

**KARPAGAM ACADEMY OF HIGHER EDUCATION**

Deemed to be University

*(Established Under Section 3 of UGC Act 1956)*

Eachanari Post, Pollachi Main Road, Coimbatore – 641021.



**COURSE OF STUDY AND SCHEME OF EXAMINATION**

**Ph.D COURSE IN PHARMACY**

**2021-2022**

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**PART – I COURSE WORK SYLLABUS FOR Ph.D COURSE IN PHARMACY**  
**(2021-2022)**

<b>SL.NO</b>	<b>TITLE OF THE COURSE</b>	<b>NO. OF SUBJECT</b>	<b>C</b>	<b>EXAM . HRS</b>	<b>MARKS</b>
1	PAPER I	01	4	3	100
2	PAPER II	01	4	3	100
3	PAPER III	01	4	3	100
	<b>TOTAL</b>	03	12	9	300

**PART – I COURSE WORK SYLLABUS FOR Ph.D COURSE IN PHARMACY**  
**(2021-2022)**

<b>SUB.CODE</b>	<b>TITLE OF THE COURSE</b>	<b>CREDITS</b>	<b>EXAM HRS</b>	<b>MARKS</b>
<b>PAPER - I (COMPULSORY)</b>				
21RPY101	Research Methodology and Pedagogy	4	3	100
<b>PAPER - II ( COMPULSORY)</b>				
21RPY 201	Research Publication Ethics	4	3	100
<b>PAPER - III (ANY ONE)</b>				
21RPY 301	Pharmaceutics	4	3	100
21RPY 302	Pharmaceutical Chemistry	4	3	100
21RPY 303	Pharmacology	4	3	100
21RPY 304	Pharmacognosy	4	3	100
21RPY 305	Pharmaceutical Analysis	4	3	100
21RPY306	Pharmacy Practice	4	3	100

## **21RPY101. RESEARCH METHODOLOGY AND PEDAGOGY**

### **Course Objectives:**

- To design the impart fundamental knowledge of higher education
- To illustrate the Research Processes and Methodologies that was undergone by the Research scholars
- To Explain the Research Skills like Research strategies, Ethics, Code for Research and IPR
- To Illustrate the techniques of teaching and evaluation
- To demonstrate the Essentials that was needed for the effective communication in English
- To describe the Data collection, Data Presentation Skills and Research Writing skills

**Course Outcomes (CO's):** On successful completion of the course the student will

1. Explain the objectives, role, social focus, curricular focus, administrative focus, drivers of change globalization in Higher Education
2. Restructure the new patterns of decision making
3. Describe the Expectations by employers, rate of knowledge growth, campus demographics and concern for community
4. Illustrate the Research strategies, Ethics, Code of conduct for Research, Health and Safety and also the IPR
5. Describe the Data collection , Modeling , Simulation , Analysis, Prototyping, Presentation Skills , Data Presentation Skills and Research Writing skills
6. Demonstrate the techniques of teaching and evaluation

### **Course Content**

#### **UNIT I**

**HIGHER EDUCATION AN INTRODUCTION:** Historical perspectives, the objectives of higher education, role of higher education-social focus, curricular focus, administrative focus, drivers of change in higher education-globalization, changing demographics, structuring of employment, technological change, demand of accountability, consumerism,. Expectations by employers, rate of knowledge growth, campus demographics, concern for community. Restructuring and new patterns of decision making.

#### **UNIT II**

**RESEARCH PROCESSES AND METHODOLOGY:** Introduction to Research – Research strategies – Ethics – Code of conduct for Research – Health and Safety – IPR – Research Events

– Networks – Outreach Activities – Best Research practices – Quality assurance for Research – Career Management for Researchers – Research seminars – Journal critiques -.

### **UNIT III**

#### **EFFECTIVE RESEARCH SKILLS**

Data collection – Modeling – Simulation – Analysis – Prototyping – Presentation Skills – Data Presentation Skills – Research Writing skills (For Articles, Reports, Journals and Thesis) – Creative Skills – Effective Interview Skills – Team Building Skills – Communication and Interpersonal Skills – knowledge Transfer skills – Vivo Voce – Teaching and Information Skills – Effective use of Library – Survey Skills – Planning and Control Methods – Statistical Tools – Patents and Copyrights – Advanced Research Techniques and Tools.

### **UNIT IV**

#### **TECHNIQUES OF TEACHING AND EVALUATION**

Large group techniques – lecture, seminar, symposium, panel discussion-project approaches and workshop. Small Group techniques- group discussion simulation, role playing-Buzz techniques, brain storming, case discussion and assignment...system approach in education. Individualized techniques-CAI Keller plan – PSI and programmed learning-methods of evaluation-self evaluation and student evaluation in higher education, question banking, diagnostic testing and remedial teaching.

### **UNIT V**

#### **ESSENTIALS FOR EFFECTIVE COMMUNICATION IN ENGLISH**

Improving Vocabulary stock-general and technical vocabulary-British and American vocabulary-homophones & homonyms, idioms and phrases-Different grammatical functions of the same word-Grammar-Tenses, Voice, reported speech, Modals, spoken English structures, formal and informal-letters, project reports, descriptions, circulars, synopsis and summary writing. Listening skills for competitive exams-Reading skills-skimming and scanning – Reading journals, magazines and newspapers for comprehension. Practical use of English – conversation, seminars, individual speeches and group discussions. Reference skills-Using dictionary, thesaurus and encyclopedia effectively. Error shooting for better use of English.

