



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
ANANTHAPURAMU – 515 002 (A.P) INDIA

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

**SEMESTER – I**

S. No.	Course code	Course Name	Hours per week			Credits
			L	T	P	
1.	21S01101	Modern Pharmaceutical Analytical Techniques	4	-	-	4
2.	21S01102	Advanced Pharmacology-I	4	-	-	4
3.	21S01103	Clinical Pharmacology and Pharmacotherapeutics	4	-	-	4
4.	21S01104	Cellular and Molecular Pharmacology	4	-	-	4
5.	21S01105	Modern Pharmaceutical Analytical Techniques Lab	-	-	6	3
6.	21S01106	Advanced Pharmacology – I Lab	-	-	6	3
7.	21DAC101a 21DAC101b 21DAC101c	<b>Audit Course – I</b> English for Research paper writing Disaster Management Sanskrit for Technical Knowledge	2	-	-	0
8.	21S01107	Seminar/Assignment	-	1	6	4
		<b>Total</b>	18	1	18	26

**SEMESTER – II**

S.No.	Course code	Course Name	Hours per			Credits
			L	T	P	
1.	21S01201	Advanced Pharmacology- II	4	-	-	4
2.	21S01202	Pharmacological Screening Methods & Toxicology	4	-	-	4
3.	21S01203	Principles of Drug Discovery	4	-	-	4
4.	21S01204	Clinical research and Pharmacovigilance	4	-	-	4
5.	21S01205	Advanced Pharmacology -II Lab	-	-	6	3
6.	21S01206	Pharmacological Screening Methods & Toxicology Lab	-	-	6	3
7.	21DAC201a 21DAC201b 21DAC201c	<b>Audit Course – II</b> Pedagogy Studies Stress Management from Yoga Personality Development through Life Enlightenment Skills	2	-	-	0
8.	21S01207	Seminar/Assignment	-	1	6	4
		<b>Total</b>	18	1	18	26



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**COURSE STRUCTURE SYLLABI**

**SEMESTER - III**

S.No.	Course code	Course Name	Hours per			Credits
			L	T	P	
1.	21DRM101	Research Methodology and Intellectual Property Rights	4	-	-	4
2.	21SOE301a 21SOE301b 21SOE301c	<b>Open Elective</b> Pharmaceutical Validation Biostatistics Entrepreneurship Management	3	-	-	3
3.	21S01302	Teaching Practice/Assignment	-	-	4	2
4.	21S01303	Comprehensive viva voce	-	-	-	2
	21S01304	Research Work – I	-	-	24	12
		<b>Total</b>	7	-	32	23

**SEMESTER - IV**

S.No.	Course code	Course Name	Hours per			Credits
			L	T	P	
1.	21S01401	Co-Curricular Activities	2			2
2.	21S01402	Research Work – II	3		30	18
		<b>Total</b>	5		30	20



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**COURSE STRUCTURE & SYLLABI**

Course Code	MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES	L	T	P	C								
<b>21S01101</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>								
<b>Semester</b>		<b>I</b>											
<b>Course Objectives:</b>													
This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.													
<b>Course Outcomes (CO):</b> Student will be able to													
<ul style="list-style-type: none"> <li>The analysis of various drugs in single and combination dosage forms</li> <li>Theoretical and practical skills of the instruments</li> </ul>													
<b>UNIT - I</b>													
UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy.													
<b>UNIT - II</b>													
IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier -Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.													
<b>UNIT - III</b>													
NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and <sup>13</sup> C NMR. Applications of NMR spectroscopy													
<b>UNIT - IV</b>													
Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.													
<b>UNIT - V</b>													
<b>Chromatography</b>													
Introduction to chromatography and classification of chromatographic methods based on the mechanism of separation, Principle, instrumentation, selection of solvents; chromatographic parameters, factors affecting resolution, applications of the following:													
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">a) Thin Layer chromatography;</td> <td style="width: 50%;">b) High Performance Thin Layer Chromatography</td> </tr> <tr> <td>c) Paper Chromatography;</td> <td>d) Column chromatography</td> </tr> <tr> <td>e) Gas chromatography;</td> <td>f) High Performance Liquid chromatography</td> </tr> <tr> <td>g) Affinity chromatography;</td> <td>h) Gel Chromatography</td> </tr> </table>						a) Thin Layer chromatography;	b) High Performance Thin Layer Chromatography	c) Paper Chromatography;	d) Column chromatography	e) Gas chromatography;	f) High Performance Liquid chromatography	g) Affinity chromatography;	h) Gel Chromatography
a) Thin Layer chromatography;	b) High Performance Thin Layer Chromatography												
c) Paper Chromatography;	d) Column chromatography												
e) Gas chromatography;	f) High Performance Liquid chromatography												
g) Affinity chromatography;	h) Gel Chromatography												
i) Hyphenated techniques : <ul style="list-style-type: none"> <li>Ultra High Performance Liquid chromatography- Mass spectroscopy</li> <li>Gas Chromatography-Mass Spectroscopy</li> </ul>													
<b>Reference Books:</b>													
<ol style="list-style-type: none"> <li>1. Instrumental Methods of Chemical Analysis by B.K Sharma</li> <li>2. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel</li> <li>3. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley &amp; Sons, 2004.</li> <li>4. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.</li> </ol>													



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**M.PHARM. IN PHARMACOLOGY**

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5. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
6. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4<sup>th</sup> edition, CBS Publishers, New Delhi, 1997.
7. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
8. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
9. Pharmaceutical Analysis - Modern Methods – Part B - J W Munson, Vol 11, Marcel. Dekker Series
10. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley esternLtd., Delhi.
11. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley& Sons, 1982.
12. Organic Chemistry by I. L. Finar
13. Quantitative Analysis of Drugs by D. C. Garrett
14. HPTLC by P.D. Seth
15. Indian Pharmacopoeia 2007
16. High Performance thin layer chromatography for the analysis of medicinal plants by Eike
17. Reich, Anne Schibli
18. Introduction to instrumental analysis by Robert. D. Braun



