SUMANDEEP VIDYAPEETH

(Declared as Deemed to be University under Section 3 of the UGC Act 1956)
Accredited by NAAC with a *CGPA of 3.61 out of four-point scale at 'A++'*
Grade Category - I deemed fo *be university under UGC Act* - 20f8
At & Post *Piparia, Tat: Waghodi8 391760 (Gujarat) India.*
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CURRICULUM

Doctor of Medicine
(M.D.)
PHARMACOLOGY

Attested CTC

15/2/2021

Vice-Chancellor
Sumandeep Vidyapeeth
An Institution Deemed to be University
Vill. Piparia, Taluka: Waghodia.
Dist. Vadodara-391 760. (Gujarat)

Dean

Programme outcome : MD

The purpose of MD education is to create specialists who would provide high quality health care and advance the cause of science through research & training. The goal of postgraduate medical education shall be to produce competent specialists and/or Medical teachers.

Programme specific outcome : MD

POS 1. Scholars shall recognize the health needs of the community, and carry out professional obligations ethically and in keeping with the objectives of the national health policy.

POS 2. Scholars shall have acquired the basic skills in teaching of the medical and paramedical professionals.

POS 3. Practice the specialty concerned ethically and in step with the principles of primary health care.

POS 4. Demonstrate sufficient knowledge of the basic sciences relevant to the concerned specialty**.**

POS 5. Develop skills in using educational methods and techniques as applicable to the teaching of medical/nursing students, general physicians and paramedical health workers.

COURSE OUTCOME (CO): At the end of the MD training programme in Pharmacology, the student shall acquire competencies in the following areas:

1. Scholars have basic knowledge of concepts and principles of Pharmacology and therapeutics. The student should also be able to explain the drug development processes. S/he should be able to explain Drugs and Cosmetics Act, in addition to clinical trial procedures.
2. The student shall learn basic skill to teach undergraduate students in medicine (MBBS) and allied health science courses (Dentistry and Nursing) so they become competent healthcare professionals and able to contribute to training of postgraduate trainees.
3. The student should be able to carry out a research project (both basic and clinical) from planning to publication and be able to pursue academic interests and continue life-long learning to become more experienced in all the above areas and to eventually be able to guide postgraduates in their thesis work.

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Preamble-

The purpose of MD (Pharmacology) program at this university is to train medical graduates to develop into medical pharmacologists and bridge the gap between demand supply of qualified medical pharmacologists both in academia & pharmaceutical industry.Obviously, therefore, training inputs for this program are different from the ones prescribed for M.Sc. or / and Ph.D. in Pharmacology where the approach to the subject is purely experimental.

Program Objectives:-

Candidates upon successfully qualifying in the MD pharmacology examination will be able to-

1. Teach pharmacology & therapeutics to students of medical & allied disciplines.
2. Independently plan & undertake research related to drugs (basic as well as clinical pharmacology) and communicate the findings in conferences/journals.
3. Set up the therapeutic drug monitoring, ADR monitoring, therapeutic audit and drug information services.
4. Plan and conduct toxicity studies and clinical trials.
5. Educate the public about use and misuse of drugs.
6. Supervise breeding & upkeep of laboratory animals.
7. Act as medical advisor in a pharmaceutical house.

Learning Objectives-

1. Demonstrate sound knowledge of general pharmacological principles, systemic pharmacology and rational use of drugs.
2. Plan & conduct lecture, demonstration, practical and tutorial classes for students of medical and allied disciplines.
3. Understand the principles of essential drug concept, rational use of drugs including rational pharmacotherapy.
4. Carry out screening of drugs for pharmacological and toxicological profile.
5. Carry out drug related literature search, formulate research project& undertake the same. Apply appropriate statistical methods for analyzing and summarizing data.
6. Present research findings in conference as (Oral / poster sessions), communicate research / education papers in peer reviewed journals, critically review and comment on research papers.
7. Measure drug levels in blood and other biological fluids using suitable chemical assay methods and interprete the same in therapeutic / toxicological context.
8. Use computer and IT tools for teaching, research and presentation / publication of data.
9. Monitor adverse drug reactions, carry out therapeutic audit and provide information to doctors/public.
10. Demonstrate knowledge of National health policies, essential drug concept/ lists and supervise drug management in a hospital.
11. Demonstrate knowledge of drug rules and regulations existing in the country.