#### **SUGGESTED READING BOOKS**

1. Alley, Michael,( 1996), ‘The Craft of Scientific Writing’, 3<sup>rd</sup> Edition, Springer.
2. Alley, Michael, (2003), ‘The Craft of Scientific Presentations’, Springer.

## **REFERENCE BOOKS :**

1. Hubbuch, Susan M.,(2005), Writing Research Papers Across the Curriculum, 5<sup>th</sup> Edition, Thompson.
2. Vedanayagam.E.G (1989),Teaching technology for college teachers New Delhi - Sterling publishers (Pvt) Ltd.
3. Kumar.K.H.( 1997), Educational technology, New Delhi- New age international (Pvt) Ltd.
4. Tony Bates.A.N,( 2005) Technology, e-learning and distance education, New York, Rout ledge.
5. Agarwal. J.C. (1995), Essential of educational technology; Teaching Learning innovations in education-New Delhi- Vikas publishing house (p) Ltd.
6. Crow & Crow. (1998), Educational Psychology”, Erusia Publishing House New Delhi.
7. M. Ashraf Rizvi.(2005), Effective technical communication, Tata Mc Graw Hill Co.Ltd.

## **Websites:**

[www.english4engineer.com](http://www.english4engineer.com)

[www.learn4good.com/language/engineer](http://www.learn4good.com/language/engineer)

## **21RPY201. RESEARCH PUBLICATION ETHICS**

### **Course Objectives:**

- To illustrate the Philosophy, Ethics, nature of moral judgments and reaction
- To Explain the Intellectual honesty , research integrity, Fabrication and Plagiarism
- To demonstrate the Publication Ethics, violation of publication ethics and authorship
- To describe the duplicate ,overlapping publication, salami slicing, selective reporting and misrepresentation of date
- To illustrate the Conflicts of interest, publication misconduct and problems that lead to unethical behavior.
- To develop the e-content, IPR, indexing database, citation database and web of science

**Course Outcomes (CO's):** On successful completion of the course the student will

1. Explain the Philosophy, Ethics, nature of moral judgments.
2. Illustrate the Intellectual honesty, research integrity, Fabrication and Plagiarism
3. Describe the duplicate, overlapping publication, salami slicing, selective reporting and misrepresentation of date
4. Demonstrate the Publication Ethics, violation of publication ethics and authorship
5. Develop the e-content, IPR, indexing database, citation database and web of science
6. Illustrate the Conflicts of interest, publication misconduct and problems that lead to unethical behavior

### **Course Content**

#### **UNIT I: Philosophy and Ethics**

Introduction to Philosophy: Definition, nature and scope, concept, branches – Ethics: Definition, moral philosophy, nature of moral judgments and reaction.

#### **UNIT II: Scientific Conduct**

Ethics with respect to science and research – Intellectual honesty and research integrity – scientific misconduct: Falsification – Fabrication – Fabrication and Plagiarism (FFP) – Redundant publications: duplicate and overlapping publication-salami slicing- selective reporting and misrepresentation of date.

### **Unit III: publication Ethics**

Publication Ethics: Definition , introduction and importance- Best practices/ standards setting initiatives and guidelines : COPE, WAME, etc. – Conflicts of interest – publication misconduct: definition , concept , problems that lead to unethical behavior and vice versa, type- violation of publication ethics, authorship and contributing and appeals- predatory publishers and journals.

### **Unit IV: Publication misconduct**

Group discussions: Subject specific ethical issues, FFP, authorship – conflicts of interest-complaints and appeals: examples and fraud from India and abroad.

### **Unit V: Development of e-content & IPR**

Database: Indexing database- citation database: web of science, scopus, etc.

Research Metrics: impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score – Metrics: h-index, g index, g index, I 10 index, altmetrics.

### **Unit VI : Development of e- content & IPR**

Integrated Library Management System (ILMS): e-journals – e-books – e-shodhsindu – shodhganga – database – e-content development – Learning Management system (LMS) – e-PG –Pathshala – CEC (UG) SWAYAM – MOOCs – NPTEL – NMEICT. IPR: Patent – Copyrights-trademark – Geographical Indication.

### **PRACTICE:**

Open access publishing

Open access publications and initiatives-SHERPA/RoMEO online resource to check publisher copyright & self -archiving policies-software tool to identify predatory publications developed by SPPU-Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.



## 21RPY301. PHARMACEUTICS

### Course objective

- To determine the organoleptic properties and physical properties of the different dosage forms
- To explain the Physico- chemical characteristics of new drug molecules with respect to different dosage forms
- To illustrate the Compaction and Compression of tablet Dosage form
- To demonstrate the Controlled & Novel Delivery Systems like microparticulates, nano particles, Liposomes & niosomes
- To estimate the bioavailability & bioequivalence concept & methodology
- To determine the dissolution of poorly soluble drugs and invitro dissolution testing models

**Course outcome(CO's):** On successful completion of the course the student will

1. Evaluate the physico- chemical characteristics of new drug molecules with respect to different dosage forms
2. Measurement of forces within the powder mass, moisture content and strength of tablets
3. Explain the concept of optimization parameters, classical optimization, statistical design and optimization methods.
4. Explain the Oral SR/CR products, Ocular, Transmucosal, transdermal delivery Colonic delivery, Liposomes and niosomes of different dosage forms
5. Estimate the absorption rate of drugs, bioavailability and Bioequivalence methodologies.
6. Illustrate the In-vitro dissolution testing models and its In-vivo correlation

### Course Content

#### UNIT – I

**Preformulation-** Introduction- organoleptic properties- purity- particle size- shape- and surface area. Solubilisation- surfactants and its importance- temperature- pH- co-solvency; Techniques for the study of crystal properties and polymorphism. Drug- Excipients compatibility studies. Physico- chemical characteristics of new drug molecules with respect to different dosage forms.

