



**RAMAIAH  
UNIVERSITY**  
OF APPLIED SCIENCES

**M.S. Ramaiah University of Applied Sciences**  
**Programme Structure and Course Details**  
**Of**  
**MD Pharmacology 2022 onwards**

**M.S. Ramaiah University of Applied Sciences**  
**Ramaiah Medical College**

Registrar  
M.S. Ramaiah University of Applied Sciences  
Bangalore - 560 054

Dean - Academics  
M.S. Ramaiah University of Applied Sciences

Principal and Dean

Approved by the Academic Council meeting held on 27<sup>th</sup> September 2022  
M.S. Ramaiah Medical College  
M.S. Ramaiah University of Applied Sciences  
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**RAMAIAH  
UNIVERSITY**  
OF APPLIED SCIENCES

**M.S. Ramaiah University of Applied Sciences**

**Programme Specifications**

**MD Pharmacology Programme 2022 onwards**

**Programme Code: MD131**

**M.S. Ramaiah University of Applied Sciences**

**Ramaiah Medical College**

  
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## University's Vision, Mission and Objectives

The M. S. Ramaiah University of Applied Sciences (MSRUAS) will focus on student-centric professional education and motivates its staff and students to contribute significantly to the growth of technology, science, economy and society through their imaginative, creative and innovative pursuits. Hence, the University has articulated the following vision and objectives.

### Vision

MSRUAS aspires to be the premier university of choice in Asia for student centric professional education and services with a strong focus on applied research whilst maintaining the highest academic and ethical standards in a creative and innovative environment

### Mission

Our purpose is the creation and dissemination of knowledge. We are committed to creativity, innovation and excellence in our teaching and research. We value integrity, quality and teamwork in all our endeavors. We inspire critical thinking, personal development and a passion for lifelong learning. We serve the technical, scientific and economic needs of our Society.

### Objectives

1. To disseminate knowledge and skills through instructions, teaching, training, seminars, workshops and symposia in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to equip students and scholars to meet the needs of industries, business and society
2. To generate knowledge through research in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to meet the challenges that arise in industry, business and society
3. To promote health, human well-being and provide holistic healthcare
4. To provide technical and scientific solutions to real life problems posed by industry, business and society in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences
5. To instill the spirit of entrepreneurship in our youth to help create more career opportunities in the society by incubating and nurturing technology product ideas and supporting technology backed business
6. To identify and nurture leadership skills in students and help in the development of future leaders to enrich the society we live in
7. To develop partnership with universities, industries, businesses, research establishments, NGOs, international organizations, governmental organizations in India and abroad to enrich the experiences of faculties and students through research and developmental programmes

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Programme Specifications: MD Pharmacology

Faculty	Ramaiah Medical College
Department	Pharmacology
Programme	MD – Pharmacology
Programme Code	MD 131
Dean of Faculty	Dr Shalini C Nooyi
Head of the Department	Dr Anuradha H V

1. Title of the Award: MD Pharmacology
2. Mode of Study: Full-Time
3. Awarding Institution /Body: M. S. Ramaiah University of Applied Sciences, Bengaluru
4. Joint Award: Not Applicable
5. Teaching Institution: Faculty of Medicine, Ramaiah Medical College
6. Date of Programme Specifications: September 2022
7. Programme Approval by the Academic Council of MSRUAS: 27<sup>th</sup> September 2022
8. Programme Approving Regulating Body and Date of Approval: National Medical Council of India

**9. Rationale for the Programme**

The Post Graduate MD Program in Pharmacology aims to produce competent professionals equipped with the comprehensive knowledge in drug actions, mechanisms, clinical applications, and therapeutic innovations.

A Post graduate (MD) student in Pharmacology should be competent to meet the job requirements at all these places Pharmacology consists of both the experimental (basic) and clinical sciences. Experimental pharmacology is essential to understanding of drug action in diseases as well as for the pharmaceutical industry for drug discovery and development. Clinical pharmacology is essential for prescribing practice in medicine, adverse drug reactions, clinical trial and pharmacovigilance. The job prospects for a medical pharmacologist are in academics, pharmaceutical industry/clinical research organization, government research institutions, in regulatory bodies and as scientific writer or science manager.

The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment. This document was prepared by various subject-content specialists. The Reconciliation Board of the Academic Committee has attempted to render uniformity without compromise to purpose and content of the document. Compromise in purity of syntax has been made in order to preserve the purpose and content. This has necessitated retention of "domains of learning" under the heading "competencies".