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Post graduate training-

Active learning process by the post graduate students will be the main stay of the training. This will involve structures lectrures, seminars, symposia, group discussions, journal club meetings etc…. The post graduate students will also regurlarly attend ward rounds of various clinical departments with the objective of learning pharmacotherapeutic inputs in interesting cases. Senior teachers of the department will accompany them to bring about meaningful and effective discussions. They will also actively participate in teaching UG students for which teaching resource material will be generated by medical education unit (MEU) of the college.

- To introduce Basic life support (BLS) and Advanced Cardiac Life Support (ACLS) training for all the First year Postgraduate Resident Doctors from academic year 2017-18.

To introduce New chapter / topic 'Intellectual Property Rights (IPR) for all the First year Postgraduate Resident Doctors from academic year 2020-2021 of duration of 4hrs (Board of Studies letter no.: SBKS/DEAN/742/2021,dated 05/06/2021 and Vide Notification of Board of Management Resolution Ref no.:SVDU/R/3051-1/2020-21, dated - 29" July 2021)

List of topics :

1. *Introduction - Concept of Intellectual Property, Historical view of Intellectual Property system in India and International Scenario, Evolution of Intellectual Property Laws in India, Legal basis of Intellectual Property Protection, Need for Protecting Intellectual Property, Theories on concept of property - Major IP Laws in India.*
2. *Types of IPR: Patents, Copyright, Trademark Industrial Designs, Trade Secrets.*
3. *Patents: Concept of Patent, Criteria of Patentability, Inventions NOT patentable, Process of Obtaining a Patent, Duration of Patents, Rights of Patentee, Limitation of rights, Infringement and Enforcement.*
4. *Copyrights: Meaning of Copyright, Copyright Vs. Moral rights, Copyright eligibility, Term of Copyright, Registration of Copyright, Infringement and Remedies*
5. *Trademark: Meaning of Trademark, Criteria for trademark, Procedure for Trademark Registration, Term of protection, Infringement and Remedies.*
6. *Industrial Designs: Meaning of Industrial Designs, Rights in Industrial Designs: Nature, Acquisition and duration of rights.*
7. *Trade Secrets: Meaning of Trade Secrets, Need to protect Trade secrets, Criteria of Protection, Procedure for registration, Infringement.*
8. *Commercialization of IPR: Traditional IP and Evolving IP, Assignment, Licensing, Cross License, Patent Pool, Negotiations, Defensive Publications, Technical Disclosures, Patent Pooling, Patent Trolling, Brand Management, Brand and Pricing Strategies.*

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- *With reference to the Notification vide no. MC!-18(1)12020-Med.1121415, dated 16.09.2020, related to 'Postgraduate Medical Education (Amendment) Regulations 2020'; all the postgraduate students pursuing MD / MS in broad specialties in Sumandeep Vidyapeeth Deemed to be University, as a part of course curriculum, shall undergo a compulsory Residential rotational posting in the 3rd or 4th or Sth semester of the Postgraduate programme, for a duration of three months, in the District Hospitals / District Health System, is confirmed and approved for execution.*

- *(Board of Studies letter no.:SBKS/DEAN/1576/2020,dated 0/10/2021 and Vide Notification of Board of Management Resolution : Ref no. SVDU/R/1271-1/2020-21, dated - 30th December 2020)*

Post graduate examination-

Degree: M.D in Pharmacology

Project: A topic in any branch of pharmacology shall be assigned to the student for dissertation work. After getting approval from the Sumandeep Vidyapeeth Institutional ethics committee, the student is expected to carry out the study and submit the dissertation to the university for the assessment purpose six months before the expected date of university examination. Acceptance of the dissertation by university shall be a pre-requisite condition for appearing at the examination.

The MD Pharmacology examination shall be in three parts.

