MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed To Be University U/S 3 OF UGC ACT, 1956)
12, Vembuliamman Koil Street, West K.K. Nagar, Chennai – 600 078

MEENAKSHI MEDICAL COLLEGE HOSPITAL AND RESEARCH INSTITUTE,
ENATHUR, KANCHIPURAM

M.D (PHARMACOLOGY)

FACULTY OF MEDICINE

REGULATIONS AND SYLLABUS (REGULATIONS – 2019)

Effective from the Academic Year 2020-2021

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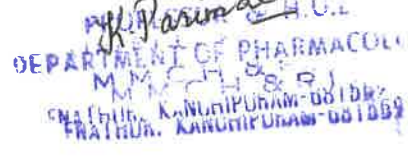
DEPARTMENT OF PHARMACOLOGY,
M.M.C.H. & R.I.,
ENATHUR, KANCHIPURAM-631559



MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH

DOCTOR OF MEDICINE –M.D (PHARMACOLOGY)

REGULATIONS -2019

I.VISION AND MISSION OF MAHER

VISION

To be a world-class institution, transforming society through value-based diverse programs and healthcare advancements, leading to the all-around development of human resources, knowledge, innovation, entrepreneurship, and research.

MISSION

To become an institute of eminence by developing world-class professionals in the field of healthcare, science, liberal arts, technology and research with a focus on the societal good.

To create an enabling state-of-the-art infrastructure, intellectual capital and provide best-in- class learning experience with a freedom to innovate and invent.

To foster values and ethics so as to develop students and learners into responsible citizens of the Nation and the world.

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MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH

DOCTOR OF MEDICINE –M.D (PHARMACOLOGY)

REGULATIONS -2019

II.VISION AND MISSION OF MMCHRI

VISION

To provide global leadership in human development, excellence in education and quality health care.

MISSION

To train competent, compassionate and caring physicians through excellence in teaching, patient care and medical research

MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH

DOCTOR OF MEDICINE –M.D (PHARMACOLOGY)

REGULATIONS -2019

III. VISION AND MISSION – DEPARTMENT OF PHARMACOLOGY

VISION

To become a centre of excellence in the discipline of pharmacology by imparting latest knowledge of drug development in pharmacology and equip the students to provide quality health care.

MISSION

The main focus of teaching and training in pharmacology will be:

- To emphasize the essential concepts of rational and scientific basis of therapeutics
- To impart a clear understanding on the mode of action of drugs.
- To promote skills in human values, ethics in clinical practice and professional attitude for patient safety.
- To motivate the postgraduates in pharmacology for productive research.

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FACULTY OF MEDICINE

DOCTOR OF MEDICINE –M.D (PHARMACOLOGY)

REGULATIONS -2019

IV. PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

PEO 1	Able to become a competent Pharmacologist equipped with adequate knowledge and skills in basic and clinical pharmacology and develop an aptitude on planning and problem solving abilities.
PEO 2	Should be able to teach Pharmacology to undergraduates, postgraduates, nurses and paramedical staff.
PEO 3	Carry out research and write a manuscript systematically to publish in a journal. Able to present a paper in a conference through an oral presentation and poster presentation.
PEO 4	Should be able to work as a part of the team with good leadership skills and inspire the members of the team.
PEO 5	Always adopt ethical principles and to develop good communication skills.

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V. PROGRAM OUTCOMES

At the end of the MD training programme in Pharmacology, the student will be able to

1. Become a competent pharmacologist equipped with adequate knowledge and skills in basic and clinical pharmacology.
2. Develop an aptitude on planning and problem solving abilities in the healthcare Industry.
3. Demonstrate a thorough understanding of principles related to conduct of basic and clinical research activities.
4. Demonstrate adequate knowledge on professionalism, ethics and leadership qualities.
5. Acquire the basic skills in teaching and learning of medical and paramedical professionals.

VI. PROGRAM SPECIFIC OUTCOMES (PSO's)

At the end of the MD training programme in Pharmacology, the student will be able to

1. Become a competent pharmacologists equipped with adequate knowledge and skills on Bio-availability and Bio-equivalence studies.
2. Develop an aptitude on planning and problem solving abilities in basic and clinical research.
3. Demonstrate good attitude, ethics and communication skills in the concerned specialty.