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**COURSE STRUCTURE & SYLLABI**

Course Code	ADVANCED PHARMACOLOGY- I	L	T	P	C
<b>21S01102</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
	<b>Semester</b>	<b>I</b>			
<b>Course Objectives:</b>					
The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Discuss the pathophysiology and pharmacotherapy of certain diseases</li> <li>• Explain the mechanism of drug actions at cellular and molecular level</li> <li>• Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases</li> </ul>					
<b>UNIT – I</b>					
a. Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding. b. Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functional families of receptors quantification of drug receptors interaction and elicited effects.					
<b>UNIT – II</b>					
<b>Neurotransmission</b>					
a. General aspects and steps involved in neurotransmission. b. Neurohumoral transmission in autonomic nervous system (Detailed study about neurotransmitters- Adrenaline and Acetylcholine). c. Neurohumoral transmission in central nervous system (Detailed study about neurotransmitters histamine, serotonin, dopamine, GABA, glutamate and glycine). d. Non-adrenergic non-cholinergic transmission (NANC). Co-transmission. Systemic Pharmacology: A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology of existing as well as novel drugs used in the following systems Autonomic Pharmacology: Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting neuromuscular junction					
<b>UNIT - III</b>					
<b>Central nervous system Pharmacology</b>					
General and local anesthetics, Sedatives and hypnotics, drugs used to treat anxiety. Depression, psychosis, mania, epilepsy, neurodegenerative diseases. Narcotic and non-narcotic analgesics.					
<b>UNIT - IV</b>					
<b>Cardiovascular Pharmacology</b>					
Diuretics, antihypertensives, antiischemics, anti- arrhythmics, drugs for heart failure and hyperlipidemia. Hematinics, coagulants, anticoagulants, fibrinolytics and antiplatelet drugs					
<b>UNIT - V</b>					
<b>Autacoid Pharmacology</b>					
The physiological and pathological role of Histamine, Serotonin, Kinins Prostaglandins Opioid autacoids. Pharmacology of antihistamines, 5HT antagonists					
<b>Reference Books:</b>					
1. The Pharmacological Basis of Therapeutics, Goodman and Gillman's 2. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, EhrinJ, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott					



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**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

Williams & Wilkins Publishers.

3. Basic and Clinical Pharmacology by B. G Katzung
4. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B. C. Yu.
6. Graham Smith. Oxford textbook of Clinical Pharmacology.
7. Avery's Drug Treatment
8. Dipiro Pharmacology, Pathophysiological approach.
9. Green Pathophysiology for Pharmacists



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Course Code	CLINICAL PHARMACOLOGY AND PHARMACOTHERAPEUTICS	L	T	P	C
21S01103		4	0	0	4
<b>Semester</b>		<b>I</b>			
<b>Course Objectives:</b>					
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.					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• The pathophysiology of selected disease states and the rationale for drug therapy; the controversies in drug therapy;</li> <li>• The importance of preparation of individualized therapeutic plans based on diagnosis;</li> <li>• Needs to identify the patient-specific parameters relevant in initiating drug therapy, and</li> <li>• Monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);</li> <li>• Summarize the therapeutic approach to management of these diseases including reference to the latest available evidence;</li> <li>• Therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).</li> <li>• Pathophysiology and applied Pharmacotherapeutics of diseases associated with following system/diseases with of special reference to the drug of choice</li> </ul>					
<b>UNIT - I</b>					
Principles of Pharmacokinetics 1. Revision of basic concepts. 2. Clinical Pharmacokinetics. a. Dose – response in man b. Influence of renal and hepatic disease on Pharmacokinetics c. Therapeutics drug monitoring & individualization of drug therapy d. Population Pharmacokinetics.					
<b>UNIT - II</b>					
Adverse Drug Reactions, Drug Interactions, ADR monitoring & Pharmacovigilance					
<b>UNIT - III</b>					
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.					
<b>UNIT - IV</b>					
Pathophysiology and drug therapy of the following disorders. TB, leprosy, leukemia, solid tumors, lymphomas, psoriasis, respiratory, urinary, G.I. tract infections, endocarditis, fungal and HIV infection, rheumatoid arthritis, glaucoma, menstrual disorders, menopause.					
<b>UNIT - V</b>					
Drug therapy in a) Geriatrics b) Paediatrics c) Pregnancy & Lactation. d) Renal & hepatic insufficiency					
<b>Reference Books:</b>					



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**COURSE STRUCTURE SYLLABI**

1. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication.
2. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange.
3. Pathologic basis of disease - Robins SL, W.B. Saunders publication.
4. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication.
5. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication.
6. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
7. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
8. Relevant review articles from recent medical and pharmaceutical literature.
9. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
10. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
11. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA





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**COURSE STRUCTURE & SYLLABI**