1. **Thesis** (dissertation) to be submitted by each candidate at least 6 months before the date of commencement of theory examination.
2. **Theory:** there shall be four theory papers-

Theory Examination: (400 Marks)

Paper Number	Topics	Marks	Time
I	**Basic Medical Sciences applied to Pharmacology** - [Physiology, Biochemistry, anatomy, Microbiology, Pathology, Immunology, Genetics, Biostatistics, Drug development Experimental pharmacology, Bioassay and Statistics etc]	100	3 Hours
II	**Pharmacology – I** [General Pharmacology including Essential Medicines and Rational use of Medicines, Autonomic nervous system, Central nervous system, Autacoids, Cardiovascular system and diuretics, Ocular Pharmacology]	100	3 Hours
III	**Pharmacology – II** [Gastrointestinal system, Antimicrobial agents and chemotherapy, Cancer chemotherapy, Immunomodulators, Blood, Hormones and hormone antagonists, Dermatological pharmacology, Toxicology, miscellaneous]	100	3 Hours
IV	**Recent advances in Pharmacology** [including pharmacology as applied to other medicine sciences, clinical pharmacology]	100	3 Hours

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Note: The distribution of topics in each paper is arbitrary. There may be overlapping of relevant topics in question papers.

Each paper shall have 5 questions; all compulsory; no options

Question – 1 Long Question (1 or 2 Parts)	20 Marks
Question – 2 Long Question (1 or 2 Parts)	20 Marks
Question – 3 Long Question (1 or 2 Parts)	20 Marks
Question – 4 Long Question (1 or 2 Parts)	20 Marks
Question – 5 Short notes - (4 Parts)	20 Marks

3. Practical Examination: (450 Marks + 150 Marks oral) = 600 Marks

Exercise Number	Description	Marks	Time	Assessment
1	Animal Experiments (2) • Invito /invivo experiment (In vitro- Guinea pig ileum – Dose response curve, demonstration of antagonism, bioassay) (In vivo- Rotarod Exercises, Eddy's hot plate and actophotometer)	200	3 Hours	Exercise 1- Part-I Exercise 2- Part-II All Four Examiners
2	Clinical Pharmacology Exercises (2) Any two of the following Exercises • Case therapeutic audit • Protocol writing • Journal article abstract writing • Drug information sheet designing • Adverse drug reaction reporting and analysis	200	45 Minutes for each exercise	Exercise 1- Part-I Exercise 2- Part-II All Four Examiners
3	Microteaching/dissertation discussion	50	15 minutes	All Four Examiners
4	Viva voce	150	30 Minutes	All Four Examiners

Maximum Marks for M.D Pharmacology	Theory	Practical & Oral	Total
	400	600	1000

Practical examination shall last for not less than 2 days and not more than 4 days.

To pass the examination, a candidate will be required to obtain 50 percent of the aggregate of the marks assigned to papers, practical, oral and dissertation. Those of the successful candidates who obtain no less than 75% of the grand total in papers, practicals and orals including dissertation taken together, at the first attempt, will be declared to have passed the examination with distinction.

Attested Etc

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Notes-

1. All components of practical examination will be evaluated jointly by all the examiners.
2. An oral question – answer session will be conducted at the end of each practical exercise.

COURSE CONTENT:

General pharmacological principles and applied sciences;

- Theories and mechanism of drug action
- Pharmacokinetic principles and parameters
- Factors modifying drug action, pharmacogenetics and chronopharmacology
- Adverse effectsof drugs, drug dependence, toxicology
- Dose response relationship, structure activity relationship, physiological and biochemical basis of drug action
- Pathophysiology of diseases relevant to therapeutic use of drugs
- Basic microbiology, immunology and molecular biology
- History of pharmacology, sources of drug information and use of information technology

Systemic pharmacology, chemotherapy and therapeutics;

- Pharmacology of drugs acting on autonomic, peripheral and central nervous systems; cardiovascular, endocrine, respiratory, renal, gastrointestinal and haemopoietic systems and treatment of diseases affecting these systems
- Pharmacology of antimicrobial and antiparasitic drugs and treatment of infective diseases; cancer chemotherapy, immunopharmacology, gene therapy and evidence based medicines and pharmacology of drugs used in the treatment of ocular and dermatological diseases.

