Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Scheme of teaching and examination

Master of Pharmacy (M.Pharm)

(Pharmacology)

II Semester

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination			Total Marks	Credit L+(T+P)/ 2
							Theory /Practical				
				L	T	P	ESE	CT	TA		
1.	Pharmacy	56911(41)	Pharmacology – I (General Pharmacology)	4	1	-	100	20	20	140	
2.	Pharmacy	569212(41)	Pharmacology – II (Pharmacological Screening Methods)	4	1	-	100	20	20	140	
3.	Pharmacy	569213(41)	Pharmacology – III (Molecular Pharmacology)	4	1	-	100	20	20	140	
4.	Pharmacy	569214(41)	Pharmacology – IV (Clinical Pharmacology & Toxicology)	4	1	-	100	20	20	140	
5.	Pharmacy	569221(41)	Pharmacology – I Lab	-	-	6	100	-	50	150	
6.	Pharmacy	569222(41)	Pharmacology – II Lab	-	-	6	100	-	50	150	
7.	Pharmacy	569223(41)	Pharmacology – III Lab	-	-	6	100	-	40	140	
Total				**16**	**4**	**18**	**700**	**80**	**220**	**1000**	

L – Lecture, T-Tutorial, P-Practical,

Duration of Theory Paper 3Hours

ESE – End Semester Examination, CT – Class Test, TA – Teacher Assessment

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M-Pharm. II[nd] Semester **Branch: Pharmacy**
Subject: Pharmacology –I (General Pharmacology) **Code: 569211(41)**
Total Theory period: 50 **Total Tutorial periods: 12**
Total marks in the end Semester: 100 **Minimum of class test to be conducted: 2**

UNIT-I Drugs acting on ANS
- Cholinergic drugs and cholinergic blocking drugs
- Ganglionic stimulants, ganglionic blockers
- Neuromuscular blockers
- Adrenergic (or) Sympathomimetic drugs
- Antiadrenergic (or) sympatholytic drugs

UNIT-II Drugs acting on CNS
General anesthetics, Anxiolytics & hypnotic drugs, Antiepileptics, Analgesics, CNS stimulants, NSAID's, Antigout drugs, Antipsychotic drugs, Antidepressants and Anti Parkinsonian drugs Drugs acting on peripheral nervous system: Local anesthetics

UNIT-III Drugs acting on CVS
Cardiotonics, Antiarrythmic drugs, Antianginal drugs, Antihypertensives ,Diuretics

UNIT-IV Drugs acting on Digestive system
Drugs used in gastric ulcer, purgative, antiemetic, antidiarrhoeal

UNIT-V Drugs acting on Respiratory System
Bronchodilators, Expectorants and Antitussive agents

UNIT-VI Chemotherapy
Basic principles of chemotherapy; chemotherapy of bacterial infections (antibacterial and antibiotics) ; chemotherapy of tuberculosis and leprosy; chemotherapy of viral and fungal infections, malaria, amoebiasis, cancer and AIDS.

UNIT-VII Hormones and Hormone Antagonists
a) Adenohypophyseal hormones and their hypothalamic releasing factors.
b) Hormones of Posterior pituitary
c) Thyroid and Antithyroid drugs
d) Estrogens and Progestins, Antifertility agents
e) Androgens
f) Adrenocorticotropic hormones; Adrenocortical steroids and their synthetic analogs; Inhibitors of the synthesis and actions of adrenocortical hormones.
g) Insulin, oral hypoglycemic agents and the Pharmacology of pancreatic hormones.
h) Agents affecting Calcification and bone turnover:
Calcium phosphate, parathyroid hormones, vitamin D, Calcitonin and other compounds.
i) Vasopressin and other agents affecting the renal conservation of water.