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MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH

MEENAKSHI MEDICAL COLLEGE HOSPITAL AND RESEARCH INSTITUTE

FACULTY OF MEDICINE

DOCTOR OF MEDICINE –M.D (PHARMACOLOGY)

VII. REGULATIONS -2019

In exercise of the powers conferred by the Board of Management, Meenakshi academy of higher education and research, deemed to be University, Chennai hereby makes the following regulations:

1. SHORT TITLE

These Regulations shall be called "THE REGULATIONS FOR DOCTOR OF MEDICINE –M.D (PHARMACOLOGY) PROGRAM OF MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH" deemed to be University.

2. COMMENCEMENT

They shall come into force from the academic year 2020-2021 onwards.

The Regulations and the Syllabus are subject to modification by the Academic council and board of studies from time to time.

3. TITLE OF THE PROGRAM

It shall be called DOCTOR OF MEDICINE –M.D (PHARMACOLOGY)

4. SYLLABUS

The syllabus is as prescribed according to the norms given by NMC and finalised with board of studies management by the university

5. ELIGIBILITY FOR ADMISSION

1) Candidates who have obtained minimum eligibility in qualifying exam
2) The reservation of seats and relaxation in the qualifying marks for SC/ST/OBC and other categories shall be as per the rules of the Central Government/State Government, whichever is applicable.

6. CRITERIA FOR SELECTION

Students for M.D (PHARMACOLOGY) Degree Program shall be admitted based on performance at the Competitive Examinations held by the government.

7. ADMISSION PROCEDURE

Admission shall be made as per the NMC and University norms.

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8. ELIGIBILITY CERTIFICATE

No candidate shall be admitted to the M.D (PHARMACOLOGY) Program unless the candidate has obtained and produced an Eligibility Certificate issued by this University. The candidate has to make an application to the University with the Original and Xerox copies of the following documents along with the prescribed fee:

1) 10^{th} and Higher Secondary or equivalent Examination Mark Sheets.
2) Transfer Certificate
3) MBBS Under graduate degree certificate and mark sheets.
4) Candidates should obtain an Eligibility Certificate before the last date for admission as notified by the University.

9. REGISTRATION

A candidate admitted to the M.D (PHARMACOLOGY) Program of this University shall register by remitting the prescribed fees along with the application form for registration duly filled-in and forwarded to this University through the Head of the Institution within the stipulated date.

10. DURATION OF THE PROGRAM

The programme shall be of duration of three academic years.

11. FEES

The institution shall change only such a fee as prescribed by the university

12. COMMENCEMENT OF THE PROGRAM

The program shall commence from the Academic year 2020- 2021.

13. CUT-OFF DATES FOR ADMISSION TO EXAMINATION

The candidates admitted from 1^{st} May to 30^{th} September of the academic year will be registered to take up their Final examination in May at the completion of 3rd year.

There will not be any admission after 30^{th} September for the academic year.

14. LEAVE DAYS IN AN ACADEMIC YEAR

There shall be maximum of 15 days in a year exclusive of the period of admission and examination

15. ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATIONS

a) No candidate shall be permitted to write any one of the papers of M.D (PHARMACOLOGY) examination unless he/ she has attended all the courses in the subject for the prescribed period and produces the necessary certificates of study and attendance from the Head of the Institution.
b) A candidate is required to put in a minimum of 80% of attendance in both theory and clinical separately in each year before admission to the examination.

c) A candidate, who has not completed the program and not submitted the dissertation signed by the Head of the Department, will not be permitted to appear for the exam.

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d) Attendance earned by the student should be displayed on the Notice Board of the department every month and a copy of the same sent to the University for computerization and parents shall be informed regarding the shortage of attendance of their wards through email (if available) or by post by the Institution.

16. SUBMISSION OF LOG BOOK

a. At the time of practical examination each candidate shall submit to the Examiners his / her log book duly certified by the Head of the Department as a bonafide record of the work done by the candidate.
b. The log book shall be evaluated by the concerned member of the faculty and the external examiner (Internal and external Evaluation) the practical record marks shall be submitted to the University prior to the commencement of the theory examinations.