## **UNIT – II**

**Compaction and compression-** Compaction of powders with particular reference to distribution and measurement of forces within the powder mass undergoing compression including- physics of tablet compression; Effect of particle size- moisture content- lubrication etc on strength of tablets, Heckul's Plot. Transducers, Concept of optimization- optimization parameters- classical optimization- statistical design- and optimization methods.

## **UNIT – III**

**Controlled & novel delivery systems-**Concept of CR- Polymers for CR- Parental SR products- Oral SR/CR products- Ocular- Transmucosal- transdermal delivery- Colonic delivery- nasal delivery, Particulate CR systems – microparticulates- nano particles and Liposomes & niosomes

## **UNIT – IV**

**Bioavailability & bioequivalence-**Basic considerations- Definition- estimating absorption rate of drugs- measurement of bioavailability- Pharmacokinetic methods and Pharmacodynamic methods. Methods of enhancing bioavailability of drugs- Bioequivalence – concept & methodology

## **UNIT – V**

**Dissolution-**Theory, factors influencing dissolution, study of various approaches to improve dissolution of poorly soluble drugs- Invitro dissolution testing models- *Invitro -Invivo* correlation in brief.

### **TEXT BOOKS:**

1. Biopharmaceutics and clinical Pharmacokinetics By Milo Gibaldi.
2. Remington's Pharmaceutical Sciences; By Mack publishing company- Pennsylvania.

### **REFERENCE BOOKS:**

1. Pharmacokinetics; By Milo Gibaldi- Donald Perrier; Marcel Dekker- Inc.
2. Handbook of clinical Pharmacokinetics; By Milo Gibaldi and Laurie Prescott by
3. ADIS Health Science Press.
4. Biopharmaceutics and Pharmacokinetics; By Robert E. Notari.
5. Biopharmaceutics; By Swarbrick.

6. Biopharmaceutics and Pharmacokinetics- A Treatise; By D.M.Brahmankar and Sunil
7. B.Jaiswal.-VallabhPrakashanPitampura- Delhi.
8. Clinical Pharmacokinetics- Concepts and Applications; By Malcolm Rowland and
9. Thomas N.Tozer. Lea and Febiger- Philadelphia- 1995.
10. Dissolution- Bioavailability and Bioequivalence; By Abdou.H.M.- Mack Publishing
11. Company- Pennsylvania- 1989.
12. Biopharmaceutics and Clinical Pharmacokinetics- An introduction; 4th edition-
13. Revised and expanded By Robert. E. Notari- Marcel Dekker Inc- New York and Basel-1987.
14. Encyclopedia of Pharmaceutical Technology- Vol 13- James Swarbrick- James.
  
15. C.Boylan. Marcel Dekker Inc- New York- 1996.

#### **WEBSITES:**

- [www.slideshare.net](http://www.slideshare.net)
- [www.picscheme.org](http://www.picscheme.org)
- [www.ijper.org](http://www.ijper.org)

## 21RPY302. PHARMACEUTICAL CHEMISTRY

### Course Objectives:

- To describe the Modern concept and principles of Drug design and drug discovery
- To explain pharmacokinetic parameters in drug design and Molecular Docking
- To Illustrate techniques for preparing chiral drugs
- To explain the synthetic strategical analysis and QSAR
- To analyze the recent advances in anticancer research
- To describe the Applications of UV- IR-  $^1\text{H}$  NMR-  $^{13}\text{C}$  NMR- MASS spectroscopic data in structural elucidation

### Course Outcomes (CO's): On successful completion of the course the student will

1. Evaluate the drug target interactions, Intracellular signaling pathways and Pharmacokinetic parameters in drug design
2. Describe the Molecular Modeling, Docking, XRD, QSAR methods, Combinatorial Synthesis and Computer-Aided Drug Design.
3. Demonstrate the Techniques in preparing the chiral drugs, Enantioselective synthesis and Stereoselective synthesis
4. Explain the Synthetic strategies like Synthones for carbon-carbon bond formation
5. Illustrate the Pathophysiology of Anti-microbial activities and Recent advances in antimicrobial research.
6. Elucidate the structure of natural- synthetic and semi-synthetic by using the UV, IR,  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR, MASS spectroscopic data

### Course Content

#### UNIT – I

**Drug design & drug discovery-** Modern concept and principles of Drug design - Analog design- Receptors and Enzymes as drug targets and their characterization – Drug target interactions - Intracellular signaling pathways - Pharmacokinetic parameters in drug design. Molecular Modeling –Docking - XRD - QSAR methods & Combinatorial Synthesis. Computer-Aided Drug Design (CADD).

#### UNIT – II

**Asymmetric Synthesis-** Chirality and the importance of chiral drugs- Techniques for preparing chiral drugs (chirality pool - enzymatic transformation and asymmetric synthesis). Enantioselective synthesis - Stereoselective synthesis.