Programme objectives (PO) for MD Pharmacology Postgraduate students

**PO1.** Apply Pharmacological principles in therapeutics (C, P).

**PO2.** Demonstrate competence in rationally prescribing medication (C, P)

**PO3.** Acquire and develop knowledge, skills and attitude required to be a competent teacher and ethical researcher (A, C, P)

**PO4.** Be able to independently perform pharmacovigilance activity with a reasonable degree of professionalism and competence. (P)

Programme specific outcome (PSO) for MD Pharmacology Postgraduate students

**PSO1.** To acquire a comprehensive understanding of pharmacology and therapeutics, including essential concepts and principles, drug development processes adhering to the current regulations (C)

**PSO2.** To demonstrate proficiency in promoting rational drug use and Pharmacovigilance activity (C,P)

**PSO3.** To conduct research projects in pharmacology, navigating from research project planning to successful publication (A,P)

**PSO4:** To teach and assess medical, paramedical and allied health students, and acquire skills to conduct research independently (C, P)

**PSO5.** To apply principles of professionalism, ethics, and effective communication in day to day practice (A,P)

**Note:** A- Affective Domain, C- Cognitive Domain & P- Psychomotor Domain



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Course-PO-PSO Mapping

Course Code and name	Program Outcomes				Program Specific Outcomes				
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDC517A Basic Sciences: a applied to Pharmacology	3	2	2	2	3	3	2	2	2
MDC518A Systemic Pharmacology	3	3	2	3	3	3	3	2	3
MDC518A Clinical Pharmacology, Experimentation, Research, Biostatistics and Education	3	3	2	3	3	3	3	2	2
MDC520A Recent Advances in Pharmacology	3	3	2	3	3	3	3	2	2
MDP505A Thesis- Pharmacology	2	3	3	2	2	2	2	3	3



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**10. Regulations:****(A) Attendance, Progress and Conduct**

A candidate pursuing degree course should work in the concerned department of the institution for the full period as a full time student. No candidate is permitted to run or work in clinic/laboratory/nursing home while studying postgraduate course. No candidate shall join any other course of study or appear for any other examination conducted by this university or any other university in India or abroad during the period of study.

1. Each year shall be taken as a unit for the purpose of calculating attendance. Attendance of 80% every term is mandatory for appearing in the final university examination.
2. Every student shall attend symposia, seminars, conferences, journal review meetings, case presentation, clinics and lectures during each year as prescribed by the department and not absent himself / herself from work without valid reasons.
3. Every candidate is required to attend a minimum of 80% of the training during each academic term of the post graduate course. Provided further, leave of any kind shall not be counted as part of academic term without prejudice to minimum 80% attendance of training period every term.
4. Any student who fails to complete the course in the manner stated above shall not be permitted to appear for the University Examinations.

**(B) Monitoring of progress of Studies**

1. Work diary / Log Book - Every candidate shall maintain a work diary and record of his/her participation in the training programmes conducted by the department such as journal reviews, seminars, etc. as per the model checklists and logbook specimen copy.
2. Special mention may be made of the presentations by the candidate as well as details of clinical or planning procedures, if any conducted by the candidate. The work diary shall be scrutinized and certified by the Head of the Department and Head of the Institution, and presented in the university practical/clinical examination
3. Procedure for defaulters: The defaulting candidate is counselled by the guide and head of the department. In extreme cases of default, the departmental committee can be formed which will recommend that defaulting candidate will be withheld from appearing the examination, if she/he fails to fulfil the requirements in spite of being given adequate chances to set himself or herself right.

Pharmacology, a medical specialty, encompasses both experimental and clinical sciences. Experimental Pharmacology plays a vital role in understanding drug actions, aiding drug discovery, and development. Clinical Pharmacology is crucial for medical practice, including prescribing, handling adverse drug reactions, clinical trials, and pharmacovigilance. A postgraduate MD student in Pharmacology must be well-equipped to meet the demands of academia, the pharmaceutical industry, government research, regulatory bodies, and roles like scientific writing or management. This applied discipline, evolving into integrated courses, crossing disciplinary boundaries, and attracting more students, raises concerns about competency maintenance and academic standards. Integration with other biomedical and clinical disciplines becomes imperative to address these challenges.

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### 11. Teaching Learning Methods:

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

During the course, students should have formal training in teaching and research.

The sessions should be in the form of:

#### Teaching and Learning Methods

1. Team Teaching/ Integrated Teaching/ CPCs sessions
2. Face to Face Lectures using Audio-Visuals
3. Seminars/journal clubs/e-lectures
4. Case Based Discussions
5. Group Discussions, Presentations
6. Student Symposium
7. Clinical based learning
8. Hospital based learning – clinical examination of patients before performing FNAC and need based bedside visit.
9. Interdepartmental colloquium
10. Rotational clinical / community / institutional **postings** - Regular postings in medicine, dermatology, oncology, hospital pharmacy,
11. Continuing Medical education programs/symposiums/workshops
12. State/National/International conferences and conventions

#### 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 would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should 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.