REFERENCE
1. Modern Pharmcology by C.R. Craig and R.E. Stitzel.
2. Goodman and Gilman's: The Pharmacological Basis of Therapeutics, edited by Alfred Goodman Gilman, Theodore W. Rall, Alan S Nies, and Palmar Taylor.
3. Essentials of Pharmcotherapeutics by F.S.K. Barar.
4. Pharmacology by H.P. Rang and M.M. Dale.
5. Lewis's Pharmacology revised by James Crossland.
6. Oxford Textbook of Clinical Pharmacology and Drug Therapy by D.G. Grahame-Smith and J.K. Aronson.
7. Pharmacology and Pharmcotherapeutics by R.S. Satoskar, S.D. Bhandarkar and S.S. Ainapure.
8. Pharmacology (Lippincott's) by Mary J. Mycer, Richard A. Harvey and Pamela C. Champe.
9. Essentials of Medical Pharmacology by K.D. Tripathi

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M-Pharm. II[nd] Semester **Branch: Pharmacy**
Subject: Pharmacology-II (Pharmacological Screening Methods) **Code: 569212(41)**
Total Theory period: 50 **Total Tutorial period: 12**
Total marks in the end Semester: 100
Minimum of class test to be conducted: 2

UNIT-I
Regulations for Laboratory Animals care and Ethical Requirements
Guidelines and regulatory agencies- CPCSEA, OECD, USFDA, ICH, FHSA, WHO

UNIT-II
Principles of biological standardization:
a. Statistical treatment of model problems in evaluation of drugs.
b. Methods of biological assay, principles of biological assays with certain examples.
c. Development of new bioassay methods.

UNIT-III
Preclinical and clinical models employed in the screening of new drugs belonging to following categories:
Antipsychotic agents, antianxiety agents; nootropic drugs; antidepressant drugs; antiparkinsonian agents; opioid analgesics; anti-inflammatory drugs.

UNIT-IV
Preclinical and clinical models employed in the screening of new drugs belonging to following categories.
Infarction; antiatherosclerotic drugs; antimalarials; anthelmintics; antidiabetics; models for antiepileptics; local anesthetics; activity on the GI tract, transgenic animals and other genetically prone animal models.

UNIT-V Alternatives to animal screening procedures
Alternatives to animal screening procedures, cell-line, patch-clamp techniques, in-vitro models, molecular biology techniques.
High throughput screening, human genomics.

UNIT-VI New approaches in drug discovery:
a. Combinatorial chemistry.
b. Pharmacogenomics.
c. Proteonomics.
d. Array technology.

REFERENCE

1. Drug discovery and evaluation by Vogel
2. Screening Methods in Pharmacology by Robert A. Turner
3. Biological standardization by J.H. Burn, D.J. Finney and L.G. Goodwin.2nd ed. Oxford Uni.Press, 1950
4. Indian Pharmacopoeia, Govt of India press2009.
5. Methods in Pharmacology by Arnold Schwartz. 1972, the Univ. Of Chicago Press.
6. Selected topics on the Experimental Pharmacology by Usha G. Kamat, Dadkar, N.K and Seth, U.K., 1972.
7. Fundamentals of experimental Pharmacology Ghosh, M.N., 2007, Hiltton Company , Kolkata.
8. Pharmacological experiment on intact preparations byL. J. Mc Leod; Churchill Livingstone.1970
9. Animal models in toxicology by Shayne Cox Gad and Christopher P. Chengelis.
10. Principles and methods of toxicology by Hayes.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M-Pharm. II[nd] Semester **Branch: Pharmacy**
Subject: Pharmacology-III (Molecular Pharmacology) **Code: 569213 (41)**
Total Theory period: 50 **Total Tutorial period: 12**
Total marks in the end Semester: 100
Minimum of class test to be conducted: 2

UNIT-I Molecular Aspects of Drug Action
Receptors, ion channels and their modulators i.e. calcium, potassium, sodium and chloride channels, enzymes and carrier proteins, mechanism of signal transduction.

UNIT-II Recent advances in following receptors
Angiotensin receptors, Excitatory amino acid receptors, Kinin receptors, Adrenoceptors, Low molecular weight heparins and GP II/IIIa receptor antagonists, Imidazole receptors, Cholinergic receptors, Dopamine receptors, Serotonin receptors, Hormone receptors, GABA and Benzodiazepine receptors, Opiod receptors, Purinergic receptors, Glutamate receptors.

UNIT-III Gene therapy
a. Gene transfer technologies (viral and non viral vectors).
b. Clinical application of gene therapy.
c. Disease targets for gene therapy.
d. Pharmacodynamics, pharmacokinetics of peptide and protein drugs and Immunogenicity of protein therapeutics.