Course Code	CELLULAR AND MOLECULAR PHARMACOLOGY	L	T	P	C
21S01104		4	0	0	4
<b>Semester</b>		<b>I</b>			
<b>Course Objectives:</b>					
The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Explain the receptor signal transduction processes.</li> <li>• Explain the molecular pathways affected by drugs.</li> <li>• Appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process.</li> <li>• Demonstrate molecular biology techniques as applicable for pharmacology</li> </ul>					
<b>UNIT – I</b>					
Cell biology Structure and functions of cell and its organelles Genome organization. Gene expression and its regulation, importance of siRNA and micro RNA, gene mapping and gene sequencing Cell cycles and its regulation. Cell death– events, regulators, intrinsic and extrinsic pathways of apoptosis. Necrosis and autophagy					
<b>UNIT – II</b>					
Cell signaling Intercellular and intracellular signaling pathways. Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors. Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1,4,5-trisphosphate, (IP3), NO, and diacylglycerol. Detailed study of following intracellular signaling pathways: cyclic AMP signaling pathway, mitogen-activated protein kinase (MAPK) signaling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signaling pathway					
<b>UNIT – III</b>					
Principles and applications of genomic and proteomic tools DNA electrophoresis, PCR (reverse transcription and real time), Gene sequencing, micro array technique, SDS page, ELISA and western blotting, Recombinant DNA technology and gene therapy. Basic principles of recombinant DNA technology-Restriction enzymes, various types of vectors. Applications of recombinant DNA technology. Gene therapy- Various types of gene transfer techniques, clinical applications and recent advances in gene therapy					
<b>UNIT – IV</b>					
Pharmacogenomics Gene mapping and cloning of disease gene. Genetic variation and its role in health/ pharmacology Polymorphisms affecting drug metabolism Genetic variation in drug transporters Genetic variation in G protein coupled receptors Applications of proteomics science: Genomics, proteomics, metabolomics, functionomics, nutrigenomics. Immunotherapeutics Types of immunotherapeutics, humanisation antibody therapy,					



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**COURSE STRUCTURE SYLLABI**

Immunotherapeutics in clinical practice		
<b>UNIT – V</b>		
<p>a. Cell culture techniques            Basic equipments used in cell culture lab. Cell culture media, various types of cell culture, general procedure for cell cultures; isolation of cells, subculture, cryopreservation, characterization of cells and their application.            Principles and applications of cell viability assays, glucose uptake assay, Calcium influx assays            Principles and applications of flow cytometry</p>		
<p>b. Biosimilars</p>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. The Cell, A Molecular Approach. Geoffrey M Cooper.</li> <li>2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J.Licinio and M -L. Wong</li> <li>3. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al</li> <li>4. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al</li> <li>5. Basic Cell Culture protocols by Cheril D.Helgason and Cindy L.Miller</li> <li>6. Basic Cell Culture (Practical Approach ) by J. M. Davis (Editor)</li> <li>7. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)</li> <li>8. Current protocols in molecular biology vol I to VI edited by Frederick M. Ausuvel et al.</li> </ol>		



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<b>21S01105</b>	<b>TECHNIQUES LAB</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>3</b>
<b>Semester</b>		<b>I</b>			
<ol style="list-style-type: none"> <li>1. Analysis of Pharmacopoeial compounds and their formulations by UV Vis Spectrophotometer.</li> <li>2. Simultaneous estimation of multi component containing formulations by UV Spectrophotometry</li> <li>3. Effect of pH and solvent on UV –Spectrum</li> <li>4. Determination of Molar absorption coefficient</li> <li>5. Estimation of riboflavin/ quinine sulphate by fluorimetry</li> <li>6. Study of quenching effect by fluorimetry</li> <li>7. Estimation of sodium or potassium by flame photometry</li> <li>8. Colorimetric determination of drugs by using different reagents</li> <li>9. Quantitative determination of functional groups</li> <li>10. Experiments based on Column chromatography</li> <li>11. Experiments based on HPLC</li> <li>12. Experiments based on Gas Chromatography</li> </ol>					


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ANANTHAPURAMU – 515 002 (A.P) INDIA

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**COURSE STRUCTURE SYLLABI**

Course Code	ADVANCED PHARMACOLOGY – I LAB	L	T	P	C
21S01106		4	0	0	4
<b>Semester</b>		<b>I</b>			
<b>List of experiments</b>					
<b>Handling of laboratory animals.</b>					
1. Various routes of drug administration.					
2. Study of techniques of blood sampling, anesthesia and euthanasia of experimental animals.					
3. To record the dose response curve of Ach using isolated ileum/rectus abdominis muscle preparation.					
4. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation method.					
5. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by three point method.					
6. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by four point method.					
7. Estimation of pA <sub>2</sub> value on isolated tissues					
8. Bioassay of 5-HT using rat fundus strip					
9. Bioassay of oxytocin using rat uterus					
<b>Reference Books:</b>					
1. CPCSEA, OECD, ICH, USFDA, Schedule Y, EPA guidelines,					
2. Fundamentals of experimental Pharmacology by M. N. Ghosh					
3. Handbook of Experimental Pharmacology by S.K. Kulkarni.					
4. Drug discovery and Evaluation by Vogel H.G.					
5. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi (Author), Ajay Prakash (Author) Jaypee brothers' medical publishers Pvt. Ltd					