17. COMMENCEMENT OF THE EXAMINATIONS

a. There shall be examinations at the end of 3rd year in the month of April/May. A candidate who does not pass the examination in any of the 4 papers shall be permitted to appear in all the final year papers in the subsequent examinations to be held in September or April/May.
b. Candidates should get enrolled/register for the first semester examination. If enrolment/registration is not possible owing to shortage of attendance beyond condition limit/rules prescribed OR belated joining OR on medical grounds, such candidates shall redo the lost academic days in the subsequent term and shall be admitted to appear for exams, if he/she has successfully kept the term in first year or the university rules are followed.

18. EVALUATION

Attendance shall be taken as a component of continuous assessment. The students should have a minimum 80% attendance in each year. In addition to the continuous evaluation component, the end of program examination, which will be a written type examination of at least 3 hours duration, would also form an integral component of the evaluation. The evaluation of practical work will be at end of the program.

19. REVALUATION OF ANSWER SCRIPTS

There shall be no revaluation of answer papers of failed candidates in the examination

However re-totalling of answer papers is allowed once upon request by the students.

20. RE-ADMISSION AFTER BREAK OF STUDY

1) The calculation of the break of study of the candidate for re-admission shall be calculated from the date of first discontinuance of the program instead of from the date of admission.
2) Candidates having break of study shall be considered for re-admission provided, they are not subjected to any disciplinary action and no charges are pending or contemplated against them.
3) All readmissions of candidates are subject to the approval of the Vice-Chancellor.
4) A candidate having a break of study of less than 6 months shall apply for re-admission for condonation to the Academic Officer of this University. The candidate may be re-admitted in the corresponding program of study. The candidate has to fulfil the attendance requirements of the University

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5) A candidate having a break of study of more than 6 months but less than 2 years shall apply for re-admission for condonation to the Academic Officer of this University. The candidate may be re-admitted to the beginning of the academic year of the program. The candidate has to fulfil the attendance requirements of the University
6) A candidate having a break of study of more than 2 years and up to 5 years shall apply for the re-admission for condonation to the Academic Officer of this University. The candidates may be re-admitted in the corresponding program of study. The candidate has to fulfil the attendance requirements of the University and shall not be granted exemption in the subjects he has already passed.
7) Candidates having a break of study of 5 years and above from the date of discontinuance and more than two spells of break will not be considered for re-admission.

21. TRAINING PROGRAMME

Tentative Schedule for three years of MD training:

<table>
<tr><th colspan="2">Block</th><th>Duration</th></tr>
<tr><td colspan="3">1st Year</td></tr>
<tr><td colspan="2">Orientation to the Departmental activities</td><td>2 weeks</td></tr>
<tr><td>Theory</td><td>Practical</td><td rowspan="2">3 months 2 weeks</td></tr>
<tr><td>Basic and molecular pharmacology
Drug receptors and pharmacodynamics
Pharmacokinetics (Absorption, Distribution, Metabolism and Excretion).
Biotransformation
Pharmacogenomics and Pharmacogenetics</td><td>Introduction to Experimental Pharmacology (including animal experiments)
Chemical pharmacology & toxicology
Clinical pharmacology
Equipment handling</td></tr>
<tr><td>Autonomic Pharmacology
Drugs acting on Smooth muscles
Drugs acting on Synaptic and Neuroeffector Junctional sites</td><td>Experimental pharmacology – computer simulations Chemical pharmacology & Toxicology – chemical assay
Clinical pharmacology -
Drug development and regulations
- Clinical Pharmacokinetics
Equipment handling
Thesis – selection of topic and submission of title.</td><td>3 months</td></tr>
<tr><td>Drugs acting on Central Nervous System (Sedative, Hypnotics, Antiepileptics, General Anesthetics, Local Anesthetics, Skeletal Muscle Relaxants, Antipsychotic, Antidepressants, Drugs used in Parkinson's disease and other neurodegenerative disorders, opioid agonists</td><td>Experimental pharmacology – screening methods Chemical pharmacology & Toxicology - chemical assay.
Clinical pharmacology - Pharmacovigilance
Equipment handling</td><td>3 months</td></tr>
</table>

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<table>
<tr><td>and antagonists, Drugs of abuse