**Moleculardocking:** Rigid docking, flexible docking, manual docking, Docking based screening. De novo drug design.

**Quantitative Structure Activity Relationship (QSAR):** SAR versus QSAR, History and Development of QSAR, Types of physicochemical parameters, experimental and theoretical Approaches for the determination of physicochemical parameters such as Partition coefficient, Hammett's substituent constant and Tafts, Steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

### **UNIT – III**

**Synthetic strategies** - Introduction- Disconnection approach- Synthones for carbon-carbon bond formation.-Difunctional compounds- Selective functional group interconversions (FGI) - Retrosynthetic analysis.

**Informatics & Methods in drug design:** Introduction toBioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

### **UNIT – IV**

**Cytotoxic (Anti cancer) activities-** Pathophysiology of Cytotoxic (Anticancer) activity-Recent advances in anticancer research - **Antimicrobial activities** - Pathophysiology of Anti microbial activities - Recent advances in antimicrobial research.

### **UNIT-V**

**Spectroscopic Analysis-** Applications of UV- IR-  $^1\text{H}$  NMR-  $^{13}\text{C}$  NMR-, correlation spectroscopy, DEPT, MASS spectroscopic data in structural elucidation of natural- synthetic and semi-synthetic drugs. **Chromatographic techniques-** Applications of TLC- HPTLC- HPLC- GCMS- LCMS.

### **TEXT BOOKS:**

1. Organic Medicinal and Pharmaceutical Chemistry by Wilson and Gisvold
2. Organic spectroscopy by William Kemp

## REFERENCE BOOKS

1. Burger's medicinal chemistry drug discovery- vol. 1 sixth edition- by Donald J. Abraham. (2007)
2. Organic Medicinal and Pharmaceutical Chemistry by Wilson and Gisvold
3. Introduction to Medicinal Chemistry by G. Patrick.
4. Introduction to principles of drug design by Smith and Williams- Harwood Academy press.
5. Advanced Organic chemistry- Reaction mechanisms and structure- J. march- John Wiley and sons- N.Y
6. Medicinal Chemistry by William O Foye.
7. Text book of pathology by Harsh Mohan- third edition. (1998)
8. Spectrometric Identification of organic compounds by Robert M. Silverstein- Francis X- Webster- sixth edition. (1998)
9. Instrumental methods of analysis by Skoog.
10. Organic spectroscopy by William Kemp

## WEBSITES:

- [www.rsc.org](http://www.rsc.org)
- [www.acs.org](http://www.acs.org)
- [www.medicinalchemistry.org](http://www.medicinalchemistry.org)

## 21RPY303 . PHARMACOLOGY

### Course Objectives:

- To explain the drug discovery process, Bioassays, statistical designs and statistical models employed in biological standardization.
- To employ the Preclinical, clinical models in the screening of new drugs .
- To explain the Review of Literature and the Regulations in the laboratory animal care
- To Illustrate the various International guidelines like ICH, WHO, OECD and CPCSEA
- To evaluate ED<sub>50</sub>, LD<sub>50</sub> and TD values
- To describe the Pathophysiology and drug therapy of various disease disorders

**Course Outcomes (CO's):** On successful completion of the course the student will

1. Describe the High throughput screening and human genomics of drug discovery
2. Explain the principles of bioassays, experimental models, statistical designs and statistical models employed in biological standardization.
3. Demonstrate the Preclinical and clinical models employed in the screening of new drugs.
4. Explain the alternatives to animal screening procedures like cell-line and patch-clamp technique
5. Describe the Principles of toxicity evaluations like ED<sub>50</sub>, LD<sub>50</sub>, TD values and bioassay methods
6. Illustrate the Pathophysiology and drug therapy of the various disease disorders

### Course Content

#### UNIT – I

**Drug discovery process & Bioassays:** Principles- techniques and strategies used in new drug discovery. High throughout screening- human genomics of drug discovery. Basic principles of bioassays- official bioassays- experimental models- statistical designs and statistical models employed in biological standardization

#### UNIT - II

Preclinical and clinical models employed in the screening of new drugs such as Antifertility agents- sedatives- hypnotics- antiarrhythmic agents- cardiac stimulants- bronchodilators- antihistaminics. Antipsychotic agents- Neurodegenerative diseases- antidepressant drugs; antiparkinsonian agents; antiepileptics; analgesics and anti-inflammatory agents; antiulcer

agents; antiatherosclerotic drugs; antidiabetics; transgenic animals and other genetically prone animal models.

**Study of pharmacological screening methods of the following categories of drugs:** hypolipidemic- - cardiovascular- hepatoprotective- anticancer- - antioxidant- immunomodulator- antimalarial- antimicrobial- antiallergic and antifertility drugs.

Narcotic and non-narcotic analgesics, Drugs acting on Central Nervous System General anesthetics.

### **UNIT - III**

Regulations for laboratory animal care and ethical requirements. Alternatives to animal screening procedures- cell-line- patch-clamp technique *in-vitro* and *in-vivo* models- molecular biology techniques.

**Research methodology and Bio-statistics:** Selection of research topic, review of literature, research hypothesis and study design Pre-clinical data analysis and interpretation using Students't test and One-way ANOVA. Graphical representation of data.

### **UNIT – IV**

**Principles of toxicity evaluations:** ED<sub>50</sub>- LD<sub>50</sub> and TD values. International guidelines (ICH /WHO/OECD/CPCSEA recommendations). Toxicology: Principles of toxicity evaluations, ED<sub>50</sub>, LD<sub>50</sub> and TD values, International guidelines (ICH& OECD recommendations). Preclinical studies: General principles and procedures involved in acute, sub-acute, chronic, teratogenicity, mutagenicity and carcinogenicity toxicity studies.