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Course Code	ADVANCED PHARMACOLOGY – II	L	T	P	C
21S01201		4	0	0	4
<b>Semester</b>		<b>II</b>			
<b>Course Objectives:</b>					
The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, the subject helps the student to understand the concepts of drug action and mechanism involved					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Explain the mechanism of drug actions at cellular and molecular level</li> <li>• Discuss the Pathophysiology and pharmacotherapy of certain diseases</li> <li>• Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases</li> </ul>					
<b>UNIT – I</b>					
<b>Endocrine Pharmacology:</b> Molecular and cellular mechanism of action of hormones such as growth hormone, prolactin, thyroid, insulin and sex hormones Anti-thyroid drugs, Oral hypoglycemic agents, Oral contraceptives, Corticosteroids. Drugs affecting calcium regulation.					
<b>UNIT – II</b>					
<b>Chemotherapy:</b> Cellular and molecular mechanism of actions and resistance of antimicrobial agents such as $\beta$ -lactams, aminoglycosides, quinolones, Macrolide antibiotics. Antifungal, antiviral, and anti-TB drugs					
<b>UNIT – III</b>					
<b>Chemotherapy:</b> Drugs used in Protozoal Infections Drugs used in the treatment of Helminthiasis Chemotherapy of cancer Immunopharmacology Cellular and biochemical mediators of inflammation and immune response. Allergic or hypersensitivity reactions. Pharmacotherapy of asthma and COPD. Immunosuppressants and Immunostimulants.					
<b>UNIT – IV</b>					
<b>GIT Pharmacology:</b> Antiulcer drugs, Prokinetics, antiemetics, anti-diarrheals and drugs for constipation and irritable bowel syndrome. Chronopharmacology Biological and circadian rhythms, applications of chronotherapy in various diseases like cardiovascular disease, diabetes, asthma, and peptic ulcer					
<b>UNIT – V</b>					
<b>Free radicals Pharmacology:</b> Generation of free radicals, role of free radicals in etiopathology of various diseases such as diabetes, neurodegenerative diseases and cancer. Protective activity of certain important antioxidant Recent Advances in Treatment: Alzheimer's disease, Parkinson's disease, Cancer, Diabetes mellitus					
<b>Reference Books:</b>					
<ol style="list-style-type: none"> <li>1. The Pharmacological basis of therapeutics- Goodman and Gill man's</li> <li>2. Principles of Pharmacology. The Pathophysiologic basis of drug therapy by David E Golan et al.</li> <li>3. Basic and Clinical Pharmacology by B. G -Katzung</li> <li>4. Pharmacology by H.P. Rang and M.M. Dale.</li> <li>5. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.</li> <li>6. Text book of Therapeutics, drug and disease management by E T. Herfindal and Gourley.</li> <li>7. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B. C. Yu.</li> <li>8. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists</li> </ol>					



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| <p>9. Robbins &amp; Cortan Pathologic Basis of Disease, 9th Ed. (RobbinsPathology)</p> <p>10. A Complete Textbook of Medical Pharmacology by Dr. S. K Srivastava published by A P C Avichal Publishing Company.</p> <p>11 K D. Tripathi. Essentials of Medical Pharmacology Principles of Pharmacology.</p> <p>12.The Pathophysiologic basis of drug Therapyby David E Golan, Armen H, Tashjian Jr., EhrinJ, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams &amp; Wilkins Publishers</p> |
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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

Course Code	PHARMACOLOGICAL SCREENING METHODS & TOXICOLOGY	L	T	P	C
21S01202			4	0	0
<b>Semester</b>		<b>II</b>			
<b>Course Objectives:</b>					
This subject is designed to impart the knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development. The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines, basic knowledge of various in-vitro and in-vivo preclinical evaluation processes					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Appraise the regulations and ethical requirement for the usage of experimental animals.</li> <li>• Describe the various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals</li> <li>• Describe the various newer screening methods involved in the drug discovery process</li> <li>• Appreciate and correlate the preclinical data to humans</li> </ul>					
<b>UNIT – I</b>					
Laboratory Animals: Common laboratory animals: Description, handling and applications of different species and strains of animals. Transgenic animals: Production, maintenance and applications Anesthesia and euthanasia of experimental animals. Maintenance and breeding of laboratory animals. CPCSEA guidelines to conduct experiments on animals Good laboratory practice. Bioassay-Principle, scope and limitations and methods					
<b>UNIT – II</b>					
Preclinical screening of new substances for the pharmacological activity using <i>in-vivo</i> , <i>in-vitro</i> , and other possible animal alternative models. General principles of preclinical screening. CNS Pharmacology: behavioral and muscle coordination, CNS stimulants and depressants, anxiolytics, anti-psychotics, anti epileptics and nootropics. Drugs for neurodegenerative diseases like Parkinsonism, Alzheimers and multiple sclerosis. Drugs acting on Autonomic Nervous System.					
<b>UNIT – III</b>					
Preclinical screening of new substances for the pharmacological activity using <i>in vivo</i> , <i>in vitro</i> , and other possible animal alternative models. Respiratory Pharmacology: anti-asthmatics, drugs for COPD and anti allergics. Reproductive Pharmacology: Aphrodisiacs and antifertility agents Analgesics, anti-inflammatory and antipyretic agents. Gastrointestinal drugs: anti ulcer, anti -emetic, antidiarrheal and laxatives.					
<b>UNIT – IV</b>					
Preclinical screening of new substances for the pharmacological activity using <i>in vivo</i> , <i>in vitro</i> , and other possible animal alternative models. Cardiovascular Pharmacology: antihypertensives, antiarrhythmics, antianginal, antiatherosclerotic agents and diuretics. Drugs for metabolic disorders like anti-diabetic, antidyslipidemic agents. Anti cancer agents. Hepatoprotective screening methods.					
<b>UNIT – V</b>					
Preclinical screening of new substances for the pharmacological activity using <i>in vivo</i> , <i>in vitro</i> , and other possible animal alternative models. Immunomodulators, Immunosuppressants and immunostimulants General principles of immunoassay: theoretical basis and optimization of immunoassay, heterogeneous and homogenous immunoassay systems. Immunoassay methods evaluation; protocol outline, objectives and preparation. Immunoassay for digoxin and insulin. Limitations of animal experimentation and alternate animal experiments. Extrapolation of <i>in vitro</i> data to preclinical and preclinical to humans					
<b>Reference Books:</b>					



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

(Established by Govt. of A.P., ACT No.30 of 2008)

**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

1. Biological standardization by J. H. Burn D.J. Finney and I.G. Goodwin
2. Screening methods in Pharmacology by Robert Turner. A
3. Evaluation of drugs activities by Laurence and Bachrach
4. Methods in Pharmacology by Arnold Schwartz.
5. Fundamentals of experimental Pharmacology by M. N. Ghosh
6. Pharmacological experiment on intact preparations by Churchill Livingstone
7. Drug discovery and Evaluation by Vogel H.G.
8. Experimental Pharmacology by R. K. Goyal.
9. Preclinical evaluation of new drugs by S. K. Guta
10. Handbook of Experimental Pharmacology, S K. Kulkarni
11. Practical Pharmacology and Clinical Pharmacy, S K. Kulkarni, 3rd Edition.
12. David R. Gross. Animal Models in Cardiovascular Research, 2nd Edition, Kluwer Academic Publishers, London, UK.
13. Screening Methods in Pharmacology, Robert A. Turner.
14. Rodents for Pharmacological Experiments, Dr. Tapan Kumar chatterjee.
15. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi (Author), Ajay Prakash (Author)





