<b>16</b>

**PRINCIPAL**  
Geethanjali College of Pharmacy  
neervaj(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

PHARMACEUTICAL MANAGEMENT-I (GENERAL & PERSONNEL) (Core course-I)

**Course Objective:** The topics which are present in the pharmaceutical management are very much useful to the students in personality development become a perfect pharma professional.

**Course Outcome:**

- These topics are useful for the students to know how to manage a pharma industry and its various departments viz QA, QC, RA, Production etc.
- Along with this it aids the students to develop leadership qualities, communication & interpersonal skills, decisions making, motivation, organization & various managerial functions & professional skills required for a dynamic professional.
- Management helps to understand the concept of managerial control, its levels & role, importance in pharma industry

**UNIT - I**

Pharmaceutical Management: Meaning, Evolution-scientific, administrative and human relation approach. Process of management: Planning, organizing, staffing, directing, coordinating and controlling—a preliminary idea of concepts, processes and techniques.

**UNIT - II**

Fundamental concepts of production, financial, personal, legal and marketing functions with special reference to Pharmaceutical Management. Introduction to budgeting, costing, accounting, auditing and budgetary control. Entrepreneurship development.

**UNIT - III**

Understanding organizations: Meaning, process, types of organization structures and departmentation, line/staff authority, promoting organizational culture. Organizations, pharmaceutical services and functioning of hospital pharmacy, bulk drug unit, formulation unit, Ayurvedic and Unani manufacturing units and testing labs etc.

**UNIT - IV**

Professional Managers; Tasks, responsibilities and skills needed. Leadership; Styles and managing change. Decision Making; Types, procedures, evaluation and selection of alternatives, decision making under various situations. Management information and decision support systems and time management.

Personnel Management: Job Analysis, recruitment, selection, orientation and training, performance appraisal and compensation. Retrenchment, lay off and discharge.

**UNIT - V**

Management of Industrial Relations: Industrial disputes, settlement of disputes through various routes such as bargaining, etc.

Motivational aspects, theories of motivation, group dynamics, rewards and incentives, interpersonal skills, significance of communication, its processes, measures for effective communication, conflict management. Stress management.

**TEXT AND REFERENCE BOOKS:**

1. Marketing Management by Philip Kotlar; Prentice-Hall of India Ltd., New Delhi.0
2. Management and Organization by Louis A. Allen; McGraw Hill, Tokyo..



*Handwritten signature*  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Vijayapuri(V), Keerasara(M), Medchal Dist. T.S.-501303

3. Corporate Strategy by Ansoff, H.T.; McGraw Hill, New York.
4. Modern Management by Hempran David R.; McGraw Hill, New York.
5. Management by Stoner and Freeman; Prentice Hall, New Delhi.
6. Motivation and Personality by Maslow, Abraham, Harper & Row, New York.
7. Management of Organizational Behavior, Utilizing the Human Resources by Harcey, Paul and Blanchard Kenneth; Prentice Hall of India, New Delhi
8. Organization Structure, Process and out comes V<sup>th</sup> Edition Richard. H. Hall
9. Principles and Methods of Pharmacy Management III rd Edition Harry A. Smith.
10. Management "Global Perspective Heinz Wehrich, Harold Koontz by Tata Mcgraw Hill".
11. Personnel Management and Industrial Relations by P. C. Tripathi.

**PRINCIPAL**  
Geethanjali College of Pharmacy  
Heeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm (PM & RA)

**DRUG REGULATORY AFFAIRS (Core course-II)**

**Course Objective:** The topics which are present in the Drug regulatory affairs are very much useful which increases the knowledge regarding the regulatory aspects in the pharmaceutical industries.

**Course Outcomes:**

- Students will come to know the different competent regulatory authorities globally.
- Students be aware of technical aspects pertaining to the marketing authorization application (MAA)
- The regulatory guidelines and directions framed by the regulatory authorities will be helpful to place the drug products in market for marketing approvals.

**UNIT - I**

A study of regulatory aspects that affect drug product design, manufacture and distribution in India with special emphasis on the detailed study of the following Acts (with latest amendments)

**UNIT - II**

The Drugs and Cosmetics Act, 1940 and Rules there under. Recent amendments to Drugs and Cosmetic Act and other relevant rules.

Drugs (Price Control) Order in force. Loan license (contract manufacture). Certification and licensing procedures.

**UNIT - III**

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act; Bolar Provisions and other FDA Regulations. Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.

**UNIT - IV**

Documentation related to manufacturing, cleaning methods, retention samples and records, quality control, batch release documents, distribution records, complaints and recalls.

Quality, safety and legislation for cosmetic products and herbal products.


**UNIT - V**

**Governing Regulatory Bodies across the globe.**

Country Authority Submission

- a. U.S Food & Drug Administration USDMF
- b. Canada Therapeutic Product Directorate DMF
- c. Europe
  - 1) European Medicines Agency (EMEA/ National Authorities) EDMF
  - 2) European Directorate for Quality of Medicines CEP/COS & Health Care Products
- d. Product Filing
- e. Responding Regulatory Deficiencies
- f. Final Approval Procedure

Preparation, review, and submission of Drug Master Files to Regulatory Authorities as per their specific requirements.

  
**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

### TEXT AND REFERENCE BOOKS

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.
5. Pharmaceutical Regulatory Affairs - Selected Topics, CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (Core course III)

**Course Objective:** The course is designed to impart the knowledge in the field of Pharmaceutical Analysis. The various modern analytical techniques like UV-Visible, IR, NMR, Mass, GC, HPLC, different chromatographic methods and other important topics are taught to enable the students to understand and apply the principles involved in the determination of different bulk drugs and their formulation. In addition to the theoretical aspects, the basic practical knowledge relevant to the analysis is also imparted.

**Course Outcome:** Appreciable knowledge will be gained by the students in the Modern Analytical Techniques and can apply the theories in the Analysis of various bulk drugs and their formulations. The students will also be in a position to apply their knowledge in developing the new methods for the determination and validate the procedures.

**UNIT - I**

**Introduction to chromatography and classification of chromatographic methods based on the mechanism of separation**

- a. Column Chromatography: Adsorption and partition, theory, preparation, procedure and methods of detection
- b. Thin Layer Chromatography: Theory, preparation, procedures, detection of compounds
- c. Paper Chromatography: Theory, different techniques employed, filter papers used, qualitative and quantitative detection
- d. Counter – current extraction, solid phase extraction techniques, gel filtration

**UNIT - II**


- a. **Gas chromatography:** Introduction, fundamentals, instrumentation, columns: preparation and operation, detection, dramatization.
- b. **HPLC:** Principles and instrumentation, solvents and columns used, detection and applications
- c. **HPTLC:** Theory and principle, instrumentation, elution techniques and pharmaceutical applications

**UNIT - III**

- a. **UV-Visible spectroscopy:** Introduction, electromagnetic spectrum, absorbance laws and limitations, instrumentation-design and working principle, chromophore concept, auxochromes, Wood-Fisher rules for calculating absorption maximum, applications of UV-Visible spectroscopy
- b. **IR spectroscopy:** Basic principles-Molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, sampling techniques, instrumentation, interpretation of spectra, FT-IR, theory and applications

**UNIT - IV**

**Mass spectroscopy:** Theory, ionization techniques: electron impact ionization, chemical ionization, field ionization, fast atom bombardment, plasma desorption, fragmentation process: types of fission, resolution, GC/MS, interpretation of spectra and applications for identification and structure determination.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301



## UNIT - V

NMR: Theory, instrumentation, chemical shift, shielding and deshielding effects, splitting of signals, spin-spin coupling, proton exchange reactions, coupling constant(J), nuclear overhauser effect(NOE), <sup>13</sup>CNMR spectra and its applications, 2D-NMR, COSY and applications in pharmacy.