Experimental pharmacology, bioassay and statistics;

- Experimental methodologies involved in the discovery of drugs (in vivo, in vitro, ex vivo)
- Animal handling and animal care ; restraining and blood collection methods;
- Methods of anaesthetizing animals and methods of euthanasia
- Screening methods involved in the evaluation of anti ulcer, antidepressant, antianginal, antihypertensive, antiarrhythmic, antidiabetic, anticataract, anti platelet anticancer, anti inflammatory, anti diarreal, antiepileptic, analgesic, antithyroid, antipyretic , anti glaucoma, anti hyperlipidemic, antiasthamatic and anti tussive drugs; antifungal, antehelminthic, antibacterial and anti viral agents drugs used in heart failure and posterior pituitary, adrenal steroid,testicular, ovarian, parathyroid and thyroid hormones
- Methods for testing teratogenecity, carcinogenecity and organ toxicities in animals

Clinical pharmacology and recent advances;

- Clinical pharmacokinetic and pharmacodynamic studies
- Development of new drugs; protocol designing, phases, methodology and ethics of clinical trials
- Post marketing surveillance,pharmacovigilance, ADR monitoring and therapeutic drug monitoring
- Drug information service, drug utilization studies, therapeutic audit
- Essential drug concept and rational prescribing
- Good learning and teaching practices
- Recent advances in understanding of mechanism of drug action and treatment of diseases; new drugs and new uses of old drugs

PRACTICAL TRAINING:

Experimental methods discussion:-

A. Screening and evaluation of drug activities including animal models for study of following groups of drugs;

1. Analgesics
2. Anti inflammatory agents
3. Antipyretic drugs ; Pyrogen testing
4. Anti convulsants
5. Antianxiety drugs
6. Antipsychotics
7. Antidepressants
8. Anti parkinsonian drugs
9. Sedative and hypnotics
10. Anti hypertensive drugs
11. Anti anginal drugs
12. Antiarrhythmic drugs
13. Skeletal musclr relaxants
14. Local anaesthetics
15. Antihistaminics, antiallergics
16. Antisecretory and drugs for peptic ulcers
17. Antiemetics
18. Hypoglycemics
19. Antifertility agents
20. Anticancer agents
21. Diuertics
22. Antimalarial drugs
23. Antitubercular drugs
24. Anti diabetic drugs
25. Anti atherosclerotic drugs
26. Bronchodilators anti asthmatics

B. Bioassay of:

1. Acetyl choline
2. Adrenaline / Noradrenaline
3. Histamine
4. 5-hydroxy tryptamine
5. Insulin
6. Antibiotics Digoxin
7. Corticosteroids

C. Methods for studying absorption, biotransformation and excretion of drugs

D. Limitations of anima l experiments in drug evaluation

E. Quantitative study of agonists and antagonists on isolated tissues

F. Measurement of blood pressure in conscious and anaesthetized animals

G. Extraction, purification and characterization of active principles from plant sources/ crude products.

EXPERIMENTAL PHARMACOLOGY EXERCISES

1. Frog's rectus abdominis muscle: dose response curve (DRC) and cumulative DRC of acetylcholine; potentiation of ACh by physostigmine antagonism by tubocurarine / pancuronium
2. Study of drug action on perfused frog heart
3. Study of drug action on isolated rabbit ileum
4. DRC of histamine on guinea pig isolated ileum. Cumulative DRC of histamine in guinea pig isolated tracheal chain
5. Bioassay of histamine on guinea pig isolated ileum by matching, (2+1) point, (2+2 point – latin square design) methods
6. Bioassay of ACh on frog isolated rectus abdominis muscle
7. Determination of EC_{50} and pD_2 values of histamine & ACh on isolated guinea pig ileum & frog rectus abdominis muscle
8. Determination of EC_{50} and pA_2 values of Chlorphemiramine, pancuronium
9. Bioassay of adrenaline on isolated rabbit duodenum
10. Bioassay of adrenaline on rat BP
11. Bioassay of 5-HT on estrogen primed rat uterus
12. Demonstration of muscarinic and nicotinic actions of ACh and carbachol on the BP and respiration of anaesthetized dog/cat
13. Demonstration of cholinesterase activity in blood and anti-cholinesterase activity of physostigmine using BP and respiration of anesthetized dog/cat
14. Demonstration of tachyphylaxis with ephedrine & Dale's vasomotor reversal phenomenon on BP & respiration of anaesthetized dog/cat
15. Identification of the nature of the given unknown drug using BP and nictitating membrane contractions of anaesthetized cat
16. Identification of the nature of unknown drug using BP and spleen volume of anaesthetized dog
17. Identification of the nature of unknown drug using BP & intestine in situ of anaesthetized dog