**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

Course Code	PRINCIPLES OF DRUG DISCOVERY	L	T	P	C
21S01203		4	0	0	4
	<b>Semester</b>	<b>II</b>			
<b>Course Objectives:</b>					
The subject imparts basic knowledge of drug discovery process. This information will make the student Competent in drug discovery process.					
<b>Course Outcomes (CO):</b>					
Upon completion of the course, the student shall be able to, <ul style="list-style-type: none"> <li>• Explain the various stages of drug discovery.</li> <li>• Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery</li> <li>• Explain various targets for drug discovery.</li> <li>• Explain various lead seeking method and lead optimization</li> <li>• Appreciate the importance of the role of computer aided drug design in drug discovery</li> </ul>					
<b>UNIT – I</b>					
An overview of modern drug discovery process: Target identification, target validation, lead identification, and lead Optimization. Economics of drug discovery. Target Discovery and validation- Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation.					
<b>UNIT – II</b>					
Lead Identification: combinatorial chemistry & high throughput screening, <i>in silico</i> lead discovery techniques; Assay development for hit identification. Protein structure Levels of protein structure, Domains, motifs, and folds in protein structure. Computational prediction of protein structure: Threading and homology modeling methods. Application of NMR and X-ray crystallography in protein structure prediction.					
<b>UNIT – III</b>					
Rational Drug Design: Traditional vs rational drug design, Methods followed in traditional drug design, High throughput screening, Concepts of Rational Drug Design, Rational Drug Design Methods: Structure and Pharmacophore based approaches. Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening					
<b>UNIT – IV</b>					
Molecular docking: Rigid docking, flexible docking, manual docking; Docking based screening. Denovo drug design. Quantitative analysis of Structure Activity Relationship History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis, and relationship between them.					
<b>UNIT – V</b>					
QSAR Statistical methods: regression analysis, partial least square analysis (PLS) and other multivariate statistical methods. 3D-QSAR approaches like COMFA and COMSIA Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption, and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design.					
<b>Reference Books:</b>					
<ol style="list-style-type: none"> <li>1. Mouldy Sioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targets and Treatment Options. 2007 Humana Press Inc.</li> <li>2. Darryl León. Scott MarkellIn. Silico Technologies in Drug Target Identification and Validation 2006 by Taylor and Francis Group, LLC.</li> </ol>					



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

(Established by Govt. of A.P., ACT No.30 of 2008)

**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

3. Johanna K. DiStefano. Disease Gene Identification. Methods and Protocols. Springer New York Dordrecht Heidelberg London.
4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design.
6. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
7. Abby L .Parrill. M. Rami Reddy. Rational Drug Design. Novel Methodology and Practical Applications. ACS Symposium Series; American Chemical Society: Washington, DC, 1999.
8. J. Rick Turner. New drug development design, methodology and, analysis. John Wiley & Sons, Inc., New Jersey.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

Course Code	CLINICAL RESEARCH AND PHARMACOVIGILANCE	L	T	P	C
<b>21S01204</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
<b>Semester</b>		<b>II</b>			
<b>Course Objectives:</b>					
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.					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Explain the regulatory requirements for conducting clinical trial</li> <li>• Demonstrate the types of clinical trial designs</li> <li>• Explain the responsibilities of key players involved in clinical trials</li> <li>• Execute safety monitoring, reporting and close-out activities</li> <li>• Explain the principles of Pharmacovigilance</li> <li>• Detect new adverse drug reactions and their assessment</li> <li>• Perform the adverse drug reaction reporting systems and communication in pharmacovigilance</li> </ul>					
<b>UNIT - I</b>		12Hrs			
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.					
<b>UNIT - II</b>		12Hrs			
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.					
<b>UNIT - III</b>		12Hrs			
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.					
<b>UNIT - IV</b>		12Hrs			
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.					
<b>UNIT - V</b>		12Hrs			



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

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, Vigi Flow, Statistical methods for evaluating medication safety data.

**Reference Books:**

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



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

Course Code	ADVANCED PHARMACOLOGY – II LAB	L	T	P	C
<b>21S01205</b>		<b>0</b>	<b>0</b>	<b>6</b>	<b>3</b>
<b>Semester</b>		<b>II</b>			
<ol style="list-style-type: none"> <li>1. Effect of drugs on chick/rat mean arterial blood pressure (MABP) by using Condon's mercury manometer.</li> <li>2. Isolation and identification of DNA from various sources (Bacteria, Cauliflower, onion, Goat liver).</li> <li>3. Isolation of RNA from yeast</li> <li>4. Gene amplification by PCR.</li> <li>5. Enzyme based in-vitro assays (MPO, AChEs, <math>\alpha</math> amylase, <math>\alpha</math> glucosidase).</li> <li>6. Cell viability assays (MTT/Trypan blue/SRB).</li> <li>7. DNA fragmentation assay by agarose gel electrophoresis.</li> <li>8. DNA damage study by Comet assay.</li> <li>9. Apoptosis determination by fluorescent imaging studies.</li> <li>10. Enzyme inhibition and induction activity</li> </ol>					