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- 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 should 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 shall 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 should maintain a Log Book giving details of experimentation done and skills acquired. The log book shall be used to aid the internal evaluation of the student. The Log books shall be checked and assessed periodically by the faculty members imparting the training.
- Department should encourage e-learning activities.

## 12. Innovative teaching learning practices

1. Focused discussion during journal club inculcates culture in the areas of research and publication
2. Faculty lecture helps in bridging the gap between what is presented during the month and what is not about particular topic. Also it reinforces learning

**13. Assessment:** It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only also helps teachers to evaluate students, but also students to evaluate themselves. The monitoring will be done by the staff of the department based on participation of students in various teaching/learning activities.

1. Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, selfdirected learning and ability to practice in the system.
2. Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and practical/clinical examination.
3. The Internal Assessment should be conducted in theory and practical/clinical examination, should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should include quarterly assessment.
4. Teaching skills: Candidates are encouraged to teach undergraduate medical students and paramedical students, if any. In addition, the second year student acts as a mentor for the immediate junior in all aspects of the course.
5. Pedagogy as a tool in formative assessment helps the student to be a better teacher.

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Scheme of Examination**A. Theory (Written Paper) 400 marks**

There shall be four question papers, each of three hours' duration. Each paper shall consist of 10 short essay questions each carrying 10 marks. Total marks for each paper will be 100. Questions on recent advances may be asked in any or all the papers. Details of distribution of topics for each paper will be as follows.

Name of the course	Course Code	Topics	Marks
Basic sciences as applied to Pharmacology	MDC517A	General Pharmacology, Therapeutic drug monitoring, Pharmacovigilance and Pharmacoeconomics	100
Systemic Pharmacology	MDC518A	Drugs acting on various systems	100
Clinical Pharmacology, Experimentation, Research, Biostatistics and Education	MDC519A	Clinical Pharmacology, Experimentation, Research, Biostatistics and Education	100
Recent Advances in Pharmacology	MDC520A	Recent Developments in various domains of Pharmacology and its applications	100
Thesis- Pharmacology	MDP505A	Approval 6 months before final examination.	

**B. Practical :200**

The practical/clinical examination should consist of the following and should be spread over two days.

Practical Examination Exercises:

a) Long exercises:

1. Protocol design for a given scenario
2. Case audit for a given case
3. Perform experiments or simulated experiments (as per PG Regulations)
4. The exercises should be observed, response of student noted and assessed. The question related to these exercises can be asked



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## b) Short exercises:

1. Interpretation of results of a previous tracing - Table exercise
  2. Demonstration of effects of drugs/interpretation of results in small, animals - optional (as per Regulations notified)
- The exercises should be observed and assessed.

## c) OSPE exercises: Objective Structured Practical Examination (OSPE)

OSPE should have 10-15 stations. Stations should be mixture of observed (observer present) and unobserved stations (without an observer). Few examples are given below:

1. Various drug delivery systems
2. Calculating pharmacokinetic parameters
3. Pharmaceutical calculations
4. Statistical exercise
5. Pharmacoeconomics
6. Critical appraisal of a published paper
7. Abstract writing of a published paper
8. Evaluation of drug promotional literature.
9. Adverse Drug Reaction (ADR) reporting and causality assessment
10. Assessment of preclinical toxicity data
11. Analysis of rational and irrational formulations
12. Selecting a P-drug and writing rational prescriptions
13. Analytical instruments - use and interpretation
14. Identifying ethics related dilemmas / mistakes in clinical trial documents

## d) Assessment of teaching/presentation skills

All practical exercises are to be evaluated jointly by all the examiners.

**C. Viva voce:100 marks**

Structured Viva Voce exam for 80 marks and pedagogy for 20 marks will be conducted during practical exam.

**A. Viva-Voce Examination:(80Marks)**

All examiners will conduct viva-voce conjointly on candidate's comprehension, analytical approach, expression and interpretation of data. It includes all components of course contents. In addition, candidates may be also be given case reports, charts, graphs,. It includes discussion on dissertation also.



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**B. Pedagogy Exercise:(20Marks)**

A topic be given to each candidate in the beginning of examination.  
He/she is asked to make a presentation on the topic for 8-10 minutes.