18. Study of drug action on isolated perfused rabbit heart (langendorff's technique)
19. Study of drug action on isolated rabbit atria
20. Demonstration of rabbit head drop with d-tubocurarine & its reversal by neostigmine
21. Study of neuromuscular blocking agents using phrenic nerve diaphragm preparation of rat
22. Study of local anesthetic by rabbit cornea, guinea pig intra-dermal wheal , frog lumbar plexus
23. Study of anticonvulsant activity of drugs using maximal electroshock seizures & pentylene tetrazole induced convulsions in rats
24. Study of analgesic activity of drugs using rat tail- hot wire, hot plate, acetic acid induced writhing methods
25. Study of anti-inflammatory activity of drugs against caragreen rat paw edema
26. Antagonism of histamine aerosol induced bronchospasm by antihistaminic
27. Effect of psychopharmacological drugs on conditioned avoidance response (Cook's pole climbing)
28. Effect of psychopharmacological drugs on foot shock induced aggression in rats.
29. Effect of psychopharmacological drugs on elevated plus maze
30. Effect of drugs on spontaneous motor activity of mice, actophotometer
31. Study of anorectic activity of amphetamine in mice
32. Potentiation of barbiturate hypnosis by chlorpromazine
33. Study of miotics and mydriatics

MINOR PROCEDURES:

1) Mouse tail vein injection
2) Administration of drugs to rats by gastric canula
3) Collection of blood form rat tail
4) Collection of blood by cardiac puncture in rats / guinea pigs/ rabbits
5) Injection of drugs through marginal ear vein of rabbit
6) Intraperitoneal & subcutaneous injections to rats & mice
7) Intracerebroventricular injection in rats

CHEMICAL PHARMACOLOGY EXERCISES:

1. Identification of steroids, salicylates, using chemical tests.
2. Estimation of drug levels using colorimeter, spectrophotometer, fluorometer, flame photometer, high performance liquid chromatography (HPLC), enzyme linked immunoassay

CLINICAL PHARMACOLOGY EXERCISES:

1. Recording BP in human volunteers
2. Recording ECG and measurement of heart rate, PR interval, QT interval, ST segment depression etc. in human volunteers
3. Study of effect of sublingual nitroglycerine tablet on BP and Heart rate
4. Study of effect of beta blockers on exercise tolerance in human volunteers using tread mill/ bicycle ergo meter /Master's two step test
5. Spirometry & respiratory function test, effect of bronchodilators
6. Psychomotor testing in volunteers by six letter cancellation test, digit-letter symbol substitution test, finger tapping test
7. Assessment of analgesic activity in volunteers by soda water bottle cap – BP cuff pressure test
8. Mydriatics, miotics and cycloplegic effect of drugs in human volunteers
9. Effect of ant cholinergic drugs on salivation, papillary size, heart rate & memory
10. Training at poison information center. Determination of plasma cholinesterase levels in organophosphorus poisoned patients. Spot test for aluminum phosphide poisoning. Estimation of lead in drinking water & patients urine
11. Molarity calculations and preparation of reagents. Estimation of serum salicylates levels using spectro- fluorimetric method. Estimation of plasma phenobarbitone concentration using spectrophotometer.
12. *Implementation of Revised Competency Based Post Graduate Training Programme for MD in Pharmacology as per the guidelines prepared by the National Medical Commission through Subject Expert Groups{ Date of Bos 21.07.2022 Ref :SBKSMIRC/Dean/Outward No.1301/2021-22, Date of Academic council :29.07.2022 Ref :SVDU/NOTFN/O370/2021-22 dated 30.07.2022}*
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