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

<b>Course Code</b>	<b>PHARMACOLOGICAL SCREENING METHODS AND TOXICOLOGY LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21S01206</b>		<b>0</b>	<b>0</b>	<b>6</b>	<b>3</b>
<b>Pre-requisite</b>		<b>Semester</b>		<b>II</b>	
1. Analgesic property of drug using analgesiometer. 2. Anti-inflammatory effect of drugs using rat-paw edema method. 3. Anticonvulsant activity of drugs using maximal electroshock and pentylenetetrazole methods. 4. Antidepressant activity of drugs using pole climbing apparatus and pentobarbitone induced sleeping time methods. 5. Locomotor activity evaluation of drugs using actophotometer and rotarod. 6. Cardiotonic activity of drugs using isolated frog heart and mammalian heart preparations. 7. Antidiabetic activity using rats / mice 8. Hepatoprotective activity 9. Anti ulcer activity 10. Antioxidant activity 11. Toxicity studies as per OECD guidelines. 12. Functional observation battery tests (modified Irwin test)					


**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

 (Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**
**M.PHARM. IN PHARMACOLOGY**
**COURSE STRUCTURE & SYLLABI**

Course Code	RESEARCH METHODOLOGY AND INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
21DRM101		4	0	0	4
<b>Semester</b>		<b>III</b>			
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To understand the research problem</li> <li>• To know the literature studies, plagiarism and ethics</li> <li>• To get the knowledge about technical writing</li> <li>• To analyze the nature of intellectual property rights and new developments</li> <li>• To know the patent rights</li> </ul>					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Understand research problem formulation.</li> <li>• Analyze research related information</li> <li>• Follow research ethics</li> <li>• Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.</li> <li>• Understanding that when IPR would take such important place in growth of individuals &amp; nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general &amp; engineering in particular.</li> <li>• Understand that IPR protection provides an incentive to inventors for further research work and investment in R &amp; D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.</li> </ul>					
<b>UNIT - I</b>					
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations					
<b>UNIT - II</b>					
Effective literature studies approaches, analysis, Plagiarism, Research ethics					
<b>UNIT - III</b>					
Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee					
<b>UNIT - IV</b>					
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.					
<b>UNIT - V</b>					
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs					
<b>Textbooks:</b>					
1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"					
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"					
<b>Reference Books:</b>					



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

1. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
2. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
3. Mayall, “Industrial Design”, McGraw Hill, 1992.
4. Niebel, “Product Design”, McGraw Hill, 1974.
5. Asimov, “Introduction to Design”, Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
8. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008





**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
ANANTHAPURAMU – 515 002 (A.P) INDIA

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

# **AUDIT COURSE-I**



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

Course Code	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
21DAC101a		2	0	0	0
<b>Semester</b>		<b>I</b>			
<b>Course Objectives:</b> This course will enable students:					
<ul style="list-style-type: none"> <li>• Understand the essentials of writing skills and their level of readability</li> <li>• Learn about what to write in each section</li> <li>• Ensure qualitative presentation with linguistic accuracy</li> </ul>					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Understand the significance of writing skills and the level of readability</li> <li>• Analyze and write title, abstract, different sections in research paper</li> <li>• Develop the skills needed while writing a research paper</li> </ul>					
<b>UNIT - I</b>		Lecture Hrs:10			
1 Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity					
<b>UNIT - II</b>		Lecture Hrs:10			
Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cautionization					
<b>UNIT - III</b>		Lecture Hrs:10			
Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion- Conclusions-Recommendations.					
<b>UNIT - IV</b>		Lecture Hrs:9			
Key skills needed for writing a Title, Abstract, and Introduction					
<b>UNIT - V</b>		Lecture Hrs:9			
Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions					
<b>Suggested Reading</b>					
<ol style="list-style-type: none"> <li>1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering &amp; Technology PG Courses [Volume-I]</li> <li>2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press</li> <li>3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook</li> <li>4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011</li> </ol>					



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

Course Code	DISASTER MANAGEMENT	L	T	P	C
21DAC101b			2	0	0
<b>Semester</b>		<b>I</b>			
<b>Course Objectives:</b> This course will enable students:					
<ul style="list-style-type: none"> <li>• Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response.</li> <li>• Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.</li> <li>• Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations</li> <li>• Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in</li> </ul>					
<b>UNIT - I</b>					
<p><b>Introduction:</b> Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.</p> <p><b>Disaster Prone Areas in India:</b> Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics</p>					
<b>UNIT - II</b>					
<p><b>Repercussions of Disasters and Hazards:</b> Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.</p>					
<b>UNIT - III</b>					
<p><b>Disaster Preparedness and Management:</b> Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.</p>					
<b>UNIT - IV</b>					
<p><b>Risk Assessment Disaster Risk:</b> Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.</p>					
<b>UNIT - V</b>					
<p><b>Disaster Mitigation:</b> Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.</p>					
<b>Suggested Reading</b>					
<ol style="list-style-type: none"> <li>1. R.Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies</li> <li>2. "New Royal book</li> </ol>					



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

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| <p>Company..Sahni,PardeepEt.Al.(Eds.),”DisasterMitigationExperiencesAndReflections”,PrenticeHall OfIndia, New Delhi.</p> <p>3. GoelS.L.,DisasterAdministrationAndManagementTextAndCaseStudies”,Deep&amp;Deep Publication Pvt. Ltd., New Delhi</p> |
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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

Course Code	SANSKRIT FOR TECHNICAL KNOWLEDGE	L	T	P	C
21DAC101c		2	0	0	0
<b>Semester</b>		<b>I</b>			
<b>Course Objectives:</b> This course will enable students:					
<ul style="list-style-type: none"> <li>• To get a working knowledge in illustrious Sanskrit, the scientific language in the world</li> <li>• Learning of Sanskrit to improve brain functioning</li> <li>• Learning of Sanskrit to develop the logic in mathematics, science &amp; other subjects enhancing the memory power</li> <li>• The engineering scholars equipped with Sanskrit will be able to explore the huge</li> <li>• Knowledge from ancient literature</li> </ul>					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Understanding basic Sanskrit language</li> <li>• Ancient Sanskrit literature about science &amp; technology can be understood</li> <li>• Being a logical language will help to develop logic in students</li> </ul>					
<b>UNIT - I</b>					
Alphabets in Sanskrit,					
<b>UNIT - II</b>					
Past/Present/Future Tense, Simple Sentences					
<b>UNIT - III</b>					
Order, Introduction of roots					
<b>UNIT - IV</b>					
Technical information about Sanskrit Literature					
<b>UNIT - V</b>					
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics					
<b>Suggested Reading</b>					
<ol style="list-style-type: none"> <li>1. "Abhyas pustakam" – Dr. Vishwas, Sanskrit-Bharti Publication, New Delhi</li> <li>2. "Teach Yourself Sanskrit" Prathama Deeksha- Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication</li> <li>3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi</li> </ol>					