UNIT-IV Renin-Angiotensin System
Its physiological role, essential hypertension, Interrelationship between rennin angiotensin system and sympathetic nervous system – Pharmacology of Drugs acting on Renin-angiotensin system.

UNIT-V Endogenous Bioactive Molecules
Cytokines, neuropeptides and their modulators,neurosteroids, nitric oxide, phosphodiestrase enzyme and protein kinase C, arachidonic acid metabolites, COX-2 regulators and their role in inflammation, endothelium derived vascular substances (NO, endothelins) and their modulators. Pharmacology of atrial peptides, reactive oxygen intermediates, antioxidants and their therapeutic implications.

UNIT-VI Immunoassay
a. General principles of immunoassay: Theoretical basis, optimization of immunoassay, heterogeneous Immunoassay system, homogeneous immunoassay systems.
b. Production of Immunoassay reagents. Introduction, receptors or binders, unlabelled ligands calibrators, labeled ligands and receptors, separation techniques, buffers.
c. Immunoassay methods evaluation: Protocol outline, objectives and preparation, evaluation of precision, standard tracer, sensitivity, evaluation of accuracy, antibody characteristics monitoring, reaction conditions, clinical evaluation

REFERENCE
1. The Pharmacological basis of therapeutics by Joel G. Hardman, Lee E. Limbird and Alfred Goodman Gilman.
2. Principles of Medicinal Chemistry by William O. Foye, Tomas L. Lemke & David A. Williams.
3. Pharmacology by H.P. Rang, M.M. Dale, J.M. Ritter & P.K. Moore.
4. Essentials of Pharmcotherapeutics by F.S.K.Barar .
5. Principles of drug action by Golsteins, Aranow and Kalman.
6. Basic and Clinical Pharmacology, 10th edition 2007, B.G.Katzung.
7. Modern Pharmacology with Clinical Application, 6th Edition CR Craig and MJ Rand.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M-Pharm. IInd Semester **Branch: Pharmacy**
Subject: Pharmacology-IV (Clinical Pharmacology and Toxicology) Code: 569214 (41)
Total Theory period: 50 **Total Tutorial period: 12**
Total marks in the end Semester: 100
Minimum of class test to be conducted: 2

UNIT -I Principles of Pharmacokinetics

- Clinical Pharmacokinetics: Dose – response in man, Influence of renal and hepatic disease on pharmacokinetics, Therapeutic drug monitoring, Population pharmacokinetics.
- Adverse drug reactions: Definition and classification, epidemiology, predisposing factors, mechanism of ADR & different types of ADR.
- Pharmacovigilance & Pharmacoepidemiology: Current method of Pharmcovigilance, Ethical oversight, consent and confidentiality, The ICH step process, Periodic safety update reports, Statistical method of evaluating pharmacovigilance data, Pharmacovigilance & risk management.

UNIT-II Drug therapy in
Geriatrics
Pediatrics
Pregnancy & lactation

UNIT-III Pathophysiology and Drug therapy of the following disorders
CNS disorders: Schizophrenia, anxiety, depression, epilepsy, Parkinson's, Alzheimer's diseases, migraine
CVS disorders: hypertension, angina pectoris, arrhythmias, atherosclerosis, myocardial infraction
Infectious disorders: Gastrointestinal, respiratory and urinary infections, Endocarditis and Meningitis

UNIT-IV Pathophysiology and Drug therapy of the following disorders:
Endocrine disorders: Diabetes mellitus, Hypo / Hyperthyroidism, Cushing's syndrome, Addison's disease, sexually transmitted diseases
Autoimmune and metabolic disorder:-Rheumatic fever, Pain management Rheumatoid arthritis, Osteoarthritis, gout and Hyperuricemia, Diabetes mellitus(DM).
Respiratory Diseases-: Pneumonia, Flu (Influenza), Bronchitis, Chronic Obstructive
Pulmonary disease (COPD), Asthma
Neoplastic disorder:-Leukemia; General Principal of cancer chemotherapy.