Autacoids and related pharmacological agents (NSAIDs) and drugs used in Rheumatoid arthritis and Gout</td><td></td><td></td></tr>
<tr><td>Reproductive Pharmacology
Agents effecting calcification and bone turnover</td><td>Thesis – literature search & Research methodology Clinical pharmacology – Pharmacoeconomics & Pharmacoepidemiology</td><td>2 month</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">2nd Year</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Duration</td></tr>
<tr><td rowspan="12">Drugs acting on cardiovascular system and haemostatic mechanisms (Antihypertensives, Antianginal, Antiarrhythmics, Drugs used in heart failure,Drugs used in Dyslipidemias, Fibrionolytics, Anticoagulants, Antiplatelets)</td><td>Clinical postings
Department — Duration
Biochemistry — 2 weeks
Microbiology — 1 week
Pathology — 1 week
Community medicine — 2 weeks
General medicine — 4 weeks
Paediatrics — 1 week
OBG — 1 week
Central research lab — 1 week
Dermatology — 1 week
Psychiatry — 1 week
Anesthesiology — 2 weeks
Cardiology — 1 week</td><td>4 months 2 weeks</td></tr>
<tr><td>Drugs modifying renal function
Gastrointestinal drugs
Pharmacology of drugs affecting the respiratory system (Drugs used in Bronchial Asthma and COPD)</td><td>Experimental pharmacology – bioassay
Chemical pharmacology & Toxicology - biological tests
Clinical pharmacology - evaluation of drug literature
Thesis
Equipment handling</td><td>2 months 2 weeks</td></tr>
<tr><td>Dermatological pharmacology
Ocular pharmacology
Use of drugs in pregnancy
Perinatal and Pediatric Pharmacology
Geriatric Pharmacology</td><td>Experimental pharmacology (including animal experiments)- Bioassay

Chemical pharmacology & Toxicology - Quantitative estimation - Use of colorimeter
Clinical pharmacology – Protocol writing
Equipment handling</td><td>3 months</td></tr>
</table>

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Drug delivery systems Heavy metal poisoning Non-metallic toxicants - air pollutants, pesticides etc.	Biostatistics Thesis – Discussion Chemical pharmacology & Toxicology - **Quantitative estimation** -spectrophotometer and/or other advanced analytical equipments	2 month
3rd Year		
Theory	**Practical**	**Duration**
Pharmacology of drugs used in endocrine disorders (drugs used in diabetes mellitus, hypothalamic and pituitary hormones, thyroid and antithyroid drugs, adrenocorticid hormones and their antagonists, gonadal hormones and their inhibitors)	Industrial training / CRO visit Experimental pharmacology (including animal experiments) – screening methods & in vivo experiments Chemical pharmacology & Toxicology – analytical tests Clinical pharmacology - Drug & drug interactions - Pharmacovigilance Equipment handling	5 months
Antimicrobial, antiparasitics, disinfectants, antiseptics Chemotherapy of neoplastic disease Antiviral drugs Drugs used in Autoimmune disorder and Graft versus Host Disease)	Experimental pharmacology (including animal experiments) – toxicity tests Chemical pharmacology & Toxicology – chemical, biological & analytical tests Clinical pharmacology - Drug evaluation studies - Thesis book preparation & submission Equipment handling	3 months
Immunomodulators - Immunosuppressants and immunostimulants	Experimental pharmacology (including animal experiments) Chemical pharmacology & Toxicology Clinical pharmacology Equipment handling Biochemical Pharmacology	2 months
Over the counter drugs Dietary supplements and herbal medicines	Experimental pharmacology (including animal experiments) Chemical pharmacology & Toxicology Clinical pharmacology Equipment handling Biochemical Pharmacology	2 month
Total:		**36 months**