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
ANANTHAPURAMU – 515 002 (A.P) INDIA

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

# **AUDIT COURSE-II**



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

Course Code	PEDAGOGY STUDIES	L	T	P	C
21DAC201a		2	0	0	0
<b>Semester</b>		<b>II</b>			
<b>Course Objectives:</b> This course will enable students:					
<ul style="list-style-type: none"> <li>• Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.</li> <li>• Identify critical evidence gaps to guide the development.</li> </ul>					
<b>Course Outcomes (CO):</b> Student will be able to					
Students will be able to understand: <ul style="list-style-type: none"> <li>• What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?</li> <li>• What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?</li> <li>• How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?</li> </ul>					
<b>UNIT - I</b>					
<b>Introduction and Methodology:</b> Aims and rationale, Policy back ground, Conceptual frame work and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.					
<b>UNIT - II</b>					
<b>Thematic overview:</b> Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.					
<b>UNIT - III</b>					
Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.					
<b>UNIT - IV</b>					
<b>Professional development:</b> alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barrier to learning: limited resources and large class sizes					
<b>UNIT - V</b>					
<b>Research gaps and future directions:</b> Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.					
<b>Suggested Reading</b>					
<ol style="list-style-type: none"> <li>1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.</li> <li>2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.</li> <li>3. Curriculum Studies, 36 (3): 361-379.</li> </ol>					



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

(Established by Govt. of A.P., ACT No.30 of 2008)

**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

4. AkyeampongK(2003) Teacher training in Ghana - does it count? Multi-site teachereducation research project (MUSTER) country report 1. London: DFID.
5. Akyeampong K, LussierK, PryorJ, Westbrook J (2013)Improving teaching and learning of basic maths and reading in Africa: Does teacherpreparation count?International Journal Educational Development, 33 (3): 272–282.
6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.  
Chavan M (2003)ReadIndia: A mass scale, rapid, ‘learning to read’campaign.
7. [www.pratham.org/images/resource%20working%20paper%202.pdf](http://www.pratham.org/images/resource%20working%20paper%202.pdf).





**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

Course Code		L	T	P	C
21DAC201b	<b>STRESSMANAGEMENT BY YOGA</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Semester</b>		<b>II</b>			
<b>Course Objectives:</b> This course will enable students:					
<ul style="list-style-type: none"> <li>• To achieve overall health of body and mind</li> <li>• To overcome stress</li> </ul>					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Develop healthy mind in a healthy body thus improving social health also</li> <li>• Improve efficiency</li> </ul>					
<b>UNIT - I</b>					
Definitions of Eight parts of yog.(Ashtanga)					
<b>UNIT - II</b>					
Yam and Niyam.					
<b>UNIT - III</b>					
Do's and Don't's in life. i) Ahimsa, satya, asthaya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan					
<b>UNIT - IV</b>					
Asan and Pranayam					
<b>UNIT - V</b>					
i) Various yoga poses and their benefits for mind & body ii) Regularization of breathing techniques and its effects - Types of pranayam					
<b>Suggested Reading</b>					
1. 'Yogic Asanas for Group Training-Part-I': Janardan Swami Yogabhyasi Mandal, Nagpur 2. 'Rajayoga or conquering the Internal Nature' by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata					



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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

Course Code	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	T	P	C
21DAC201c		2	0	0	0
<b>Semester</b>		<b>II</b>			
<b>Course Objectives:</b> This course will enable students:					
<ul style="list-style-type: none"> <li>• To learn to achieve the highest goal happily</li> <li>• To become a person with stable mind, pleasing personality and determination</li> <li>• To awaken wisdom in students</li> </ul>					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life</li> <li>• The person who has studied Geeta will lead the nation and mankind to peace and prosperity</li> <li>• Study of Neetishatakam will help in developing versatile personality of students</li> </ul>					
<b>UNIT - I</b>					
Neetisatakam- Holistic development of personality Verses-19,20,21,22(wisdom) Verses-29,31,32(pride & heroism) Verses-26,28,63,65(virtue)					
<b>UNIT - II</b>					
Neetisatakam- Holistic development of personality Verses-52,53,59(dont's) Verses-71,73,75,78(do's)					
<b>UNIT - III</b>					
Approach to day to day work and duties. Shrimad Bhagwad Geeta: Chapter 2- Verses 41,47,48, Chapter 3- Verses 13,21,27,35, Chapter 6- Verses 5,13,17,23,35, Chapter 18- Verses 45,46,48.					
<b>UNIT - IV</b>					
Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter 2- Verses 56,62,68 Chapter 12 - Verses 13,14,15,16,17,18 Personality of Role model. Shrimad Bhagwad Geeta:					
<b>UNIT - V</b>					
Chapter 2- Verses 17, Chapter 3- Verses 36,37,42, Chapter 4- Verses 18,38,39 Chapter 18- Verses 37,38,63					
<b>Suggested Reading</b>					
1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata 2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P. Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.					