### REFERENCES:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. HPTLC by P.D. Seth
12. Indian Pharmacopoeia 2007
13. High Performance thin layer chromatography for the analysis of medicinal plants by Eike Reich, Anne Schibli
14. Introduction to instrumental analysis by Robert. D. Braun

**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

TOTAL QUALITY MANAGEMENT (Core Elective I)

**Course Objective:** Total quality management constitutes very useful chapter like –good manufacturing practices, GLP, GCP, ICH etc. Which increases the knowledge of students in various quality control & regulatory aspects.

**Outcome:** Total quality management helps the students to learn the established regulatory guidelines in GMP, GCP, GLP, USFDA, WHO, ISO etc to become a perfect budding pharmacist.

It is very useful to students to acquire vast knowledge regarding the quality control aspects of different regulatory bodies as per their requirements throughout the world.

**UNIT - I**

Concepts and Philosophy of TQM, GLP, GMP (orange guide).

**UNIT - II**

Drug regulatory and accrediting agencies of the world (USFDA, TGA, ICH, WHO, ISO etc.)

**UNIT - III**

Good manufacturing practices: Organization and personnel, responsibilities, training, hygiene.

Premises: Location, design, plant layout, construction, maintenance and sanitation, environmental control, utilities and services like gas, water, maintenance of sterile areas, control of contamination.

Equipments: Selection, purchase specifications, maintenance, clean-in-place, sterilize-in-place, methods (TP and STP).

Raw materials: Purchase specifications, maintenance of stores, selection of vendors, controls on raw materials and finished dosage forms.

Manufacture of and controls on dosage forms: Manufacturing documents, master formula, batch formula records, standard operating procedures, quality audits of manufacturing processes and facilities.

In process quality controls on various dosage forms; sterile and non-sterile, standard operating procedures for various operations like cleaning, filling, drying, compression, coating, disinfections, sterilization, membrane filtration etc.,

Packaging and labelling control, line clearance, reconciliation of labels, cartons and other packaging materials.

Quality Control Laboratory: Responsibilities, good laboratory practices, routine controls instruments, reagents, sampling plans, standard test procedures, protocols, non-clinical testing, controls on animal house.

Data generation and storage, quality control documents, retention samples, records and audits of quality control facilities.

Finished products release, quality review, quality audits, batch release document.

**UNIT - IV**

Regulatory Considerations for Pre-clinical and Clinical Evaluation: Pre-clinical requirements currently in use. Regulatory requirements of single dose and repeat dose toxicity studies. Study of specific toxicities such as mutagenicity, carcinogenicity and teratogenicity. Animal pharmacokinetics and toxicokinetics. Regulatory requirements of clinical evaluation, pharmacokinetics in man genetic polymorphism. Design and interpretation of clinical trials.

Quality assurance standards as per ISO.

## UNIT - V

Globalization of drug industry, present status and scope of pharmaceutical industry in India.  
WHO and NABL certification, ICH guidelines for manufacturing and quality assurance of drug formulation.

### TEXT AND REFERENCE BOOKS:

1. Guidelines for Developing National Drug Policies; WHO Publications, 1998.
2. Quality Assurance of Pharmaceuticals—A Compendium of Guidelines and Related Materials, Vol.-1; WHO Publications.
3. A Guide to Total Quality Management by Kaushik Maitra and Sedhan K. Ghosh.
4. GMP by Mehra.
5. How to Practice GMP by P.P. Sharma.
6. ISO 9000 and Total Quality Management by Sadhan K.Ghosh.
7. Good Manufacturing Practices for Pharmaceuticals-A Plan for Total Quality Control by Sidney H. Willing & James R Stoker. (Drugs & Pharm. Sciences) Vol. 78; Marcel Dekker Inc.
8. OPPI-Quality Assurance.
9. USP.
10. Current good manufacturing practices for pharmaceuticals by Manohar A. Potdar
11. Quality assurance and quality management in pharmaceutical industry by Y. Anjaneyulu and marayya
12. Total Quality Management, An integrated Approach by D. R. Kiran , BS Publications
13. Total Quality Management, 3<sup>rd</sup> edition by Joel E. Ross. CRC press

**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

INTELLECTUAL PROPERTY RIGHTS (Core Elective-I)

**Course Objective:** Various types of Intellectual Property Rights Patentable Subject History of Indian Patent Protection, Patent filing procedure in India, Opposition- pre-grant opposition and post-grant opposition, Patent filing procedure under PCT, advantages, patent search and literature and Salient features of Indian Patents are discussed in detail.

**Course Outcome:** The clear information about the patent laws, intellectual property rights and drug regulation in India and abroad is gained by the students.

**UNIT - I**

Introduction, Types of Intellectual Property Rights (Patents, Trademarks, Copyrights, Geographical Indications Industrial Designs and Trade secrets), Patentable Subject Matter (Novelty, Non-Obviousness, Utility, enablement and Best mode),

**UNIT - II**

- a. History of Indian Patent Protection, Rationale behind Patent System, Objectives and Advantages of Patent System, and future challenges. Indian Patents Act 1970, Definitions and Key Terminology, Types of Patent applications, Inventions not patentable (section 3 and 4).
- b. Patent filing procedure in India (Patent Prosecution), Specifications (Provisional and Complete), Claims- types of claims and legal importance of claims, Grant of patent, Rights of Patentee and co-owners
- c. Opposition- pre-grant opposition and post-grant opposition, Anticipation, Infringement, Compulsory Licensing, revocation of patents, and power of Controller.
- d. Patent filing procedure under PCT, advantages, patent search and literature

**UNIT - III**


- a. Salient features of Indian Patents (Amendments) Act 1999, 2002 and 2005. US and European Patent System,
- b. Background, Salient Features and Impact of International Treaties / Conventions like
  1. Paris Convention, Berne convention
  2. World Trade Organization (WTO)
  3. World Intellectual Property Organization (WIPO)
  4. Trade Related Aspects of Intellectual Property Rights (TRIPS)
  5. Patent Co-operation Treaty (PCT), Madrid Protocol

**UNIT - IV**

- a. PCT Application procedure and review procedure
- b. National phase application procedure for US& EU
- c. Patent prosecution procedure in US and EU
- d. WIPO and its role in IPR
- e. Hatch- Waxman provision for IPR

**UNIT - V**

- a. Patent in validation process in India, US and Europe
- b. IPR related to copyright, trade mark, trade secret and geographical indication.
- c. Patent application writing
- d. Claim construction and claims.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist, T.S.-501301.