**Laboratory Animals:** Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.

### **UNIT – V**

**Pathophysiology and drug therapy of the following disorders.** Schizophrenia- anxiety- depression- epilepsy- Parkinson's- Alzheimer's diseases- migraine hypertension- angina pectoris- arrhythmias- atherosclerosis- myocardial infarction- TB- leprosy- leukemia- solid tumors- lymphomas- psoriasis- respiratory- urinary- GI tract infections- endocarditis- fungal and HIV infection- rheumatoid arthritis- glaucoma- menstrual disorders- menopause



**Pharmacogenomics** – basic principles- Chronopharmacology – Principles- molecular pharmacology

**Biological Screening methods:** Bioassays-Basic principles of bioassays, official bioassays, experimental models and statistical designs employed in biological evaluation and standardization. Alternatives to animal screening procedures, cell-line, patch –clamp technique, *In-vitro* models, molecular biology techniques. Enzymatic screening methods:  $\alpha$ -glucosidase,  $\alpha$ -amylase, DNA polymerase, nucleases, L-asparaginase, lipases and peptidases.

**Preclinical screening models:** for CVS activity-antihypertensives, diuretics, antiarrhythmic, antidyslipidemic, antiaggregatory, coagulants, and anticoagulants. Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics.

#### **TEXT BOOKS:**

1. Essentials of Medical Pharmacology by K.D.Tripathi.
2. Pharmacology and Pharmacotherapeutics by Satoskar R.S and Bhandarkar S.D.

#### **REFERENCE BOOKS**

1. Lippincott's illustrated Reviews- Pharmacology by Mycek M.J- Gelnet S.B and PerperM.M.
2. Hand book of Experimental Pharmacology by Kulkarni.S.K.
3. Fundamentals of Experimental Pharmacology by M. N. Ghosh.
4. Pharmacology by Rang. M.P. Dale- M.M- Reter J.M.
5. Goodman and Gilman's- The Pharmacological basis of therapeutics by Gillman G- Rall T.W.-Nies
6. A.I.S. and Taylor P.
7. Basic & Clinical Pharmacology by Katzung B.G.
8. Craig C.R. and Stitzel R.R- Modern Pharmacology.
9. Ghosh M. N- Fundamentals of experimental Pharmacology.
10. Katzung B.G- Basic and Clinical Pharmacology- Prentice Hall International.
11. Laurence D.R and Bennet P.N. Clinical Pharmacology Churchill Livingstone.
12. Mycek M.J- Gelnet S.B and Perper M.M- Pharmacology- Lippincott's illustrated Reviews.
13. Rang M.P- Dale M.M- Reter J.M- Pharmacology.

14. Goodman and Gilman's- The Pharmacological basis of Therapeutics.
15. S.K. Kulkarni. Hand book of Experimental Pharmacology.
16. N.Udapa and P.D. Gupta- Concepts in Chronopharmacology.

**WEBSITES:**

- [www.libguides.utep.edu](http://www.libguides.utep.edu)
- [www.pharmacology2000.com](http://www.pharmacology2000.com)
- [www.pharmacologycorner.com](http://www.pharmacologycorner.com)

## 21RPY304. PHARMACOGNOSY

### Course Objectives:

- To evaluate the Preparation of monograph of crude drugs
- To Interpret the data of UV, IR, NMR,  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR & Mass spectroscopy
- To analyze the Ayurvedic Formulations and crude drugs
- To explain the Principles and procedures of microtomy and advanced histological techniques.
- To describe the Pharmacological screening methods
- To Illustrate the Regulatory requirements for new drugs, Markers constituents and importance in crude drug standardization

**Course Outcomes (CO's):** On successful completion of the course the student will

1. Explain the pharmacopoeia and other guidelines like European Pharmacopoeia, BP, Ayurvedic Pharmacopoeia of India, Ayurvedic formulary of India and WHO guidelines
2. Apply the chromatographic techniques in separation and identification of natural products
3. Analyze the of Ayurvedic Formulations and crude drugs
4. Describe the Principle and procedure involved in biological test like Presence of Mycobacterium tuberculosis, Living contaminants in vaccines and toxic elements
5. Demonstrate the pharmacological screening of the drugs
6. Explain the Regulatory requirements for new drugs

### Course Content:

#### UNIT – I

Evaluation of Drugs: Concept- considerations- parameters and methods of quality control for medicinal plant materials as per various pharmacopoeia and other guidelines. Preparation of monograph of crude drugs. Comparative study of IP- European Pharmacopoeias- BP / Ayurvedic Pharmacopoeia of India / Ayurvedic formulary of India and WHO guidelines in relation to above.

Application of chromatographic techniques in separation and identification of natural products. Only interpretation of data UV- IR- NMR- $^1\text{H}$  NMR- $^{13}\text{C}$  NMR & Mass spectroscopy for purification and structural elucidation of phytoconstituents. Herbal fingerprint profile of single and multicomponent herbal drugs. Stability testing of natural products.

## **UNIT - II**

Analysis of Ayurvedic Formulations and crude drugs with references to: Identity- purity and quality of crude drugs. Determination of pesticide residues- determination of arsenic and heavy metals- detection of microorganisms- determination of microbial load in crude drugs. Identification of aflatoxins in crude drugs. Quality assurance in herbal drug industry- concept of GMP and ISO-9000. Quality assurance in herbal drug: industry of cGMP, GAP, GMP and GLP in traditional system of medicine. WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines. WHO Guidelines on GACP for Medicinal Plants.