UNIT-V Clinical evaluation of drugs
Testing of Acute, Subacute and Chronic toxicity, Undue toxicity of drug
Determination of LD_{50} and ED_{50}
OECD guidelines for toxicity testing

UNIT-VI Toxicity
a) Physicochemical, Biochemical and genetic basis of toxicity, principles of toxicokinectics, mutagenesis and carcinogenesis.
b) Behavioral, Inhalation, cellular and sub-cellular toxicity hypersensitivity and immune response, range finding tests.

REFERENCE

1. Clinical Pharmacy and Therapeutics by Roger Walker and Clive Edwards
2. Pharmacotherapy: A Pathophysiological Approach, Dipiro, Joseph L.; Elsevier,2005
3. Pathology and Therapeutics for Pharmacists: A ,Russell J. Greene and Norman D. Harris.
4. Basis for Clinical Pharmacy Practice, 3rd ed.; Chapman and Hall, New York

5. Clinical Pharmacy and Therapeutics, Lippincott, Herfindal, E.T. and Hirschman, J L..
6. Applied Therapeutics: The Clinical Uses of Drugs 9th Ed., Koda and Kimble; Lippincott
7. Relevant Reviews Articles from Medical and Pharmaceutical Literature
8. Basic skills in interpreting laboratory data, American Society of HealthSystemPharmacist ,1996 ,Scott, L.T
9. Harrison's Principles of Internal Medicine, Vol-I And II, 17th Edition, 2008, Mc Graw- Hill
10. Clinical Pharmacy by D.R. Laurence, P.N. Bennett and M.J. Brown
11. Davidson's Principle And Practice Of Medicine, 20thEdition,2009, Churchill, Livingston, London
12. Chaudhari, S.K. Quintessence of Medical Pharmacology; Central Publishers, New Delhi
13. Bedside Clinics in Medicine, Academic Publishers, Kundu, A.K.;Part-I and II, 2009
14. Clinical Pharmacology by Herphendol
15. Komar's Manual of Medical Prescriptions, Balakrishan, K.V., Paras Publications
16. Oxford Textbook of Medicine,5th ed., Edited by David A. Warrell, Timothy M. Cox and John D.Firth, Blackwell Science
17. Pharmacovigilance IInd edition by Ronald and Elizabeth.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M-Pharm. IInd Semester **Branch: Pharmacy**
Subject: Pharmacology –I lab **Code: 569221 (41)**
Total Practical period: 72
Total marks in the end Semester: 100

List of Experiment

1. To study standard techniques for injection of drugs, collection of blood samples and feeding of animals.
2. To study the effect of Phenobarbital on righting reflex in mice.
3. To study the anxiolytic (antianxiety) effect of diazepam in mice using elevated plus-maze apparatus.
4. To study the antianxiety effect of diazepam in mice using Rota rod apparatus.
5. To study the anticonvulsant property of diazepam against pentylenetetrazol induced clonic convulsions in mice.
6. To Study the analgesic effect of morphine in mice using hot plate method.
7. To study the analgesic effect of morphine in mice using tail-flick method.
8. To study the effect of physostigmine and atropine on ciliary movement in frog buccal cavity.
9. To study the antisecretory and ulcerprotective effect of cimetidine in pylorus ligated rats.
10. To study the effect of adrenaline and acetylcholine on perfused frog heart.
11. To study the effect of drugs on the coronary blood flow and heart rate of isolated rat heart.
12. To study the effect of chlorpromazine on the locomotor activity of mice using actophotometer.
13. To study the anti inflammatory property of indomethacin against carrageen induced paw oedema.
14. To study the local anesthetic effects of drug using foot withdrawal reflex in laboratory animals.

REFERENCE

1. Hand book of Experimental Pharmacology-S.K.Kulakarni.
2. Text book of in vitro practical Pharmacology by Ian Kitchen.
3. Pharmacological Experiments on intact preparations by Churchill Living stone.
4. Fundamentals of Experimental Pharmacology by M.N. Ghosh.
5. Pharmacological Experiments of Isolated preparations by Edinburgh University Pharmacology Staff, 1968.
6. Practical's in Pharmacology by Dr. R.K.Goyal.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M-Pharm. IInd Semester **Branch: Pharmacy**
Subject: Pharmacology –II lab (Pharmacological Screening Methods) **Code: 569222(41)**
Total Practical period: 72
Total marks in the end Semester: 100