### RECOMMENDED BOOKS:

1. Research Methodology concepts and cases by Depak Chawla, Neena Sondhi
2. Draft manual of Patent Practice and Procedure -2008 , The Patent Office, India
3. Manual of Patent Office Practice and Procedure -2010
4. Original Laws Published by Govt. of India
5. Protection of Industrial Property rights by P.Das and Gokul Das
6. Law and Drugs, Law Publications by S.N. Katju
7. Laws of drugs in India, Hussain
8. New drug approval process, 5<sup>th</sup> edition, by Guarino
9. Commercial Manual on Drugs and Cosmetics 2004, 2<sup>nd</sup> edition
10. Drugs and Cosmetics act by Vijay Malik
11. Good Manufacturing Practices for Pharmaceuticals, S.H. Wiling, Vol. 78, Marcel Decker.
12. [fda.org](http://fda.org), [wipo.int](http://wipo.int), [patentlawlinks.com](http://patentlawlinks.com), [hc-sc.gc.ca](http://hc-sc.gc.ca), [ich.org](http://ich.org), [cder.org](http://cder.org)
13. Current good manufacturing practices for pharmaceuticals by Manohar A. Potdar

**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

PHARMACOEPIDEMOLOGY & PHARMACOECONOMICS (Open Elective –I)

**Course Objective:**

This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

**Course Outcome:** Upon completion of this course it is expected that students shall be able to:

- Understand the various epidemiological methods and their applications
- Understand the fundamental principles of Pharmacoeconomics.
- Identify and determine relevant cost and consequences associated with pharmacy products and services.
- Perform the key Pharmacoeconomics analysis methods
- Understand the Pharmacoeconomic decision analysis methods and its applications.
- Describe current Pharmacoeconomic methods and issues.
- Understand the applications of Pharmacoeconomics to various pharmacy settings.

**UNIT- I**

**Introduction to Pharmacoepidemiology:**

Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio

**UNIT- II**

**Pharmacoepidemiological Methods:**

Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

**UNIT- III**

**Introduction to Pharmacoeconomics:**

Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs. Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost Effective Ratio, Average Cost Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.

**UNIT- IV**

**Pharmacoeconomic evaluations:**

Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA), Cost Benefit Analysis (CBA), Cost

Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA).

#### **UNIT - V**

##### **Definition, Steps involved, Applications, Advantages and disadvantages of the following:**

Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures. Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in pharmacoeconomic analysis, Applications of pharmacoeconomics.

#### **REFERENCES:**

1. Rascati K L. Essentials of Pharmacoeconomics, Woulters Kluwer Lippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modelling for Health Economic Evaluation, Oxford University Press, London.
4. K G Revikumar, Pharmacoepidemiology and Pharmacoeconomics Concepts and Practices.
5. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programmes Oxford University Press, London.
6. George E Mackinnon III. Understanding health outcomes and pharmacoeconomics.
7. Graker, Dennis. Pharmacoeconomics and outcomes.
8. Walley, Pharmacoeconomics.
9. Pharmacoeconomic – ed. by Nowakowska – University of Medical Sciences, Poznan.
10. Relevant review articles from recent medical and pharmaceutical literature
11. Guru Prasad Mohanta and P K Manna, Textbook of Pharmacovigilance Concepts and Practice

**PRINCIPAL**  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

HERBAL COSMETICS TECHNOLOGY (Open elective I)

**Course Objective:**

The topics helps the students to get exposed to processes involved in the manufacturing of herbal cosmetics including the skin and hair care herbal products preparation and their evaluation

**Course Outcome:** Students will learn about the raw materials used in herbal cosmetics and get exposed to various preparations herbal cosmetics.

**UNIT - I**

- Introduction, historical background and present status of Herbal cosmetics
- Processes used in the manufacture of cosmetics-Emulsification, Mixing, compaction, Moulding, Packing. Raw materials used in preparation of herbal cosmetics
- Machinery and Equipment for Cosmetics: Cream, Liquid, Powder and emulsion making machinery
- Quality, safety and efficacy of Herbal cosmetics

**UNIT - II**

**Skin care Products:** Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like Creams, Lotions, Lipsticks, face packs. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

**UNIT - III**

**Hair care Products:** Method of preparation, pharmaceutical and Pharmacological evaluation procedures for various formulations like hair dyes, creams, Lotions, Jels, oils and Shampoos. Elaborative study of five formulations under each category with regard to their composition and claims for various herbs used in them.

**UNIT - IV**

A brief account of following herbals or herb extracts or herbal products of cosmetic importance such as *Acacia concinna* pods, Aloe Vera, Almond oil, Neem, *Citrus aurantium* peels, Henna, Turmeric, Liquorice, Olive oil, tea tree oil and wheat germ oil with special emphasis on their source, active principles and cosmetic properties.

**UNIT - V**

- General Principles of Quality control and standardization of cosmetics-Raw material control, Packaging material control, finished product control, Shelf testing.
- Natural colorants : Biological Source, coloring principles, chemical nature and usage of the following Annato, Cochineal, Caramel, Henna, Indigo, Madder, Saffron , Turmeric
- Flavors and Perfumes : Sandal wood oil, Orange oil, Lemon oil, Vanilla, Palmarosa, geranium oil

**REFERENCES:**

- Cosmetics- Formulation, Manufacturing and Quality control –P.P. Sharma
- Herbal Cosmetics Hand Book- H. Panda
- Herbal Cosmetics by P. K Chattopadhyay
- The Complete Technology Book on Herbal Perfumes and Cosmetics by H. Panda

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeraj(V), Keesara(M), Medchal Dist. T.S.-501304.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

PHYTOCHEMISTRY (Open Elective-I)

**Course Objective:** Helps the students to get exposed to natural product drug discovery and to perform quantitative and qualitative evaluation of herbal extracts. To understand the chemistry of important phytoconstituents of different categories.

**Course Outcome:** On the basis of chemistry data of phytoconstituents students will acquire knowledge on various types of phytoconstituents present in the plants.

**UNIT - I**

Extraction and Phytochemical studies: Recent advances in extractions with emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extraction and Methods of fractionation. Separation of phytoconstituents by latest CCCET, SCFE techniques including prep and Flash column chromatography.

**UNIT - II**

Sources, Chemical structure, Identification tests, mechanism of action, SAR and uses of following Alkaloids

- a) Caffeine
- b) Quinine, Reserpine, Atropine, Vinca alkaloids
- c) Morphine and brief account on its derivatives and analogues

**UNIT - III**

Sources, Chemical structure, Identification tests, mechanism of action SAR, uses and semi-synthetic derivatives of the following phytopharmaceuticals:

Camptothecin, Podophyllotoxin, Taxol, Digoxinand Artemisinin

**UNIT - IV**

Structure elucidation of the following compounds by spectroscopic Techniques like UV, IR, NMR (1H, 13C)

- a. Carvone, Citral, Menthol
- b. Luteolin, Kaempferol
- c. Nicotine, Caffeine

**UNIT - V**

Drug discovery and development: History of herbs as source of drugs and drug discovery. Sourcing and archiving Natural products for discovery. Evaluating natural products for therapeutic properties, identifying the biologically active Natural products, the lead structure selection process and structure development with suitable examples from the following source: artemesin, andrographolides.