## **UNIT-III**

Quantitative microscopy including lycopodium spore method as applied to drug evaluation and pollen grain analysis - Principles and procedures of microtomy and advanced histological techniques as applied to Pharmacognosy -Principle and procedure involved in biological test for presence of Mycobacterium tuberculosis, living contaminants in vaccines -determination of toxic elements.

## **UNIT-IV**

Herbal drugs available in the categories of Anti-inflammatory, hypolipidemic, diuretics, cardiovascular, hepatoprotective, anticancer, Expectorant antidiabetic, antiulcerative, antioxidant, immunomodulator, antimalarial, antimicrobial, antiallergic and antifertility and Study of pharmacological screening methods of the following categories of drugs: Antiinflammatory-hypolipidemic- diuretics- cardiovascular-hepatoprotective- anticancer-antidiabetic-antiulcerative- antioxidant-immunomodulator- antimalarial- antimicrobial- antiallergic, drug acting on CNS and antifertility drugs.

## **UNIT- V**

Regulatory requirements for new drugs: Markers constituents- Definition- importance in crude drug standardization. Examples of Biomarkers. Standardization- quality- efficacy and safety requirements & assessment procedures for herbal medicines as per USFDA/WHO guidelines. Regulatory requirements for herbal medicines, WHO guidelines on safety monitoring of herbal medicines in Pharmacovigilance systems Comparison of various Herbal Pharmacopoeias. Role of chemical and biological markers in standardization of herbal products. Stability testing of

herbal medicines. Application of various chromatographic techniques in standardization of herbal products. Preparation of documents for new drug application and export registration. GMP requirements and Drugs & Cosmetics Act provisions.

### **TEXT BOOKS :**

1. Vogel- Drug Discovery and Evaluation.
2. AshutoshKar-Pharmacognosy and Pharmacobiotechnology- New Age International Publishers

### **REFERENCE BOOKS :**

- 1..Dhawan- B.N.-Shrimal- R.C.- Use of Pharmalogical Techniques for the Evaluation of Natural Products- CDRI-Lucknow.
- 2.Ayurvedic Formulary of India.
- 3..Ayurvedic Pharmacopoeia of India.
- 4.. Indian herbal Pharmacopoeia.
5. Indian Pharmacopoeia 2007.
6. European Pharmacopoeia 6<sup>th</sup> Edn. 2008.
7. Pulok K. Mukherjee- Quality Control of Herbal drugs. An Approach to Evaluation of Botanicals.
8. Quality Control Methods for Medicinal Plant Material- WHO Headquarters- Geneva.
9. Standardization of Botanicals by V. Rajpal- Vol. I & II- Eastern Publishers- New Delhi.
10. Evans- W.C.-Trease& Evans Pharmacognosy- W.B. Saunders & Co. London.
11. WHO guidelines- Methodologies on Research for Drug Development and Evaluation of Traditional Medicines.
- 12.Willard- H.H.-Merrit- L.L.- Dean- J.A.- Settle P.A.- Instrumental Methods of Analysis- Van Nostrand.
13. Skoog- D.A.- Heller- F.J.-Nieman- T.A.- Principles of Instrumental Analysis- W.B Saunders.
14. Hunson- J.W.- Pharmaceutical Analysis - Modern Methods- part A & B- Marcel Dekker.
15. Schirmer- R.E.- Modern Methods of Pharmaceutical Analysis- Vol. 1- 2- Boca Raton F.L: CRC Press.
16. Mann- C.K. et al.- Instrumental Analysis- Harper & Row.

17. Jaffe- H.H.-Orchin- M.- Theory & Applications of Ultraviolet Spectroscopy- Willy.
18. Silverstein- R.M.- et al.- Spectrometric Identification of Organic Compounds- Willy.
19. Bovey- F.-Jelinski- L-Miran- P.- Nuclear Magnetic Resonance Spectroscopy-Sau:Diego Academic.
20. Stothers- J.B.- Carbon-13 NMR Spectroscopy- Academic.
21. Gordy- W.- Theory & Applications of Electron Spin Resonance- Willy.
22. Haswell- S.J.- Atomic Absorption Spectroscopy- Elsevier.
23. Ardrey- R.E.- Pharmaceutical Mass Spectra- Pharmaceutical press- London.
24. WHO Monographs on Selected Medicinal Plants- Vol. I & II.
25. WHO Quality Control Methods of Medicinal Plant Materials.
26. WHO- International Pharmacopoeia- Vol. I-V.
27. Wilfried- M.A.-Niessen- Liquid Chromatography-Mass Spectrometry.
28. Harry- G. Brittain- Spectroscopy of Pharmaceutical Solids.
29. Indian Herbal Pharmacopoeia-Vol. 1 & 2.
30. Wallis- T.E.- Practical Pharmacognosy.
31. Gorag- Steroid Analysis in Pharmaceutical Industry.
32. Wagner's- Plant Drug Analysis-A Thin layer Chromatography- Atlas.
33. Bogers- Medicinal and Aromatic plants- Agricultural- Commercial- Ecological- Legal- Pharmacological and Social Aspects.