**D. Total Marks Distribution:**

Maximum marks for M.D degree course	Theory	Practical	Viva	Grand Total
	400	200	100	700



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## Annexure

Annexure I - Check-list for evaluation of journal review presentations

Annexure ii - Evaluation of pedagogy

Annexure iii - Check-list for evaluation of seminar presentations

Annexure iv - Check list for dissertation presentation

Annexure v - Continuous evaluation

Annexure vi - Log book

Annexure vii - Students appraisal form



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Annexure – I

## CHECK-LIST FOR EVALUATION OF JOURNAL REVIEW PRESENTATIONS

Date:

Name of the Student:

Name of the Faculty/Observer:

Sl. No.	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1	Article chosen was					
2	Extent of understanding of scope & objectives of the paper by the candidate					
3	Whether cross references have been consulted					
4	Whether other relevant publications consulted					
5	Ability to respond to questions on the paper /subject					
6	Audio-Visual aids used					
7	Ability to discuss the paper					
8	Clarity of presentation					
9	Any other observation					
	<b>Total Score</b>					



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Annexure – II**EVALUATION OF PEDAGOGY**

Name of the candidate:

Date:

Register No.:

Centre:

Topic:

Max. Marks: 20

Skills		Marks
Marks Set induction (1.5marks)	Aroused interest in the beginning by relating to previous learning, throwing a new idea, questioning, etc. Specified the objectives of presentation	
Planning (5 marks)	Organized material in a logical sequence Used relevant content matter	
Presentation(5 marks)	Changed the pace of presentation by shifting emphasis, joke, etc Used specific example to illustrate main Ideas • Used non-verbal cues, eye contact, etc	
Pupil participation(5 marks)	Allowed questions from students Asked question Solicited/Raised questions Rewarded pupil effort	
Use of AV aids(2.5 marks)	Used proper AV aids used the aid(s) effectively	
Closure (1 mark)	Summarized most important points at the end of the session Overall marks	
(out of 20)		



Signature

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Annexure – III

## CHECK-LIST FOR EVALUATION OF SEMINAR PRESENTATIONS

Date:

Name of the Student:

Name of the Faculty/Observer:

Sl. No.	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	V.Good 4
1	Whether other relevant publications consulted					
2	Whether cross references have been made					
3	Completeness of Preparation					
4	Clarity of Presentation					
5	Understanding of subject					
6	Ability to answer questions					
7	Time scheduling					
8	Appropriate use of Audio-Visual aids					
9	Overall Performance					
10	Any other observation					
	Total					



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Annexure – IV**CHECK LIST FOR DISSERTATION PRESENTATION**

Name:

Faculty/Observer:

Date:

Sl. No.	Points to be considered	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Interest shown in selecting a topic					
2.	Appropriate review of literature					
3.	Discussion with guide & other faculty					
4.	Quality of protocol					
5.	Preparation of proforma					



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Annexure – V**CONTINUOUS EVALUATION OF DISSERTATION WORK BY GUIDE / CO-GUIDE**

Name:

Faculty/Observer:

Date:

Sl. No.	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1	Periodic consultation with guide/co-guide					
2	Regular collection of case material					
3	Depth of analysis / discussion					
4	Departmental presentation of findings					
5	Quality of final output					
6	Others					
7	Total Score					



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Annexure VI

## LOG BOOK

Table 1: Academic activities attended by the student Name:

Admission Year:

College:

Date	Type of Activity	Particulars, remarks, signature of faculty
	Monthly postings/Seminar/ Journal Club/ Presentation/ UG teaching/ interdepartmental/ external postings/ conferences	
1		
2		
3		
4		
5		
6		
7		
8		
9		

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## Annexure – VII

## POSTGRADUATE STUDENTS APPRAISAL FORM

## PARA CLINICAL DISCIPLINES

Date:

Name of the Department:

Name of the Student:

Period of Training: From ..... To .....

0: Poor, 1: Average, 2: Good, 3: Very good, 4: Exceptional

Sl. No.	Particulars	Not satisfactory			Satisfactory			More than satisfactory			Remarks
		1	2	3	4	5	6	7	8	9	
1	<b>Scholastic aptitude and learning</b>										
1.1	Has knowledge appropriate for level of training										
1.2	Participation and contribution to learning activity (e.g., Journal Club, Seminars, CME etc)										
1.3	Conduct of research and other scholarly activity assigned (e.g Posters, publications etc)										
1.4	Documentation of acquisition of competence (e.g., Log book)										
1.5	Performance in work-based assessments										
1.6	Self directed learning										
2	<b>Work related to training</b>										
2.1	Practical skills that are appropriate for the level of training										
2.2	Respect for processes and procedures in the work space										
2.3	Ability to work with other members of the team										
2.4	Participation and compliance with the										