**RECOMMENDED/ REFERENCE BOOKS:**

1. Phytochemical methods of chemical analysis by Harbone
2. Modern methods of plant analysis- peach & M.V. Tracey Vol. 1 to VII
3. Pharmacognosy & Phytochemistry of medical plants by Jean Brunton
4. Thin layer chromatography by Stahl
5. Chemistry of natural products by Atur Rahman
6. Comprehensive Medicinal Chemistry, Vol 1-6, Elsevier Publication
7. Medicinal Chemistry Drug Discovery by Donald J, Abrahm,

PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

8. Plant drug analysis by Wagner
9. Clarke's isolation & identification of drugs by AC Mottal
10. Chromatography of Alkaloids by Varpoorte Swendson
11. Jenkins Quantitative pharmaceutical chemistry by AN Kenwell
12. Standardization of botanicals by V. Rajpal Vol 1 & 2
13. Medicinal chemistry and drug discovery by Burger's
14. Chemistry of Natural Products by S. V. Bhat, B. A. Nagasampagi, M. Sivakumar
15. Herbal Drugs: Quality and Chemistry by D. D. Joshi

  
**PRINCIPAL**

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

PHARMACEUTICAL FORMULATION TECHNOLOGY (Open Elective-I)

**Course Objectives:** Students will know the preformulation studies, methodology, different excipients used in solid dosage forms and their evaluation with references to production technologies. The students also know the optimization techniques and their applications in pharmaceutical industries.

**Course Outcome:** Students shall explain the preformulation parameters, apply ICH guidelines and evaluate drug, drug excipients compatibility. Students also explain about formulation and development, use of excipients in tablets, powders, capsules, micro-encapsules and coating techniques. They also learn and apply the statistical design in different formulations.

**Unit - I:**

**Preformulation:** Goals of preformulation, solid state manipulation and characterization. pH dependent solubility of drug, equilibrium solubility, intrinsic dissolution of drug, particle size distribution.

**Flow of Powders:** Physical properties and importance. Angle of repose, Carr's index, compressibility, bulk density, tapped density.

**Unit - II:**

Excipients used in various dosage forms like tablets, capsules, emulsions, suspensions, semisolids and sterile products. Knowledge of packing materials. Drug- excipient compatibility- Drug stability, factors affecting stability, stabilization methods.

**Unit - III:**

**Tablets:** Types of tablets, granulation methods, highlighting operations such as mixing, drying, milling, blending, lubrication and compression.

**Tablet coating:** Types of coating, steps involved in coating process- pan coating and fluid bed coating and problems associated with coating.

**Hard Gelatin Capsules:** General principles and steps involved in the production of drug loaded hard gelatin capsules, filling operation, filling of powders, granules and pellets.

**Unit - IV:**

**Dissolution:** Principles of dissolution, factors influencing dissolution, official methods and apparatus. Dissolution of immediate release, controlled release and delayed release products.

**Unit - V:**

**Stability testing:** Chemical degradation and preventive measures. Various stability testing conditions and use of stabilizers in packing

**TEXT BOOKS:**

1. Pharmaceutics - The Science of Dosage form design by ME Aulton.
2. Pharmaceutical Dosage forms - Tablets (Vol I, II and III) by Lieberman, Lachman and Schwartz.
3. Pharmaceutical Dosage forms - Capsules (Vol I, II and III) by Avis, Lieberman and Lachman.
4. Pharmaceutical Dosage forms – Disperse systems (Vol I, II and III) by Avis, Lieberman and Lachman.
5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
6. Pharmaceutical statistics by Bolton

7. Industrial Pharmacy - Selected Topics , CVS Subramanyam and J Thimmasetty, Vallabha Prakashan Delhi - 2013

**REFERENCE BOOKS:**

1. The Theory and Practice of industrial Pharmacy by Leon Lachman, Herbert A. Lieberman.
2. Remington's Science and Practice of Pharmacy by A. Gennaro.
3. Ansel's Pharmaceutical Dosage form and Drug delivery system by Loyd V. Allen, Jr. Nicholas G. Popovich, Howard C. Ansel.
4. Generic Drug Product Development by Leon Shargel and Isadore Kanfer.
5. Dispensing for Pharmaceutical Students by SJ Carter.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

PHARMACEUTICAL VALIDATION (Open Elective-I)

**Course Objective:**

The main purpose of the subject is to understand about validation and how it can be applied to industry and thus to improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

**Course Outcome:** Upon completion of the subject student shall be able to

- Explain the aspect of validation
- Carryout validation of manufacturing processes
- Apply the knowledge of validation to instruments and equipments
- Validate the manufacturing facilities

**UNIT - I**

**Introduction:** Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan.

**UNIT - II**

**Qualification:** User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Installation Qualification, Operational Qualification, Performance Qualification, Re- Qualification (Maintaining status-Calibration Preventive Maintenance, Change management), Qualification of Manufacturing Equipments, Qualification of Analytical Instruments and Laboratory equipments.

**UNIT - III**

**Qualification of analytical instruments:** Electronic balance, Ph meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC

**Qualification of Glassware:** Volumetric flask, pipette, Measuring cylinder, beakers and burette.

**UNIT - IV**

**Validation of Utility systems:** Pharmaceutical Water System & pure steam, HVAC system, Compressed air and nitrogen.

**Cleaning Validation:** Cleaning Validation - Cleaning Method development, Validation and validation of analytical method used in cleaning. Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP).

**UNIT - V**

**Analytical method validation:** General principles, Validation of analytical method as per ICH guidelines and USP.

**REFERENCES:**

1. B. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.
4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco, (Marcel Dekker).

5. Michael Levin, Pharmaceutical Process Scale-Up, Drugs and Pharm. Sci. Series, Vol. 157, 2nd Ed., Marcel Dekker Inc., N.Y.
6. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
7. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
8. Validation of Pharmaceutical Processes: Sterile Products, Frederick J. Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker, 2nd Ed.
9. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam, Y.C. Lee, Yue. Zhang, Wiley Inter Science.

  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES LAB

**List of experiments:**

1. Colorimetry / UV / Visible, Spectroscopy, scanning of few compounds for UV-absorption, calculation of Assay / content uniformity / % of drug release (2-3 experiments.)
2. Estimation of multi components formulation by UV of two different methods
3. Experiment base on HPLC (Isocratic and gradient) Techniques – (2 experiments)
4. Incompatibility studies, identification and functional groups – Determination by FTIR (2 experiments)
5. Separation and calculation of Rf values by using paper chromatography, TLC, HPTLC Technique (2-3 experiments)
6. Interpretation of spectra and structure determination of Mass Spectroscopy
7. Separation of protein drug substances by electrophoresis.
8. Workshop on IR and NMR interpretation
9. Development and evaluation of drugs by derivative spectroscopy.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – I Sem M. Pharm. (PM & RA)

PHARMACEUTICAL MANAGEMENT LAB

Practical work shall be carried out based on the theory syllabus.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(N), Medchal Dist. T.S.-501302



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**I Year – II Sem M. Pharm (PM & RA)**

**PHARMACEUTICAL MANAGEMENT - II (Core course - IV)**  
**(PRODUCTION, MARKETING, FINANCE & PROJECT)**

**Course Objective:** To know the pharmaceutical product management, planning, marketing accounts and finance. They also know the Inventory control, concept and techniques to improve production In packaging, marketing, sale and accounting.