**WEBSITES:**

- [www-autostream-com](http://www-autostream-com)
- [www-epharmacognosy-com](http://www-epharmacognosy-com)
- [www-science20-com](http://www-science20-com)

## 21RPY305 .PHARMACEUTICAL ANALYSIS

### Course Objectives:

- To describe the Concepts and Philosophy of TQM- GMP (orange guide)- ISO-9000
- To explain the Selection- purchase specifications- maintenance- sterilization of an area.
- To explain the Manufacturing Documents- Master Formula- Batch Formula Records- Standard operating procedure- Quality audits of manufacturing processes
- To Illustrate the concepts in the Quality control Laboratory
- To describe the Regulatory aspects of Pharmaceuticals and Bulk drug Manufacturing
- To explain the Preparation of drug sample for analysis

**Course Outcomes (CO's):** On successful completion of the course the student will

1. Explain about orange guide, Location, Design, Plan Layout, Construction, Maintenance and Sanitations
2. Describe about Purchase specifications, Maintenance of stores, Selection of vendors, and Controls on Raw materials.
3. Illustrate about Manufacturing Documents, Master Formula, Batch Formula Records- Standard operating procedure and Quality audits of manufacturing processes.
4. Explain the Good Laboratory Practices and Good warehousing practice.
5. Describe about the Globalization of Drug Industry, Export of Drugs and Import Policy
6. Explain about HPLC Method development by using different stationary phases

### Course Content

#### UNIT - I

Concepts and Philosophy of TQM- GMP (orange guide)- ISO-9000. Organization and personnel-responsibilities- training- hygiene. Location- Design- Plan Layout- Construction- Maintenance and Sanitations. Environmental control- Sterile areas- control of contamination. Selection-purchase specifications- maintenance- sterilization of an area (TP & STP)

**Spectroscopy:** UV-VISIBLE Spectroscopy: Electromagnetic spectrum. Shifts and their interpretation, instrumentation and applications. INFRARED Spectroscopy: Basic principles, molecular vibrations, vibration frequency and its influencing factors, instrumentation and applications. Interpretation of IR spectra. NMR Spectroscopy: Fundamental principles of NMR, instrumentation and applications. Interpretation of NMR spectra.

**Spectrometry:** Mass Spectrometry: Basic principles and brief outline of instrumentation and applications. Ion formation and types; molecular ion, Meta stable ions, fragmentation processes. Fragmentation patterns and fragmentation characteristics in relation to parent structure and functional groups. Interpretation of Mass spectra

## **UNIT – II**

Purchase specifications- Maintenance of stores- Selection of vendors- Controls on Raw materials. Manufacture of and controls on dosage forms:. Manufacturing Documents- Master Formula- Batch Formula Records- Standard operating procedure- Quality audits of manufacturing processes and facilities. Standard operating procedures for various operations like cleaning- filling- drying- compression- coating- disinfection- sterilization- membrane filtration etc.-

## **UNIT – III**

Quality control Laboratory: Responsibilities- Good Laboratory Practices- Routine controls- Instruments- Protocols- Non-clinical testing- Controls on animal house- Application of Computers in Quality control laboratory Finished product release : Quality review- Quality audits- Batch release document. Warehousing: Good warehousing practice- Materials- Managements. Packaging and labeling controls- line clearance- reconciliation of labels; cartons and other packaging material; types and tests assuring quality of glass and plastics. Introduction to cGMP

## **UNIT – IV**

Distribution: Distribution of records- Handling of returned goods- Recovered materials and Reprocessing. Complaints and Recalls: Evaluation of complaints- Recall procedures- Related records and documents. Waste disposal- Scrap disposal procedure and records. Regulatory aspects of Pharmaceuticals and Bulk drug Manufacturing- Regulatory drug analysis. Loan License Auditing – Concepts- Auditing. Recent Amendments to drugs and cosmetics act and other relevant rules- Consumer protection- Environmental protection act- Certification and Licensing procedure. WHO Certification- Globalisation of Drug Industry- Introduction to Export of Drugs and Import Policy. Patent regime.

## **UNIT – V**



Internal and standard addition methods Preparation of drug sample for analysis-Introduction-compatibility with the instrumental method- fundamental theories controlling preparation techniques- Specific sample preparation techniques: soxhlet extraction- Liquid-liquid extraction- solid phase extraction- solid phase micro extraction- protein precipitation methods- Ultra filtration- direct injection- methods- derivatization methods- residual sample preparation- different sample preparation methods for pharmaceutical dosage forms: tablets- capsules- ointments etc- Gas Chromatography: inlets and injectors- GC column characteristics- GC detectors- GC preventive maintenance and troubleshooting- method development process- method validation and QA Processes HPLC: Detectors- PDA- ELSD- Conductivity- UV- Refractive Index- Fluorescence- Mass- HPLC column selection and mobile phases- mobile phase additives. HPLC Method development by using different stationary phases- mechanism of interactions- HPLC preventive maintenance and troubleshooting- case studies. Calibration methods: external, HPTLC and interface.

#### **TEXT BOOKS:**

1. Quality Assurance Guide by Organisation of Pharmaceutical products of India.
2. Good Laboratory Practice Regulations- 2nd Edition- Sandy Weinberg- Vo. 69-

#### **REFERENCE BOOKS:**

1. Decker Series.
2. Quality Assurance of Pharmaceuticals – A compendium of guidelines and related
3. materials – Vol. I – WHO Publications.
4. A guide to Total Quality Management – KaushikMaitra and SedhanK.Ghosh.
5. How to practice GMPs – P. P. Sharma.
6. ISO 9000 and Total Quality Management – Sadhank. G. Ghosh.
7. The International Pharmacopoeia Vol. 1-2-3-4 - 3rd Edition- General Methods of
8. Analysis and Quality specification for Pharmaceutical Substances- Excipients and
9. Dosage forms.
10. Controller of Publication- Govt. of India - Indian Pharmacopeia- Vol. I and II -
11. 1996.
12. Burn- Finiey and Godwin : Biological Standardisation- 2nd Edition- Oxford
13. University Press- London.