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	quality improvement process at the work environment				
2.5	Ability to record and document work accurately and appropriate for level of training				
3	<b>Professional attributes</b>				
3.1	Responsibility and accountability				
3.2	Contribution to growth of learning of the team				
3.3	Conduct that is ethically appropriate and respectful at all times				
4	<b>Space for additional comments</b>				
5	<b>Disposition</b>				
	Has this assessment pattern been discussed with the trainee?				
	Yes NO				
	If not Explain				

\*REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

SIGNATURE OF ASSESSEE

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## Course Specifications

### MD Pharmacology Programme 2022 onwards

**Course Code: MDC517A**



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Course Specifications

Course Title	Basic Sciences as applied to Pharmacology
Course Code	MDC517A
Department	Pharmacology
Faculty	Ramaiah Medical College

Course summary

The course is designed such a way that the student should gain comprehensive knowledge of drug development, pharmacokinetics, pharmacodynamics, drug-drug interactions, therapeutic drug monitoring, pharmacogenetics, pharmacoeconomics, and pharmacovigilance. They will analyze adverse drug effects, conduct research, apply biostatistics in drug safety and efficacy evaluations

Course outcome

**CO 1:** The student should acquire knowledge about the drug development process, principle of pharmacokinetic and pharmacodynamic drug-drug interactions, methods of Therapeutic drug monitoring, principles of pharmacogenetics, Pharmacoeconomics and Pharmacovigilance, Learn and apply the principles of Good Clinical Practice (C)

Should be able to analyse the adverse effects associated with the use of drugs, along with causality assessment.

**CO 2:** Demonstrate knowledge of basics of research methodology, develop a research protocol, conduct the study, record experimental observations, analyze data using currently available statistical software, interpret results (A)

The student should acquire knowledge and apply the principle of biostatistics in the evaluation and interpretation of drug safety and efficacy studies . (C )

Course Content

Basic Pharmacology: Understand the principles of Pharmacology including molecular pharmacology

Drug Development Process: Explain the stages involved in the development of new drugs, encompassing both preclinical and clinical phases

Understand the principles of drug pharmacokinetics and utilize them to tailor medication regimens for personalized pharmacological treatment, considering special populations such as Pediatrics, Geriatrics, Pregnancy, and individuals with specific pathological conditions.

Pharmacokinetics:

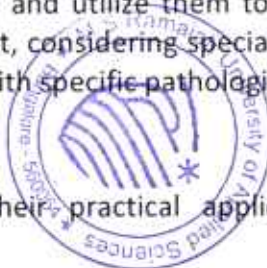
Elaborate on pharmacodynamic principles and their practical application in various therapeutic contexts.

Detail the mechanisms behind drug-drug interactions and their critical clinical implications.

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Outline the fundamental principles of pharmacogenomics and its relevance in clinical practice.

**Pharmacodynamics:**

Investigate the concept of drug synergism and antagonism in combination therapy.

Explore the role of pharmacodynamics in drug dose titration for optimal therapeutic outcomes.

Discuss the use of pharmacodynamic biomarkers in early-phase clinical trials.

**Pharmacogenomics:**

Explore the application of pharmacogenomics and the selection of targeted therapies.

Explore the challenges in drug development

Discuss the role of drug repurposing in accelerating the availability of new treatments.

**Therapeutic Drug Monitoring (TDM):**

Define Therapeutic Drug Monitoring (TDM), describe the methods of TDM and importance in therapeutic decision making.

**Pharmacoeconomics:**

Describe the principles and importance of Pharmacoeconomics in healthcare delivery.

Describe the methods in pharmacoeconomic studies and the economic considerations in the use of medicines in individuals and in the community.

**Pharmacoepidemiology:**

Describe the principles, methods and importance of pharmacoepidemiology, including drug utilization studies.

**Pharmacovigilance:**

Describe the importance of pharmacovigilance in ensuring patient safety and the various methods/procedures in pharmacovigilance.

**Essential Medicines:**

Describe the role of Essential Medicines in rational therapeutics. Describe principles for selecting Essential Medicines for a defined healthcare delivery system.

**Rational Prescribing**

Demonstrate an understanding of principles of rational prescribing.

Demonstrate an understanding of prescription analysis and be able to conduct prescription analysis in a healthcare facility.