**Course Outcome:** Student will get knowledge about production management, production planning and control, design and development of packaging, marketing of pharmaceuticals.

**UNIT I**

Production Management: Fundamentals of production, organization, economic policy, manufacturing economics, production capacities, production lines and job balancing, visible and invisible inputs, methodology of activities. Development of efficient work methods, quality control and management of R&D.

Production planning and control, production processes - mass, job and project; plant location and lay out; work study (preliminary idea only), materials management- purchase, inventory control and store keeping. Productivity management: Concepts, problems, tools and techniques for improvement. Operation research techniques by PERT and CPM.

Considerations for design of large scale manufacturing units including intricate design criteria for units to manufacture sterile and non-sterile products with special reference to tablets, capsules, and injections.

Design and development of packaging units including recent advances in packaging techniques for various types of sterile and non-sterile dosage forms.

Warehousing design, construction, maintenance and sanitation; good warehousing practice, materials management.

**UNIT II**

Pharmaceutical Marketing: Evolution of marketing concept; production oriented, sales oriented, promotion oriented and consumer oriented (modern concept); market segmentation; concept of marketing, mix Role of 7 P's (Product, Price, Promotion, Place, Physical Evidence, Process, People) in Pharmaceutical Marketing Management, corporate planning & strategy, Pharmaceutical industrial marketing management. Pharmaceutical marketing environment. Product management. E-Pharma Marketing.

**UNIT III**

Product Planning: Selection of product, new product development and product differentiation, pricing, promotion – personal selling; salesmanship, qualities of salesman, management of sales force, advertising, publicity and window display, channels of distribution.

Marketing Research: Definition and importance, Pharmaceutical Marketing Research techniques, marketing information system, pharmaceutical marketing research area.

Market Demands and Sales Forecasting: Major concepts in the demand measurement, estimating current demands, geo-demographic analysis, estimating industry sales, market share and future demand, sales forecasting.

**UNIT IV**

Introduction to financial management, financial planning and control, working capital management, management of fixed assets.

Concepts and techniques of financial management decision, concepts in evaluation – time value of money, valuation of a firm's stock, capital assets pricing model, investment in assets and required returns, risk analysis, financing and dividend policies, capital structure decision, working capital management, management of cash, management of accounts receivable, inventory management. Banking and finance: Service and functions of bank, finance planning and sources of finance, short, intermediate and long term financing, tools of financial analysis, financial ratio analysis, funds analysis and financial forecasting, operating and financial leverages. General principles of insurance. Introduction to financial management, financial planning and control, working capital management, management of fixed assets. Evaluation of investment decisions by payback period, accounting rate of return, net present value methods, break even analysis.

#### UNIT V

Accounting & Finance: Financial accounting, GAAP, cost accounting, budgetary control, valuation of inventory and assets, modern trends, role of internal auditing, internal versus external auditing, accounting control and information systems.

Project definition, preparation of feasibility assessment and selection, project reporting, conventional project appraisal; limitations, towards a new framework. Projections, profitability, cost and benefit analysis, appraisal criteria – financial, economic and social. Risk analysis.

Institutional Finance and Project Appraisal: Framework for domestic/ international finance evaluation, project identification, feasibility, appraisal, financial and capital structures, capital market instruments, managing new issues, negotiations with FIs, FIIIs, and other market players, issue pricing, SEBI guidelines, syndication of loans including term loans, lease financing.

#### TEXT AND REFERENCE BOOKS:

1. Financial Management by Johnson, R.W.; The Ronald Press.
2. Fundamental of Financial Management by Van Horne, J.C.; Prentice Hall of India (P) Limited.
3. Stock Exchange and Investment Analysis by Briston, R. J.
4. Indian Financial System by Khan, M. Y.; Tata McGraw Hill.
5. Tax Planning for Industrial Projects by Agarwal R. K.; Hind Law Publishers, New Delhi.
6. Project Management by Chaudhary, S.; Tata McGraw Hill.
7. Project Management: A System Approach to Planning Scheduling and Controlling by Harold Kerzner; CRS Publishers and Distributors, Delhi.
8. Financial Management by Gupta And Sharma 1<sup>st</sup> Edition 1996.
9. Accounting for Management Planning and Control III<sup>rd</sup> Edition Richard M. Lynch
10. Management by Tripathi P. C. and Reddy P. N.; Tata McGraw Hill.
11. Business Organization and Management by Shukla M. C.; S. Chand and Company.
12. Business Organization and Management by Sherlaker S. A.; Himalaya.
13. Personnel Management by Filippo E. B.; McGraw Hill.
14. Marketing Management by Kotler Philip.; Prentice Hall of India.
15. Organizational Behavior by Rao and Narayan; Konark Publishers.
16. Personnel Management by Tripathi P. C.; S. Chand and Company.
17. Principle and Practice of Marketing in India by Memoria C. B.
18. Principles of Pharmaceutical Marketing By Mickey Smith C.B.S. Publications.
19. Marketing Hand Book Vol. II , Marketing Management by Edwin – E Bobrow, Mark – D. Bobrow.
20. Production and Operations Management by S.N.Chary

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PM & RA)

**ANALYTICAL METHOD VALIDATION, COPY RIGHTS, AND TRADE MARKS (Core course - V)**

**Course Objective:** The students will know the validation guidelines, different methods of validation, implementation of validation. They also know about the law related to copyrights, trademarks and their implementation

**Course Outcome:** Students will get knowledge about ICH guidelines for validation, FDA drafts and techniques which are used for validation and their implementation. They also know the rights and laws related to copyrights and trademarks.

**UNIT I**

**Validation guidelines**

1. ICH Q2A: Text on validation of analytical procedures: Definitions and terminology (March 1995)
2. ICH Q2B: Validation of analytical procedures: Methodology (June 1997)
3. FDA: (Draft) Guidance for Industry: Analytical procedures and methods validation
4. Pharmacopoeias: USP and European Pharmacopoeia

**UNIT II**

**What methods to be validated?**

Defined for:

- Identification
- Quantitative tests for content of impurities
- limit tests for control of impurities
- Quantitative tests for active moiety in drug substances and drug products

Referred to:

- Dissolution testing
- Particle size determination (drug substance)

**UNIT III**

**Implementation of Guidelines**

- Standard protocols
  - Set up as procedures
  - Mutual agreement on tests
  - Mutual agreement on criteria
  - Mutual agreement on documentation
- ==> MUTUAL DEVELOPMENT PROCEDURES (MDP)

**UNIT IV**

**Copyright:** Law relating to copyright in India. Copyright Act, 1957 and its amendments. Subject matter of copyright protection. Rights of owners of copyrights. Infringement of copyright, remedies against infringement of copyright. Authorities and institutions under the copyright Act.

**Trademarks:** The trademarks legislation in India. Service marks, certification Marks, Collective marks, Distinctiveness of Trade Marks, Distinct Marks. Subject matter of Trade marks. Acquisition of registered Trade Mark. Register and conditions for Registration. Infringement of Trade marks.

**UNIT V**

Trade mark laws and governing of trademarks, role of Indian trade mark office.