List of Experiment

1. To study dose response curve and determine pD_2 Value of acetylcholine by using the rectus abdominis muscle of frog.
2. To study dose response curve and determine pD_2 Value of adrenaline by using the rabbit ileum.
3. To calculate pA_2 value for atropine using acetylcholine as an agonist employing guinea pig ileum.
4. Bio-assay of acetylcholine by comparative method using rectus abdominis muscle of frog.
5. Bio-assay of acetylcholine by three point bioassay method using rectus abdominis muscle of frog.
6. Bio-assay of acetylcholine by four point bioassay method using rectus abdominis muscle of frog.
7. Bioassay of Histamine by matching method using guinea pig ileum.
8. Bioassay of Histamine by three point bioassay method using guinea pig ileum.
9. To record the CRC of 5-hydroxytryptamine using rat fundus strip.
10. To record the CRC of oxytocin using rat uterus preparation.
11. To record the concentration response curve of acetylcholine and its modification by atropine using colon preparation.
12. To record the CRC of 5-hydroxytryptamine using rat fundus strip preparation.
13. To determine the LD_{50} of sample drug.
14. Bio equivalence studies on animals.

REFERENCE

1. Fundamentals of experimental Pharmacology Ghosh, M.N.
2. Pharmacological experiment on intact preparations by Churchill Livingstone.
3. Drug Discovery and Evaluation by Vogel HG.
4. Selected topics on the Experimental Pharmacology by Usha G. Kamat, Dadkar, N.K and Seth, U.K.
5. Screening methods in Pharmacology by Robert Turner, A.
6. Hand book of Experimental Pharmacology-S.K.Kulakarni.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M-Pharm. IInd Semester **Branch: Pharmacy**
Subject: Pharmacology –III lab (Molecular Pharmacology) **Code: 569223 (41)**
Total Theory period: 72 hrs
Total marks in the end Semester: 100

List of Experiment

1. To determine the concentration of antibody by indirect ELISA or capture ELISA method.
2. To perform antigen antibody reaction by various immunoassay based method.
3. To isolate DNA from animal tissues using CTAB (cetyltrimethyl ammonium bromide) method.
4. Estimation of protein by Lowry's method/Biuret Method.
5. To isolate RNA from Yeast.
6. Isolation of protein sample using gel electrophoresis technique.
7. To perform electrophoresis of DNA isolated from various sources.
8. To study cell culture preparation and maintenance: Chick embryo fibroblast Lymphocyte culture.

REFERENCE

1. Current protocols in molecular biology by Frederick. M. Ausubel.
2. Human molecular genetics by Tomstracham & Andrew P. Read.
3. Bioinformatics: Genes, proteins & Computers by Christine Orengo.
4. The Cell – A molecular approach, Geoffrey M. Cooper.
5. Bacq Z.M., Cepek, Fundamentals of Biochemical Pharmacology.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Scheme of teaching and examination

Master of Pharmacy (M.Pharm)

(Pharmacology)

III Semester

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory /Practical			Total Marks	Credit L+(T+P)/ 2
				L	T	P	ESE	CT	TA		
1.	Pharmacy	569321 (41)	Minor Dissertation (synopsis submission) Seminar &Viva	-	3	36	300	-	100	400	
Total				**-**	**3**	**36**	**300**	**-**	**100**	**400**	

L – Lecture, T-Tutorial, P-Practical,

Duration of Theory Paper 3Hours

ESE – End Semester Examination, CT – Class Test, TA – Teacher Assessment

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Scheme of teaching and examination

Master of Pharmacy (M.Pharm)

(Pharmacology)

IV Semester

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination			Total Marks	Credit L+(T+P)/ 2
							Theory /Practical				
				L	T	P	ESE	CT	TA		
1.	Pharmacy	569421(41)	Major Dissertation (Seminar & Viva)	-	-	36	400	-	200	600	
Total				**-**	**-**	**36**	**400**	**-**	**200**	**600**	

L – Lecture, T-Tutorial, P-Practical,

Duration of Theory Paper 3Hours

ESE – End Semester Examination, CT – Class Test, TA – Teacher Assessment