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SYLLABUS

1. Basic and molecular pharmacology
2. Drug receptors and Pharmacodynamics
3. Pharmacokinetics (Absorption, Distribution, Metabolism and Excretion)
4. Biotransformation
5. Pharmacogenomics and Pharmacogenetics
6. Autonomic Pharmacology
7. Drugs acting on Smooth muscles
8. Clinical pharmacology
9. Drug development and Regulations
10. Clinical Pharmacokinetics
11. Drugs acting on Synaptic and Neuroeffector Junctional sites
12. Drugs acting on Central Nervous System (Sedative, Hypnotics, Antiepileptics, General Anesthetics, Local Anesthetics, Skeletal Muscle Relaxants, Antipsychotic, Antidepressants, Drugs used in Parkinson's disease and other neurodegenerative disorders, opioid agonists and antagonists, Drugs of abuse
13. Drugs modifying renal function
14. Drugs acting on cardiovascular system and haemostatic mechanisms (Antihypertensives, Antianginal, Antiarrhythmics, Drugs used in heart failure, Drugs used in Dyslipidemias, Fibrionolytics, Anticoagulants, Antiplatelets
15. Reproductive Pharmacology
16. Agents effecting calcification and bone turnover
17. Autacoids and related pharmacological agents (NSAIDs) and drugs used in Rheumatoid arthritis and Gout
18. Gastrointestinal drugs
19. Pharmacology of drugs affecting the respiratory system (drugs used in Bronchial Asthma and COPD)
20. Antimicrobial, Antiparasitics, disinfectants, antiseptics
21. Chemotherapy of neoplastic disease
22. Antiviral drugs
23. Drugs used in Autoimmune disorder and Graft versus Host Disease)
24. Dermatological pharmacology
25. Ocular pharmacology
26. Use of drugs in pregnancy
27. Perinatal and Pediatric Pharmacology
28. Geriatric Pharmacology
29. Immunomodulators - immunosuppressants and immunostimulants
30. Pharmacology of drugs used in endocrine disorders (drugs used in diabetes mellitus, hypothalamic and pituitary hormones, thyroid and antithyroid drugs, adrenocorticid hormones and their antagonists, gonadal hormones and their inhibitors)
31. Drug delivery systems
32. Heavy metal poisoning
33. Non-metallic toxicants - air pollutants, pesticides etc.
34. Research methodology and biostatistics
35. Literature search.
36. Pharmacogenomics, Pharmacovigilance (ADR reporting), pharmacoeconomics (cost-effectiveness study) and pharmacoepidemiology
37. Over the counter drugs
38. Dietary supplements and herbal medicines
39. Pharmacometrics - methods of drug evaluation.
40. General screening and evaluation of:
    - Analgesics, antipyretics, anticonvulsants, anti-inflammatory drugs,

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antidepressants, antianxiety and antipsychotics, sedatives, muscle relaxants, antihypertensives, hypocholesterolaemic agents, antiarrhythmics, diuretics, adrenergic blocking drugs

- Drugs used in peptic ulcer diseases/Prokinetic agents/ antiemetics
- Antitussives, /anti-asthma agents
- Local Anaesthetics
- Oxytocics
- Antifertility agents
- Antidiabetics
- Behavioral pharmacology models and evaluation of drugs affecting learning and memory

41. Bioassays
    a. Bioassay methods
    b. Animal experiments: Ethical considerations, ethical approval, applicable regulatory Guidelines (CPCSEA), humane animal research (principles of 3Rs) and alternatives to animal experimentation. General and statistical considerations
    c. Anesthetics used in laboratory animals
    d. Principles of EC50, ED50, pD2 and pA2 values of drugs
    e. Describe methods of bioassay for estimation of : Acetylcholine, skeletal neuromuscular junction blockers, adrenaline, noradrenaline, histamine, 5 HT, hormones, insulin, vasopressin/oxytocin, estrogen, progestins, ACTH
    f. Competitive antagonism - pA2 values
    g. Immunoassays: Concept, types of bioassays and their application/s
    h. Animal experiments: Ethical consideration, ethical approval
    i. Regulatory Guidelines (CPCSEA) and alternatives to animal experimentation
42. Biochemical Pharmacology
    a. Basic principles and applications of simple analytical methods
    b. Principles of quantitative estimation of drugs, endogenous compounds and poisons using Colorimetry, Spectrophotometry, flame photometry, High Performance Liquid Chromatography (HPLC) and enzyme-linked immunosorbent assay (ELISA).

TEACHING AND LEARNING METHODS

Didactic lectures, Short topic presentations, Practical demonstrations, equipment handling, seminars, Journal club, Case based learning, Group discussion, Guest lectures, Electronic & computer simulators, Web based learning, Teaching of undergraduate medical and paramedical students, microteaching, Maintaining a log book , Rotatory clinical and nonclinical posting, Pharmacovigilance, visit to animal house, observatory/hands on experimental postings in animal house, industry/clinical research organization and analytical laboratory preparing research manuscripts, Research presentation in conferences, publishing in journals, quiz, interdepartmental and interdisciplinary symposia.