**TEXT BOOKS:**

1. Ira R. Berry and R.A. Nash ( eds ) Pharmaceutical Process Validation, Marcel Dekker Inc, New York
2. Pharmaceutical Process Validation by Loftus and Nash.
3. Remington's Pharmaceutical Sciences, The science and practice of pharmacy, 20<sup>th</sup> Edition, Vol. I & II.
4. Quality Assurance of Pharmaceuticals –A compendium of guidelines- WHO publication.
5. Theory and practice of industrial pharmacy by Liberian and Lachman.
6. Pharmaceutical Process validation by Berry and Nash.
7. Intellectual properties rights by GB Reddy.

**REFERENCE BOOKS:**

1. GMP by Sidney Herbal, Willing.
2. Quality Assurance Guide - Organization of Pharmaceutical products of India.
3. Drugs and Cosmetics Act 1969 and Rules 1945.
4. S.H. Willing M. M. T. Tuckerman, W. S. Hitchings IV, Good Manufacturing Practices for Pharmaceuticals, Marcel Decker Inc, M. New York.
5. P.P. Sharma, How to practice GMP's Vandhana Publications, Agra
6. Lippincott Williams Wilkins, Philadelphia, 2000
7. Quality assurance guide supplied by Organization of Pharmaceutical procedure of India.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PM & RA)

PHARMACEUTICAL MARKET RESEARCH AND ANALYSIS (Core course - VI)

**Course Objective:** Students shall know the overview of global pharmaceutical market, growth calculations, innovator new drug evaluation, analysis of finished dosage forms and APIs. They also know about the pharmaceutical companies, R&D strengths, and case study of companies.

**Course Outcome:** Students will have knowledge about global market, growth calculations depending on regions, market promotion datas, patent extensions, analysis of finished dosage forms and APIs. They also study data base related to strategies of companies.

**UNIT I**

- Introduction and overview of global pharmaceutical market
- Growth calculations based on Therapeutic category vs regions
- Innovator new drug candidate evaluation and strategic development cycle.
- Calculation of market promotion data
- Patent extension strategies
- Return on investment and R&D pipeline

**UNIT II**

Analysis of finished dosage forms based on

- Therapy
- Product
- Companies
- Quantity
- Value
- Country wise
- Region wise etc

Analysis of Active Pharmaceutical Ingredients based on

- Product,
- Quantities
- Value

Critical evaluation of databases for the global market research

- IMS
- Newport
- Export data etc

**UNIT III**

Lead analysis of Innovator vis-à-vis with Therapeutic Category & Generic drug makers vis-à-vis with Therapeutic Category

**UNIT IV**

Pharmaceutical Companies Portfolio, financials, R&D strengths and pipeline strength analysis

**UNIT V**

Case studies- Pharma growth stories of companies

Market research using SAS programmes on market trends

Multi Variate Analysis programmes to analyze in relationship between various factors governing the market growth.

**TEXT AND REFERENCE BOOKS:**

1. Principles of Pharmaceutical Marketing by MICKEY SMITH
2. Principles and Practice of Drug Manufacturing Management by MD BURANDE
3. Pharmaceutical Market research and analysis by Donald R. Lehmann
4. Pharmaceutical Market in 21st Century by Mickey C. Smith
5. Pharmaceutical Marketing: A Practical Guide by Dimitris Dogramatzis
6. Strategic management of health care organizations by Linda E. Swayne, Walter Jack Duncan, Peter M. Ginter
7. Managing Health Care Business Strategy by George B. Moseley, III, George B. Moseley
8. Pharmaceutical Management by Sachin Atkar

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PM & RA)

BIOSTATISTICS AND RESEARCH METHODOLOGY (Core Elective – II)

**Course Objective:** The student shall know the introduction, scope of biostatistics and Research work, calculation and present of the data. It also informs the students, how the present research work writing and correlating.

**Course Outcome:** The student will be known the Biostatistics arrangement, presentation, and formation of tables and charts. They also know the correlation and regression & application of different methods, analysis of data and also learn how to write dissertation, thesis and Research paper.

**UNIT I**

Introduction and scope of biostatistics: Use of statistics in Pharmacy. Population and Sample collection. Stages of research, types of data and methods of data collections. Data arrangement and presentation, formation of table and charts.

**UNIT II**

**Measures of central tendency:** computation of means, median and mode from grouped and ungrouped data.

**Measure of dispersion:** computation of variance, standard deviation, standard error and their coefficients.

**UNIT III**

**Measures of Correlation and Regression:** Experimental designing, planning of an experiment, replication, and randomization. Probit analysis.

**Probability rules:** Binomial, Poisson and Normal distribution.

**Hypothesis testing:** Student's 't' test, Chi square test, Analysis of Variance (ANOVA): 1-way, 2-way, 3-ways

**UNIT IV**

Developing a research question, Resources for research question,

Literature Review: Traditional Qualitative Review,

Meta-Analysis—A Quantitative Review

Preparation of Research Proposal

Variables—Definition of Variable, Types of variables (Dependent and Independent variables, Confounded variables), Measurement of variables, Types of measurement scales and their comparison. Reliability and Validity of Measurements.

**UNIT V**

The research report paper writing/ thesis writing

Different parts of the research paper

1. Title-Title of project with authors' name
2. Abstract – Statement of the problem, Background list in brief and purpose and scope
3. Key words
4. Methodology- subject, apparatus, instrumentation and procedure
5. Results – tables, graphs figure and statistical presentation
6. Discussion support or non-support of hypothesis, practical and theoretical implications
7. Conclusion
8. Acknowledgements

9. References
10. Errata
11. Importance of Spell check for entire projects
12. Uses of footnotes

**TEXT BOOKS:**

1. Deepak Chawla Neena Sondhi, Research Methodology Concepts and Cases, Vikas books publishers
2. Donald H. McBurney -Theresa L. White "Research Methods" (Cengage learning India Pvt. Ltd)

**REFERENCE BOOKS:**

1. Remington's Pharmaceutical Sciences
2. Theory & Practice of Industrial Pharmacy by Lachman
3. Statistics for business and economics 3<sup>rd</sup> edition by Vikas books publications
4. Biostatistics & Computer applications by GN Rao and NK Tiwari
5. Sokal, R.R. and Rohlf, F.J. 1987. An Introduction to Biostatistics. W.H. Freeman and Company.
6. Bailey, N.T.J. 1981. Statistical Methods in Biology. English University Press.
7. Mitchell, K. and Glover, T. 2001. Introduction to Biostatistics. McGraw Hill, Publishing Co.
8. Biostatistics and Computer Applications by G.N. Rao and N.K. Tiwari
9. Fundamentals of Biostatistics by Khan and Khanum
10. Research Methodology by R K Khanna bis and Suvasis Saha
11. Research methods and Quantity methods by G. N. Rao
12. A practical approach to PG dissertation.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PM & RA)

STABILITY OF DRUGS AND DOSAGE FORMS (Core Elective – II)

**Course Objective:** These topics are designed impart a specialized knowledge to preserve the properties of drugs and dosage forms during manufacture storage and shelf life. The understanding of properties and evaluation of stability during storage, by solution and solid state against several factors of degradation

**Course Outcome:** The students should describe the evaluation of stability of solutions, solids and formulations against adverse conditions. The students should be able to suggest the measures to retain stability and storage conditions for retaining the efficacy of the products

**UNIT- I**

**Drug decomposition mechanisms:**

1. Hydrolysis and acyltransfers: Nature of reaction, structure and utility, stabilization of Pharmaceutical examples.
2. Oxidation: Nature of oxidation, kinetics of oxidation, oxidation pathways of pharmaceutical, Interest Inhibition of oxidation
3. Photolysis: Energetics of photolysis, kinetics photolysis, photolytic reactions of pharmaceutical interest, prevention of photolytic reactions.