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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome	Program Outcomes				Program Specific Outcomes				
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDC517A Basic sciences as applied to Pharmacology	CO 1	3	2	2	2	3	3	2	2	2
	CO 2	2	3	3	2	2	2	2	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution										



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## Course Specifications

### MD Pharmacology Programme 2022 onwards

**Course Code: MDC518A**



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Course Specifications

Course Title	Systemic Pharmacology
Course Code	MDC518A
Department	Pharmacology
Faculty	Ramaiah Medical College

Course summary

The course is designed to apply and integrate knowledge of pathophysiology of diseases and pharmacological principles underlying the effects of drugs, for the purpose of diagnosis, prevention and treatment of common systemic diseases in man including disorders of:

Course outcome

**CO 1:** Should know and integrate the knowledge of pathophysiology of diseases, mechanism of action and pharmacological principles underlying the effects of drugs, for the purpose of diagnosis, prevention and treatment of systemic diseases involving Central Nervous system, Cardio vascular system, Endocrine system , Gastrointestinal system , Respiratory system, Renovascular system etc. (C,P).

**CO 2:** Should be well versed animal toxicity, rational use of drug and prescription auditing, preparation. Knowledge about poisoning, antimicrobial resistance and recent advances in pharmacology(C,P)

**CO 3:** Be conversant with mechanism of action, pharmacological effects and therapeutic status of drugs used for prevention and management of microbial and parasitic infections/infestations, neoplastic disorders and for the drugs used for dermatological and ocular disorders.

Course content**Systemic Pharmacology**

1. Apply the knowledge of pathophysiology of diseases and pharmacological principles for the purpose of diagnosis, prevention and treatment of common systemic diseases e.g.:

- Synaptic & neuroeffector junctional sites of the autonomic nervous system
- Neuromuscular junction
- Central nervous system
- Cardiovascular system
- Endocrine system
- Gastrointestinal system

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- g. Respiratory system
- h. Renovascular system
- i. Hematological system
- j. Immunological system
- k. Autacoids

2. Describe the mechanism of action, pharmacological effects and therapeutic status of drugs used for prevention and management of microbial and parasitic infections/infestations and neoplastic disorders.
3. Describe the pathophysiological basis and management of common poisonings.
4. Demonstrate an awareness about the recent advances in pharmacology and therapeutics.
5. Demonstrate an understanding of the special considerations in pharmacokinetics, mechanism of action, pharmacological effects and therapeutic status of drugs used for dermatological and ocular disorders.

#### **Affective domain**

1. Effectively explain to patients, the effects, appropriate use and adverse effects of drugs, including drug interactions and the need for medication adherence.
2. Communicate effectively with students, peers, staff, faculty and other members of the health care team about rational use of medicines and improving spontaneous reporting of adverse drug reactions, with pharmacological reasoning
3. Demonstrate respect in interactions with peers, patients and other healthcare professionals.

#### **Psychomotor domain**

1. Describe the principles of teaching-learning technology and apply these to conduct classroom lectures, self-directed learning (SDL) sessions, Case-Based Learning (CBL), case discussions, integrated teaching, small group discussions, seminars, journal club and research presentations.
2. Describe the principles of assessment of learning and be able to use the different methods for assessment of undergraduate students in pharmacology.
3. Demonstrate knowledge about the utility of computer assisted learning and be able to use them efficiently to promote learning of pharmacology



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Course Mapping (CO-PO-PSO Mapping):

Course Code and name	Course Outcome	Program Outcomes				Program Specific Outcomes				
		POs				PSOs				
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDC518A Systemic Pharmacology	CO 1	3	3	2	3	3	3	3	2	3
	CO 2	3	3	2	3	3	3	3	2	2
	CO 3	2	3	3	2	2	2	2	3	3
	CO 4	3	2	2	3	3	3	3	2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution										

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## Course Specifications

MD Pharmacology Programme 2022 onwards

Course Code: MDC519A



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Course Specifications

Course Title	Clinical Pharmacology, Experimentation, Research, Biostatistics and Education
Course Code	MDC519A
Department	Pharmacology
Faculty	Ramaiah Medical College

**Course summary**

The course is designed such a way that the student should master various experimentation, research as well as biostatistics methods used during the post-graduate study.