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TEACHING METHODOLOGY

Learning in a PG program is primarily self-directed and in Pharmacology consists of laboratory and academic work. The formal sessions are meant to supplement this core effort. Acquisition of practical competencies thus becomes the cornerstone of postgraduate medical education in Pharmacology.
Formal teaching sessions

- In addition to laboratory work, at least 6-hr of formal teaching per week is necessary. The departments may select a mix of the following sessions:

Journal club	Once a week
Seminar	Once a week
Practical	Once a week
Group Discussions	Once a week
Case discussions	Once a month
Interdepartmental case or seminar	Once a month

Note: These sessions may be organized as an institutional activity for all postgraduates.

- Attend accredited scientific meetings (CME, symposia, and conferences).
- A postgraduate student of a postgraduate degree course in broad specialties/super specialties would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which will be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
- Additional sessions on basic sciences, biostatistics, and research methodology, teaching methodology, hospital waste management, health economics, medical ethics and legal issues related to experimentation are suggested.
- There will be a training program on Research methodology for existing faculty to build capacity to guide research and for keeping abreast with rapidly evolving methods and techniques in related disciplines.
- The postgraduate students will be required to participate in the teaching and training programme of undergraduate students and interns.
- Log book: During the training period, the post graduate student will maintain a Log Book giving details of experimentation done and skills acquired. The logbook will be used to aid the internal evaluation of the student. The Log book will be checked and assessed periodically by the faculty members imparting the training.

Department will encourage e-learning activities

Mandatory to complete online research methodology course organized by ICMR-NIE within the first 6months of PG training.

Recommended Reading Books (latest edition) / REFERENCE BOOKS:

1. Goodman & Gilman's The Pharmacological basis of therapeutics. Ed. Hardman JG, Limbird LE (1 2th edn/ latest edition) McGraw Hill press New York (2005 / latest).
2. Basic and clinical pharmacology, by Bertram G.Katzung and Anthony J Trevor.
3. Rang & Dale's Pharmacology by H.P.Rang.

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4. Practical Manual of Experimental and Clinical Pharmacology – Bikash Medhi – January 2010.
5. History of Medicine, RK Marya, 1st edition-2009.
6. Fundamentals of experimental pharmacology. Ed. Ghosh MN. (6th edition/latest) Scientific book agency, Calcutta (2015 / latest).
7. Drug Discovery and Evaluation – Pharmacological assays. Ed. Vogel HG & Vogel WH. Springer – New York (2002 / 3rd edition).
8. Harrison's Principles of Internal Medicine. (19th edition/latest) McGraw Hill press New York volume I & II (2005 / latest).
9. Drug Screening Methods- Preclinical evaluation of new drugs. SK Gupta 2nd edition
10. Textbook of Therapeutics Drugs and Disease Management. (7th edition/latest) Ed. Herfindal ET &Gourley DR. Lippincott Williams & Wilkins (2000 / latest).
11. Basic Principles of Clinical Methodology – SK Gupta 1 st edition
12. Clarke's Analysis of Drugs and Poisons. (4th edition/latest) volume 1 & 2. Eds. Maffat AC, Osselton MD &Widdop B. (2004 / latest)
13. Oxford Textbook of Clinical Pharmacology and Drug Therapy. (3rd edition/latest).Smith G & Aronson JK. (2002 / latest)
14. Pharmacotherapy – A pathophysiological approach. (9th edition / latest) DiPiro JT. McGraw Hill press New York (2005 / latest).
15. Design and analysis of clinical trials – concepts & methodologies. Chow SC & Liu JP. (2nd edition / latest) Wiley. 85
16. 9 Steps guide on how to write a clinical trial protocol Dr K.Ashish Gaurav Goel O2 Publication
17 . Clinical Research from Discovery to Development – Dr. K.Ashish Gaurav Goel O2 Publication
18. Essentials of Medical Pharmacology by KD Tripathi
19. Clinical Pharmacology by Lawrence, Bennet and Brown.
20.Avery's Drug treatment (4th edn/ latest) Speight TM & Holford NHG. Adis International Ltd (1997/latest)
21. Postgraduate pharmacology by Sougata Sarkar,Vartika Srivastava and Manjushree Mohanty