**UNIT- II**

Solid state chemical decomposition: Kinetic of solids state decomposition, Pharmaceutical examples of solid state decomposition, Pure drugs, drug excipient and drug-drug interaction in solid state, methods of stabilization.

Physical stability testing of dosage forms:

1. Solids – tablets, capsules, powder and granules
2. Disperse systems
3. Microbial decomposition
4. Over-view, physical stability of novel drug carriers, liposomes, niosomes, nano-particles.

**UNIT- III**

Identification and quantitative determination of preservatives, Antioxidants, colouring materials, emulsifiers and stabilizers in Pharmaceutical formulation.

Analysis of drugs from biological samples including, selection of biological sample, extraction of drugs by various methods as LLE, SPE and Membrane filtration. Factors affecting extraction of drugs.

**UNIT- IV**

General method of analysis to determine the quality of raw materials used in cosmetic industry. ... Indian Standard Specifications (ISI) laid down for sampling and testing of various cosmetics in finished form by the Bureau of Indian Standards.

**UNIT- V**

Methods of analysis to determine the quality of cosmetics in the finished forms such as Hair care products, Skin care products, Baby care products, Dental products, Personal hygiene products, Colour cosmetics, Ethnic products, Colour makeup preparation, Lipsticks, Hair setting lotions and Eye shadows. Toxicity testing in cosmetics and Safety and Legislation of Cosmetic products.

Stability studies: Concept of stability studies.

- a) cGMP & ICH guidelines for Accelerated stability Testing.
- b) Interaction of containers & closure Compatibility Testing.

**REFERENCE BOOKS:**

1. Comprehensive Pharmacy Review 5th Edition by Leon Shargel, Alan H. Mutnick, Paul F. Souney, Larry N. Sawanson – 2004.
2. H. Beckett and J. B. Stenlake Practical Pharmaceutical Chemistry, Part I and Part II, 4th Edition. 3. G. H. Jeffery, J. Basset, J. Mendham, R. C. Denny (Rev. by) Vogels Text Book of Quantitative Chemical Analysis, 5th Edition 1989, ELBS.
3. The Controller of Publications; New Delhi, Govt. of India, Indian Pharmacopoeia, Vol. I and Vol. II - 2010.
4. J. B. Wilkinson and R. J. Moore: Herry's Cosmeticology; Longman Scientific and Technical Publishers, Singapore.
5. P. D. Sethi; Quantitative Analysis of Drugs in Pharmaceutical Formulations, 3rd Edition - 1997,
6. Classification of cosmetics raw materials and adjuncts IS 3958 of Indian Standards Institution (BIS).
7. Cosmetic and toilet goods – methods of sampling IS 3958 of Indian Standards Institution (BIS).
8. Methods of sampling and test for various cosmetics as laid down by Bureau of Indian Standards.
9. Drug stability: Principles and practices by Jens T. Carstensen
10. Stability Testing of Drug Products by W. Grimm. 12. Stability of Drugs and Dosage Forms by Yoshioka and Stella.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PM & RA)

SCREENING METHODS IN PHARMACOLOGY (Open Elective - II)

**Course Objective:**

The students are going to study about various techniques for screening of drugs for various pharmacological activities and guide lines for handling animals and human and animal ethics for screening of drugs.

**Course Outcome:**

The expected outcomes are students will know how to handle animals and know about various techniques for screening of drugs for different pharmacological activities, guidelines and regulations for screening new drug molecules on animals.

**UNIT I**

Care Handling and breeding techniques of laboratory animals, Regulations for laboratory animals, CPCSEA guidelines, alternatives to animal studies, Good laboratory Practices.

**UNIT II**

Bioassays: Basic principles of Biological standardization: Methods used in the bio-assay of Rabbits Vaccine, Oxytocin, Tetanus Antitoxin and Diphtheria Vaccine. Test for pyrogens.

**UNIT III**

Toxicity tests: OECD guidelines, determination of LD50, acute, sub-acute and chronic toxicity studies.

**UNIT IV**

Organization of screening for the Pharmacological activity of new substances with emphasis on the evaluation of cardiac and anti-diabetic activities.

**UNIT V**

Organization of screening for the Pharmacological activity of new substances with emphasis on the evaluation of psychopharmacological, anti-inflammatory and analgesic activities.

**TEXT BOOKS:**

1. Screening methods in Pharmacology, Vol.-1&2 by Robert .A. Turner and Peter Hebborn.
2. Drug discovery and evaluation by H. G. Vogel and W. H. Vogel, Springer-Verlag, Berlin Heidelberg.
3. Handbook of experimental pharmacology by S. K. Kulkarni, Vallabh Prakashan, Delhi.

**REFERENCE BOOKS:**

1. ICH of technical requirements for registration of pharmaceuticals for human use, ICH harmonized tripartite guidelines - Guidelines for good clinical practice, E6, May 1996.
2. Good clinical practice - Guidelines for Clinical trials on pharmaceutical products in India, Central drug standard control organization, New Delhi, Minister of Health- 2001.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year – II Sem M. Pharm (PM & RA)

NANO BASED DRUG DELIVERY SYSTEMS (Open Elective - II)

**Course Objective** - To develop expertise regarding suitability and evaluation of nanomaterials, able to apply the properties to the fabrication of nanopharmaceutical, evaluate the intensity of dosage forms and availability for targeting and controlled delivery.

**Course Outcomes** – The students should be able to select the right kind of materials, able to develop nano formulations with appropriate technologies, evaluate the product related test and for identified diseases

**UNIT I – Introduction to Nanotechnology**

- Definition of nanotechnology
- History of nanotechnology
- Unique properties of nanomaterials
- Role of size and size distribution of nanoparticles properties, classification.

**UNIT II – Synthesis of Nanomaterials**

- a) Physical, chemical and biological Methods
- b) Methods for synthesis of
  - Gold nanoparticles
  - Magnetic nanoparticles
  - Polymeric nanoparticles
  - Self – assembly structures such as liposomes, micelles, aquasomes and nanoemulsions

**UNIT III – Biomedical applications of Nanotechnology**

- a) Nanotechnology products used for in vitro diagnostics
- b) Improvements to medical or molecular imaging using nanotechnology
- c) Targeted nanomaterials for diagnostic and therapeutic purpose

**UNIT IV**

Design of nanomaterials for drug delivery, pulmonary and nasal drug delivery, nanomaterials for cancer therapy and cardiovascular diseases. Localized drug delivery systems.