Course outcome

**CO 1:** Be conversant with SOPs in performing major in vivo and in vitro animal experiments, basic principles of High performance Liquid chromatography (HPLC). Demonstrate standard operating procedures of various methods and techniques used in clinical trials and research (C,P)

**CO 2:** Demonstrate presentation skills at academic meetings, publications, writing research projects for funding agencies and able to analyze and evaluate a research paper. (C,P)

**CO3:** Should be introduced to biostatistics including sample size calculations, scales measurements, use appropriate statistical test for the data, interpretation of finding including application of correlation and regression analysis. He/she should independently write the thesis as well as systematic reviews in accordance with the prescribed instructions as expected of international standards(C,P)

**CO 4:** Should effectively explain to patients, the effects and side effects of drugs, including the need for medication adherence and increase in awareness for the use of generic drugs in patients. (C, A)

Course content

(Clinical pharmacology: Experimentation, Research, Biostatistics and Education)

1. Demonstrate an understanding of the importance and ethical considerations of biomedical research in animals and man.
2. Describe the principles and methods of biomedical research in animals and man.
3. Describe the current principles of Good Clinical Practice (GCP) and Good Laboratory Practice (GLP) guidelines, as applicable.
4. Demonstrate an understanding of the different tools and methods for literature search.

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5. Describe and apply the principles of biostatistics in the evaluation and interpretation of efficacy and safety studies of drugs in man. Apply and interpret the various statistical tools in biomedical research.
6. Demonstrate an understanding of the principles of Good Publication practices as applicable to publication of research studies.
7. Describe different methods of drug assays - biological, chemical, immune-assay including knowledge of analytical techniques like HPLC, TLC etc. and their applications in therapeutics.
8. Describe the methods for screening/evaluation of analgesics, antipyretics, anticonvulsants, anti-inflammatory drugs, antidepressants, antianxiety and antipsychotics, sedatives, muscle relaxants, antihypertensives, hypocholesterolemic agents, antiarrhythmic drugs, diuretics, adrenergic blocking drugs, drugs affecting learning and memory in animals and man. (*Note: This is only an indicative list*).
9. Describe the regulatory and ethical issues involved in drug development and research.
10. Demonstrate an awareness about the salient features of Undergraduate Medical Education Curriculum in India.
- 11.. Demonstrate an awareness about Postgraduate Medical Education Curriculum and Guidelines in India.
12. Describe the principles of teaching-learning technology and apply these to conduct classroom lectures, self-directed learning (SDL) sessions, Case-Based Learning (CBL), case discussions, integrated teaching, small group discussions, seminars, journal club and research presentations.
- 13.. Describe the principles of assessment of learning and be able to use the different methods for assessment of undergraduate students in pharmacology.
- 14.. Demonstrate knowledge about the utility of computer assisted learning and be able to use them efficiently to promote learning of pharmacology.

### Psychomotor domain

1. Demonstrate proper use of equipment following the SOPs e.g. organ bath, analgesiometer, physiograph, convulsiometer, plethysmograph, equipment for testing/measuring learning and memory, affective disorders, muscle relaxants, blood pressure, ECG, respiration and pain.
2. Prepare drug solutions of appropriate strength and volume.
3. Determine  $EC_{50}$ ,  $ED_{50}$ ,  $pD_2$  and  $pA_2$  values of drugs.
4. Perform *in vivo* and *in vitro* animal experiments or simulated experiments, interpret the observations and relate these to potential clinical applications of the experimental drug, e.g. - effect of mydriatics and miotics on rabbit eye,  
- effect of anti-epileptic drugs using appropriate animal models of epilepsy - effect of analgesics using appropriate animal models of analgesia, and  
- effect of drugs on learning, memory and motor coordination and effect of local anesthetics.



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Course Mapping (CO-PO-PSO Mapping):

Course Code and name	Course Outcome	Program Outcomes				Program Specific Outcomes				
		POs				PSOs				
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDC519A	CO 1	3	3	2	3	3	3	3	2	3
Clinical pharmacology: Experimentation, Research, Biostatistics and Education	CO 2	3	3	2	3	3	3	3	2	2
	CO 3	2	3	3	2	2	2	2	3	3
	CO 4	3	2	2	3	3	3	3	2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution										



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## Course Specifications

MD Pharmacology Programme 2022 onwards

Course Code: MDC520A



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Course Specifications

Course Title	Recent advances in the Pharmacology
Course Code	MDC520A
Department	Pharmacology
Faculty	Ramaiah Medical College

Course summary

The course is designed such a way that the student should keep himself or herself on recent advances in pharmacology

Course outcome

**CO 1:** Should be conversant recent advances and trends in the field of pharmacology, therapeutics, and regulatory guidelines for drugs/research and clinical trials. Application of nanotechnology in pharmacotherapeutics and recent advances in the understanding of drug action and their future therapeutic relevance (C, P)

**CO 2:** The student should be conversant evidence-based medicine, real-world evidence studies and pragmatic clinical trials, Pharmacovigilance, materiovigilance, (C)

Course content

Demonstrate an awareness about the recent advances in pharmacology and therapeutics.