JOURNALS

1. Indian Journal of Pharmacology
2. Indian Journal of Physiology & Pharmacology
3. Trends in Pharmacological Sciences
4. Annual Review of Pharmacology and Toxicology
5. Pharmacological Reviews
6. Annals of Pharmacotherapy
7. Indian Drugs
8. British Journal of Pharmacology
9. Journal of Pharmacology and Experimental Therapeutics
10. European Journal of Clinical Pharmacology
11. Journal of Ethnopharmacology
12. Nature Reviews
13. Pharmacovigilance
14. Biomedical and Pharmacology Journal
15. Indian Journal of Pharmaceutical sciences

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22. MINIMUM PASSING STANDARD

The minimum passing standard for final Examinations shall be 50% i.e., each in theory and practical courses.

Summative assessment - Scheme of examinations
Final Theory Examination at the end of THIRD YEAR

Course code	Theory Paper Title	Theory marks (A)	Practical / Clinical marks(B)
PH-I	General Pharmacology	100	-
PH-II	Clinical Pharmacology	100	-
PH-III	Systemic Pharmacology	100	-
PH-IV	Recent Advances in Pharmacology	100	-
PH Practicals	Practicals / Viva	-	200
Total		400	200
Grand total	A+B=600		

Each Theory Paper

Paper	Structured Essays (2x20)	Short Notes (10x6)	MARKS
PH-I	40 marks	60 marks	100
PH-II	40 marks	60 marks	100
PH-III	40 marks	60 marks	100
PH-IV	40 marks	60 marks	100
TOTAL			400

Practical/Clinical examinations

Practical examination will be conducted for two days include the following components as mentioned in the revised MCI curriculum:
SCHEME OF MD (PHARMACOLOGY) PRACTICALS – MARKS DISTRIBUTION
(No. of days for practical exam: 2 days)

Experimental Pharmacology (50 marks)	Chemical Pharmacology (50 marks)	Clinical Pharmacology (50 marks)	Pedagogy (20 marks)	Viva (30)	Grand Total (200 marks)
Long =1x30 = 30 Short=2x10 = 20	Long = 1x30 = 30 Short= 2x10 = 20	Long =1x30 = 30 Short =2x10 = 20	20	30	200

Pass Minimum 40% of marks in each theory paper in University Examinations and not less than 50% of marks cumulatively in all the four papers in the University Theory examinations in the aggregate ⇢ 200/400

50% of marks in the University Practical, Oral and Pedagogy Examination -100/200

50% aggregate in Theory, Practical, Viva Examinations ⇢	300/600

Thesis (Precondition to appear for the final University Examination	Accepted / Not Accepted

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23. GRADE OF MARKS:

>/= 50% of total marks	Pass
>75% of total marks	Distinction
>90 % of total marks	Honours

24. AWARD OF DEGREE

The degree shall be awarded by the university only after the completion of thesis approval and of all four final year theory exams papers and practical examination.

VIII. PROGRAM LEVEL CO/ PO AND PSO MATRIX

MAPPING COURSES WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
General pharmacology	3	2.4	2.8	1.8	2.4	1.6	2.2	1.4
Clinical Pharmacology	3	2.6	2.4	2.8	1.4	1.8	2.4	2.2
Systemic Pharmacology	3	2.4	2.0	1.6	1.6	1.4	1.6	1.6
Recent advances in pharmacology	3	2.5	2.75	1.75	1.75	1.5	2.0	1.75
Average	3.0	2.48	2.49	1.99	1.79	1.58	2.05	1.74

1. Low
2. Medium
3. High

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Mapping Course Outcomes with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	2	3	1	2	3	1	0
CO2	3	3	3	2	3	2	3	2
CO3	3	2	2	2	3	0	3	2
CO4	3	3	3	1	2	3	2	1
CO5	3	2	3	3	2	0	2	2
Avg	3.0	2.4	2.8	1.8	2.4	1.6	2.2	1.4

1. Low
2. Medium
3. High

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XI. PROGRAM AND COURSE DETAILS

COURSE - 1

Course Code	Course name	Internal Assessment	External Assessment	Total marks
1131	General Pharmacology	-	100	100

Course Objectives:

Discuss the principles and concepts of Pharmacology and Therapeutics and its applications in different clinical conditions / diseases.