14. Dr. A. Patani : The Drugs and Cosmetics Act 1940- Eastern Book Company-Lucknow.

**WEBSITES:**

- [www.jpr.info.com](http://www.jpr.info.com)
- [www.sciencedomain.org](http://www.sciencedomain.org)
- [www.pharmaresearchlibrary.com](http://www.pharmaresearchlibrary.com)

## 21RPY306. PHARMACY PRACTICE

### Course Objectives:

- To explain the role and responsibilities of community pharmacy, its relationship with healthcare professionals, code of ethics and pharmacoepidemiology.
- To discuss antibiotics, antibiotic resistance and the role of clinical pharmacist in rational use of antibiotics.
- To evaluate patient data and medication errors.
- To elaborate the need for Pharmacovigilance and importance of ADR reporting.
- To describe type and design of clinical research along with patient safety and rights.
- To illustrate the importance of pharmacoepidemiology and its applications.

**Course Outcomes (CO's):** On successful completion of the course the student will

1. Explain the role and responsibilities of community pharmacy, its relationship with healthcare professionals, code of ethics and pharmacoepidemiology.
2. Discuss antibiotics, antibiotic resistance and the role of clinical pharmacist in rational use of antibiotics.
3. Evaluate patient data and medication errors.
4. Elaborate the need for Pharmacovigilance and importance of ADR reporting.
5. Describe type and design of clinical research along with patient safety and rights.
6. Illustrate the importance of pharmacoepidemiology and its applications.

### Course Content

#### UNIT - I

##### Community Pharmacy:

Professional Role & Responsibilities of Community Pharmacist, The role of community pharmacy and its relationship with other local health care providers, Code of ethics for community pharmacist. Roles and Responsibilities of Clinical Pharmacist. Pharmacoepidemiology: Definition, scope, Pharmaceutical Care principles – Good Pharmacy Practice

#### UNIT II

##### Antibiotics:

Define Antibiotic, surgical prophylaxis of antibiotic, Roles and responsibilities of clinical pharmacist in case of rational use of antibiotics

### **Resistance:**

Define Antibiotic Resistance, Define antimicrobial resistance, Mention the roles and responsibilities of clinical pharmacist in case of antibiotic resistance, Note on National and Global impact of antibiotic resistance, Write the etiological factors of antibiotic resistance, Mention the roles of community to overcome the antibiotic resistance, Explain the sources of antibiotic resistance, antimicrobial stewardship.

## **UNIT III**

### **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.

### **Medication Errors:**

Definition, Categorization and Causes of Medication Errors, Detection and Prevention of Medication Errors, Role of Pharmacist in Monitoring and Management of Medication Errors

**Pharmacovigilance:** Definition, aims and need for pharmacovigilance, Types, predisposing factors and mechanism of adverse drug reactions (ADRs), Detection, reporting and monitoring of ADRs, Causality assessment of ADRs, Management of ADRs, Role of pharmacist in Pharmacovigilance, Guidelines of Pharmacovigilance Programme of India (PvPI).

## **UNIT IV**

**Types and Designs used in Clinical Research:** Planning and execution of clinical trials, Designing of clinical study documents, Various Phases of clinical trials, Bioavailability and Bioequivalence studies, Randomization techniques, Types of research designs and sampling methods, Health outcome measures. Clinical Trial Study team: Roles and responsibilities of: Investigator, Study Coordinator, Sponsor, Monitor, Contract Research Organization

### **Patient Rights & Patient Safety:**

Definition, patient rights and responsibilities, Education, policy and protect basic rights, patients Bill of rights, patients awareness on consent their rights, Hospitalized patients, Awareness of their rights.

Patient safety, Different types of safety, Barriers to implementation of patient safety, Improving patient safety tools and strategies in healthcare, Infection control and patient safety program in India, Tips for Improving patient safety,

## **UNIT V**

**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

### **TEXT BOOKS:**

1. A Textbook of Clinical Pharmacy Practice – Essential concepts and skills – Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata
2. Handbook of clinical research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone
3. Roger and Walker. Clinical Pharmacy and Therapeutics - Churchill Livingstone publication

### **REFERENCE BOOKS:**

1. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia
2. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc
3. Hospital Pharmacy - Hassan WE. Lea and Febiger publication.
4. Textbook of hospital pharmacy - Allwood MC and Blackwell.
5. Avery's Drug Treatment, Adis International Limited.
6. Community Pharmacy Practice – Ramesh Adepu, BSP Publishers, Hyderabad
7. Remington Pharmaceutical Sciences.
8. Relevant review articles from recent medical and pharmaceutical literature
9. Principles and practice of pharmaceutical medicine, Second edition. Authors:Lionel. D. Edward, Aadrew.J.Flether Anthony W Fos , Peter D Sloaier Publisher:Wiley;
10. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.

11. Ethical Guidelines for Biomedical Research on Human Subjects. Indian Council of Medical Research, New Delhi.
12. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, John Wiley and Sons.
13. Goodman & Gilman: JG Hardman, LE Limbard, McGraw Hill Publications.

**WEBSITES:**

- <https://www.ich.org/>
- <https://www.fda.gov/patients/clinical-trials-what-patients-need-know/what-are-different-types-clinical-research>