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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome	Program Outcomes				Program Specific Outcomes				
		POs				PSOs				
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDC520A Recent Advances in Pharmacology	CO 1	3	3	2	3	3	3	3	2	2
	CO 2	3	3	3	2	3	3	2	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution										



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## Course Specifications

### MD Pharmacology Programme 2022 onwards

Course Code: MDP505A

  
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Course Specifications

Course Title	Dissertation
Course Code	MDP505A
Department	Pharmacology
Faculty	Ramaiah Medical College

Course Summary:

The course is designed in such a way that the student will master the science of research in terms of designing, conducting and interpreting the results.

Course outcome

**CO 1:** Should be introduced to basic research methodology so that he/she can independently conduct fundamental and applied research in pharmacology and allied areas. He/she should independently write the thesis in accordance with the prescribed instructions as expected of international standards(C,P)

**CO 2:** The student should demonstrate integrity, accountability, continuous professional development and ethical principles relating to research conduct and research publication as applicable to all the specific courses

Course details:

Every candidate pursuing MD Medicine degree course is required to carry out work on a selected research project under the guidance of a recognised post graduate teacher. The results of such a work shall be submitted in the form of a dissertation. The dissertation is aimed to train a post graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, comparison of results and drawing conclusions.

Every candidate shall submit to the Registrar (Academic) of the University in the prescribed proforma, a synopsis containing particulars of proposed dissertation work within six months from the date of commencement of the course on or before the dates notified by the University. The synopsis shall be sent through the proper channel.

Such synopsis will be reviewed and the dissertation topic will be registered by the University. No change in the dissertation topic or guide shall be made without prior approval of the University.

The dissertation should be written under the following headings:

1. Introduction
2. Aims or Objectives of study
3. Review of Literature
4. Material and Methods
5. Results
6. Discussion
7. Conclusion
8. Summary
9. References (Vancouver style)
10. Tables
11. Annexure



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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome	Program Outcomes				Program Specific Outcomes				
		POs				PSOs				
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDP505A Thesis- Pharmacology	CO 1	2	3	3	2	2	2	2	3	3
	CO 2	2	3	3	2	2	2	2	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution										

  
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## Course materials

### Recommended Books and Journals

#### Books (latest edition)

1. Brunton LL, Hilal-Dandan R, Knollmann BC. Goodman and Gilman's The Pharmacological Basis of Therapeutics, 13th edition, Mc Graw Hill Education, 2018.
2. Katzung BG. Basic & Clinical Pharmacology, 14th edition, McGraw Hill Education, 2018.
3. Papadakis MA, Mcphee SJ. Current Medical Diagnosis & Treatment. 60th edition New York. McGraw Hill Education.2021.
4. Ritter M, Flower R, Henderson G, Loke YK, MacEwan D, Rang HP. Pharmacology. Elsevier, 9th edition, 2020.
5. Tripathi KD. Essentials of Medical Pharmacology, 8th edition. Jaypee Brothers Medical Publishers Private Ltd: New Delhi 2019.
6. M. N. Ghosh. Fundamentals of Experimental Pharmacology. 7th Edition. Hilton & Company, 2019.
7. Badyal D. Practical Manual of Pharmacology. Jaypee Brothers Medical Publishers; 3rd edition 2020.
8. Vogel HJ. Drug Discovery and Evaluation: Pharmacological Assays Springer; 3rd edition, 2007.
9. Sharma S, Velpandian T. Illustrated Reviews Pharmacology. Wolter Kluver, South Asian Edition, 2019.
10. Medhi B, Prakash A. Practical Manual of Experimental & Clinical Pharmacology. Jaypee Brothers Medical Publishers, 2nd edition, 2017.
11. Alldredge BK, Corelli RL, Ernst ME, Guglielmo Jr. BJ, Jacobson PA, Kradjan WA, Williams BA. Koda-Kimble and Young's Applied Therapeutics Lippincott Williams and Wilkins, 10th edition, 2012.
12. Cheston B Cunha, Burke A Cunha. Antibiotic essentials. Jaypee Brothers Medical Publishers 17th edition, 2021.

#### Journals

- 1) Indian Journal of Pharmacology
- 2) Journal of Pharmacology and Pharmacotherapeutics
- 3) Indian drugs
- 4) National Journal of Physiology, Pharmacy & Pharmacology
- 5) Indian Journal of Physiology & Pharmacology
- 6) Clinical drug investigation
- 7) International Journal of Clinical Pharmacology & therapeutics
- 8) Biomedicine & Pharmacotherapy
- 9) Current opinion in Pharmacology
- 10) Environmental toxicology and Pharmacology
- 11) European neuropsychopharmacology
- 12) Trends in pharmacological sciences



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