**UNIT V**

Characterization including the principles, size reduction, analysis of nanoparticles, size, PDI, size separation, stability, methods of analysis regarding integrity and release of drugs

**RECOMMENDED BOOKS:**

1. Nanomedicine and Nanoproducts: Applications, Disposition and Toxicology in the Human body, Eiki Igarashi, CRC press. 2015
2. Nanotechnology and Drug Delivery Volume one and two: Nanoplatfroms in Drug Delivery, Jose L. Arias, CRC press
3. Nano: The Essentials: Understanding Nanoscience and Nanotechnology, T.Pradeep, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
4. Nanocrystals: Synthesis, Properties and Applications, C. N. R. Rao, P. J. Thomas and G.U. Kulakarni, Springer (2007)
5. Nanostructures and Nanomaterials: Synthesis, Properties and Application, Guozhong Gao, Imperial College Press(2004)

6. Nanochemistry: A Classical Approach to Nanomaterials – Royal Society for Chemistry, Cambridge, UK (2005)
7. Nanocomposite science and technology, pulickel M. Ajayan, Linda S. Schadler, paul V. Braun, Wiley-VCH Verlag, Weiheim (2003)
8. Nanoscale materials in chemistry, Edited by Kenneth J. Klabunde, John Wiley & Sons, 2009
9. Nanoparticles as Drug carriers, Vladimir P Torchiling, Imperial College Press, USA, 2006

University Updates

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm. (PM & RA)

NUTRACEUTICALS (Open Elective – II)

**Course Objectives:** The students will expose to characteristic features of various phytochemicals as nutraceuticals in various diseased conditions and also know the role of antioxidant in free radical induced disease conditions and will expose to various food laws and regulations

**Course Outcome:** Helps the student to understand the importance of Nutraceuticals in various common problems with the concept of free radicals.

**UNIT I**

- Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer etc.
- Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods:  
Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

**UNIT II**

Phytochemicals as nutraceuticals: Occurrence and characteristic features(chemical nature medicinal benefits) of following

- Carotenoids-  $\alpha$  and  $\beta$ -Carotene, Lycopene, Xanthophylls, lutein
- Sulfides: Diallylsulfides, Allyltrisulfide.
- Polyphenolics: Resveratrol
- Flavonoids- Rutin, Naringin, Quercetin, Anthocyanidins, catechins, Flavones
- Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum
- Phytoestrogens : Isoflavones, daidzein, Geobustan, lignans
- Tocopherols

**UNIT III**

- Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.
- Measurement of free radicals: Lipid peroxidation products, lipid hydroperoxide, malondialdehyde.

**UNIT IV**

- Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.
- Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E,  $\alpha$ - Lipoic acid, melatonin  
Synthetic antioxidants: Butylatedhydroxy Toluene, Butylatedhydroxy Anisole.

**UNIT V**

**Food Laws and Regulations:** FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.

**Regulations and Claims** – Current Products: Label Claims, Nutrient Content Claims, Health Claims, Dietary Supplements Claims

**REFERENCES:**

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and nutraceuticals in preventing diseases by K. T Agusti and P. Faizal: BS Publication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F. Balch and Phyllis A. Balch 2<sup>nd</sup> Edn. Avery Publishing Group, NY (1997).
6. G. Gibson and C. Williams Editors 2000 *Functional foods* Woodhead Publ. Co. London.
7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
8. Labuza, T. P. 2000 *Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in Essentials of Functional Foods* M. K. Sachmidl and T. P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition. Lea and Febiger

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PM & RA)

ADVANCED DRUG DELIVERY SYSTEMS (Open Elective – II)

**Course Objective:** The students shall know the pharmacokinetic and pharmacodynamic on the basis of CDDS. They also know the design evaluation and application related to oral, parenteral, transdermal, implants, bioadhesives and targeted drug delivery systems.

**Course Outcomes:** Students will know the fabrication, design, evaluation and application of above drug delivery systems.

**UNIT I**

Fundamentals of controlled drug delivery systems, pharmacokinetic and pharmacodynamic basis of controlled drug delivery. Design, fabrication, evaluation and applications of the following controlled releasing systems

- a. Controlled release oral drug delivery systems
- b. Parenteral controlled release drug delivery systems

**UNIT II**

Design, fabrication, evaluation, and applications of the following:

- a) Implantable Therapeutic systems
- b) Transdermal delivery systems
- c) Ocular and Intrauterine delivery systems
- d) Vaccine delivery : Delivery systems used to promote uptake, absorption enhancers, oral immunization, controlled release microparticles form vaccine development

**UNIT III**

Biochemical and molecular biology approaches to controlled drug delivery of

- a. Bioadhesive drug delivery systems
- b. Nasal drug delivery systems
- c. Drug delivery to Colon

**UNIT IV**

Biochemical and molecular biology approaches to control drug delivery of

- a. Liposomes
- b. Niosomes
- c. Microspheres
- d. Nanoparticles
- e. Resealed erythrocytes

**UNIT V**

Drug targeting to particular organs

- a. Delivery to lungs
- b. Delivery to the brain and problems involved
- c. Drug targeting in neoplasms

**TEXT BOOKS:**

1. Novel Drug Delivery System by Yie W. Chien.
2. Controlled Drug Delivery by Joseph R. Robinson and Vincent H. L. Lee.
3. Controlled and Novel Drug Delivery Systems by N. K. Jain.
4. Targeted and Controlled Drug Delivery (Novel carrier systems) by S. P. Vyas and Khar.



5. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes..
6. Advances in Drug Delivery, Vol 1, 2, 3 by Y. Madhusudan Rao, A. V. Jithan
7. Oral Drug Delivery Technology, 2<sup>nd</sup> ed, by Aukunuru Jithan

University Updates



PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PM & RA)

CLINICAL RESEARCH AND PHARMACOVIGILANCE (Open Elective – II)

**Course Objective:**

This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing, and reporting of clinical trials. This subject also focuses on global scenario of pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in pre-clinical, clinical phases of drug development and post market surveillance.

**Course Outcomes:** Upon completion of the course, the student shall be able to,

- Explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in pharmacovigilance

**UNIT- I**

**Regulatory Perspectives of Clinical Trials:** Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR, Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process

**UNIT- II**

**Clinical Trials: Types and Design:** Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management.

**UNIT- III**

**Clinical Trial Documentation:** Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. predictability and preventability assessment. Management of adverse drug reactions; Terminologies of ADR.

**UNIT- IV**

**Basic aspects, terminologies, and establishment of pharmacovigilance:**

History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, Establishing pharmacovigilance centres in Hospitals, Industry and National programmes related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance.

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

#### UNIT- V

##### Methods, ADR reporting and tools used in pharmacovigilance:

International classification of diseases, International Nonproprietary names for drugs, Passive and Active surveillance, Comparative observational studies, targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for evaluating medication safety data.

##### REFERENCES:

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice. E6; May 1996.230
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
8. Textbook of PHarmacovigilance: Concept and Practice. G.P. Mohanta and P. K. Manna. 2016, PharmaMed Press.
9. A textbook of Clinical Pharmacy Practice: Essential Concepts and Skills. Second Edition, 2012, University Press

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PM & RA)

ANALYTICAL METHOD VALIDATION – LAB

Practical work shall be carried out based on the theory syllabus.


  
PRINCIPAL

Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
I Year – II Sem M. Pharm (PM & RA)

PHARMACEUTICAL MARKET RESEARCH AND ANALYSIS – LAB

Practical work shall be carried out based on the theory syllabus

  
PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.

University Updates

PRINCIPAL  
Geethanjali College of Pharmacy  
Cheeryal(V), Keesara(M), Medchal Dist. T.S.-501301.