COURSE OUTCOMES:

CO1: Apply basic principles and concepts of drug receptors, pharmacokinetics, pharmacodynamics of drugs.

CO2: Possess a thorough knowledge and interpret on bioassay experiments using whole animal and isolated biological tissues.

CO3: Adopt the screening techniques available for scientific evaluation of new drugs in various diseases.

CO4: Apply the basic principles of instrumentation such as Spectrophotometry, Calorimetry, High Performance Liquid Chromatography (HPLC), ELISA and RT-PCR techniques in drug discovery process.

CO5: Apply the basic principles of Biostatistics and Research Methodology in Biomedical research.

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COURSE - 2

Course Code	Course name	Internal Assessment	External Assessment	Total marks
1132	Clinical Pharmacology	-	100	100

COURSE OBJECTIVES:

Discuss the principles and concepts of clinical pharmacology and its applications in health care industry.

COURSE OUTCOMES:

CO1: Possess adequate knowledge on writing rational, correct and legible generic prescription for a given condition.

CO2: Apply the principles and the steps involved in the drug discovery / development processes (Pre-clinical and Clinical studies).

CO3: Apply the principles of clinical pharmacology involving protocol writing to conduct clinical trials, informed consent and ethics involved in human research.

CO4: Acquire knowledge and understanding of principles of Good clinical practice (GCP), Good laboratory practice (GLP) guidelines and Drugs and Cosmetics Act.

CO5: Possess a thorough knowledge on Pharmacovigilance program of India (PvPI) and its implementation involving reporting and assessment of serious adverse event.

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Mapping Course Outcomes with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	0	1	3
CO2	3	3	3	3	1	3	3	2
CO3	3	3	3	3	1	3	3	3
CO4	3	3	3	3	1	3	3	2
CO5	3	2	2	2	2	0	2	1
Avg	3.0	2.6	2.4	2.8	1.4	1.8	2.4	2.2

1. Low
2. Medium
3. High

DEAN

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COURSE - 3

Course Code	Course name	Internal Assessment	External Assessment	Total marks
1133	Systemic Pharmacology	-	100	100

COURSE OBJECTIVES:

Discuss the pharmacological principles and its application of drugs used in diagnosis, prevention and treatment of diseases of all systems of human body.

COURSE OUTCOMES:

CO1: Apply and integrate knowledge of pathophysiology of diseases and its modulation by drugs.

CO2: Possess adequate knowledge on the Mechanism of action and pharmacological effects of drugs used in the prevention and treatment of diseases of all systems of human body.

CO3: Possess adequate knowledge on therapeutic uses, adverse effects and contraindications of drugs used in the prevention and treatment of diseases of all systems of human body.

CO4: Describe mechanisms of drug-drug interactions and their clinical importance.

CO5: Possess a thorough knowledge on prevention and treatment guidelines for diseases of all systems of human body.

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Mapping Course Outcomes with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	2	1
CO2	3	2	2	1	2	2	2	2
CO3	3	2	2	2	2	2	2	2
CO4	3	3	2	2	1	2	2	2
CO5	3	2	2	1	2	0	0	1
Avg	3.0	2.4	2.0	1.6	1.6	1.4	1.6	1.6

1. Low
2. Medium
3. High

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COURSE - 4

Course Code	Course name	Internal Assessment	External Assessment	Total marks
1134	Recent Advances in Pharmacology	-	100	100

COURSE OBJECTIVES:

Demonstrate knowledge about recent advances and trends in the field of basic and clinical pharmacology.

COURSE OUTCOMES:

CO1: Ability to acquire knowledge on recent advancements in the field of Basic Pharmacology.

CO2: Possess adequate knowledge on recent advances in Clinical Pharmacology and drug development / discovery process.

CO3: Discuss the recent advancements in the field of Experimental Pharmacology involving in-vivo and in-vitro studies.

CO4: Discuss the recent advances in the prevention and treatment guidelines for various diseases of all systems of human body.

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Mapping Course Outcomes with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	0	2	2
CO2	3	3	3	2	2	3	3	2
CO3	3	3	3	2	2	3	2	2
CO4	3	2	2	1	1	0	1	1
Avg	3.0	2.5	2.75	1.75	1.75	1.5	2.0	1.75

1. Low
2. Medium
3. High

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