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
ANANTHAPURAMU – 515 002 (A.P) INDIA

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

# **OPEN ELECTIVE**


**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

(Established by Govt. of A.P., ACT No.30 of 2008)  
ANANTHAPURAMU – 515 002 (A.P) INDIA

**M.PHARM. IN PHARMACOLOGY**
**COURSE STRUCTURE SYLLABI**

Course Code	PHARMACEUTICAL VALIDATION	L	T	P	C
21SOE301a	(Elective)	3	0	0	3
<b>Semester</b>		<b>III</b>			
<b>Course Objectives:</b>					
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					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• Explain the aspect of validation</li> <li>• Carryout validation of manufacturing processes</li> <li>• Apply the knowledge of validation to instruments and equipments</li> <li>• Validate the manufacturing facilities</li> </ul>					
<b>UNIT - I</b>					
Introduction: Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan. 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 Equipment, Qualification of Analytical Instruments and Laboratory equipments					
<b>UNIT - II</b>					
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.					
<b>UNIT - III</b>					
Qualification of laboratory equipments: Hardness tester, Friability test apparatus, tap density tester, Disintegration tester, Dissolution test apparatus. Validation of Utility systems: Pharmaceutical water system & pure steam, HVAC system, Compressed air and nitrogen.					
<b>UNIT - IV</b>					
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).					
<b>UNIT - V</b>					
Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP.					
<b>Textbooks:</b>					
<ol style="list-style-type: none"> <li>1. T. Loftus &amp; R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol.129, 3rd Ed., Marcel Dekker Inc., N.Y.</li> <li>2. The Theory &amp; Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.</li> <li>3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.</li> <li>4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton &amp; Agalloco, (Marcel Dekker).</li> <li>5. Michael Levin, Pharmaceutical Process Scale-Up, Drugs and Pharm. Sci. Series, Vol. 157, 2<sup>nd</sup> Ed., Marcel Dekker Inc., N.Y.</li> </ol>					



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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE & SYLLABI**

Course Code	BIOSTATISTICS	L	T	P	C
21SOE301b	(Elective)	3	0	0	3
<b>Semester</b>		<b>III</b>			
<b>Course Objectives:</b>					
The student shall know the introduction, scope of biostatistics and Research work, calculation and present of the data					
<b>Course Outcomes (CO):</b> Student will be able to					
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					
<b>UNIT - I</b>					
An introduction to statistics and biostatistics-collection and organization of data, graphical, pictorial presentation of data, measures of central tendency and dispersion, sampling techniques, sample size, Coefficient of variation, mean error, relative error, precision and accuracy					
<b>UNIT - II</b>					
Tests of significance: Testing hypotheses – Principles and applications of Z, t, F-ratio and chi-square tests in pharmaceutical and medical research. Non-parametric tests: sign test, Wilcoxon signed rank test, Wilcoxon rank sum test, Kruskal Wallis test, run test and median tests.					
<b>UNIT - III</b>					
Design of Experiments: Principles of randomization, replication and local control; CRD, RBD, LSD – their applications and analysis of data;					
<b>UNIT - IV</b>					
Factorial Experiments – Principles and applications; Probit analysis: Dose – effect relationships, calculation of LD50, ED50					
<b>UNIT - V</b>					
Statistical quality control: Meaning and uses, Construction of X, R, P, np and charts.					
<b>Textbooks:</b>					
1. Statistics for business and economics 3rd edition by Vikas books publications					
2. Biostatistics & Computer applications by GN Rao and NK Tiwari					
3. Sokal, R.R. and Rohlf, F.J. 1987. An Introduction to Biostatistics. W.H. Freeman and Company.					
4. Bailey, N.T.J. 1981. Statistical Methods in Biology. English University Press.					
5. Mitchell, K. and Glover, T. 2001. Introduction to Biostatistics. McGraw Hill, Publishing Co.					
<b>Reference Books:</b>					
1. Remington's Pharmaceutical Sciences					
2. Theory & Practice of Industrial Pharmacy by Lachman					
3. Statistics for business and economics 3rd 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.					



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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.PHARM. IN PHARMACOLOGY**

**COURSE STRUCTURE SYLLABI**

Course Code	ENTREPRENEURSHIP MANAGEMENT ( Elective)	L	T	P	C
21SOE301c		3	0	0	3
<b>Semester</b>		<b>III</b>			
<b>Course Objectives:</b>					
This course is designed to impart knowledge and skills necessary to train the students on entrepreneurship management					
<b>Course Outcomes (CO):</b> Student will be able to					
<ul style="list-style-type: none"> <li>• The Role of enterprise in national and global economy</li> <li>• Dynamics of motivation and concepts of entrepreneurship</li> <li>• Demands and challenges of Growth Strategies and Networking</li> </ul>					
<b>UNIT - I</b>					
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					
<b>UNIT - II</b>					
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.					
<b>UNIT - III</b>					
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					
<b>UNIT - IV</b>					
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, coordination and feasibility study.					
<b>UNIT - V</b>					
Preparing Project Proposal to Start on New Enterprise Project work – Feasibility report; Planning, resource mobilization and implementation					
<b>Reference Books:</b>					
<ol style="list-style-type: none"> <li>1. Akhauri, M. M. P.(1990): Entrepreneurship for Women in India, NIESBUD, New Delhi.</li> <li>2. Hisrich, R. D &amp; Brush, C.G. (1996) The Women Entrepreneurs, D.C. Health&amp; Co., Toranto.</li> <li>3. Hisrich, R.D. and Peters, M.P. (1995): Entrepreneurship – Starting Developing and Managing a New Enterprise, Richard D., Inwin, INC, USA.</li> <li>4. Meredith, G.G. etal (1982): Practice of Entrepreneurship, ILO, Geneva.</li> <li>5. Patel, V.C. (1987): Women Entrepreneurship – Developing New Entrepreneurs, Ahmedabad EDII</li> <li>6. Arya kumar.(2012): Entrepreneurship- Creating and Leading an Entrepreneurial Organization, Pearson</li> </ol>					