

आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh NAAC ACCREDITED

SCHOOL OF PHARMACEUTICAL SCIENCES IFTM UNIVERSITY, MORADABAD.

www.iftmuniversity.ac.in

Study & Evaluation Scheme of Master of Pharmacy

Programme

Master of Pharmacy (Pharmacology)

Course Level

Post Graduate Degree

Duration

Four Semester (two academic year) Full Time

Medium of instruction

English

Minimum Required Attendance

80%

Total Credit Points

0070

Minimum=95, Maximum=100

Programme Outcomes (POs):

On completion of the M. Pharm. program, a student will be able to:

PO1: Explain the knowledge of the basics and advanced pharmaceutical sciences and the ability to acquire, manage and use current information with problem solving approach.

PO2: Perform the synthesis, development of analytical techniques for identification, characterization and quantification of drugs, formulation, pharmacological, pharmacognostical, biotechnological and regulatory aspects of drugs and biomolecules.

PO3: Undergo the applied and interdisciplinary research for betterment of society at national and international level.

PO4: Comply and work on rules and regulations involved in the drug discovery & development, manufacture and other allied area of the field.

PO5: Develop problem-based learning approach and analytical thinking in his/her academic and professional life.

PO6: Apply critical thinking skills, including investigation, application, analysis, creativity, evaluation of information, data and documents related to research at local, regional and global platform.

PO7: Tackle professional challenges through lifelong learning attitude.

PO8: Demonstrate the ability to plan and implement professional activities.

PO9: Act efficiently as a leader in the diverse areas of the profession including writing research papers and articles of contemporary trends.

PO10: Apply the knowledge and skills to gain recognition in professional circle as well as society.

PO11: Make initiatives to create awareness in society about the effective and safe use of medicines.

PO12: Exercise ethical practices and moral values in personal and professional endeavors.

Faculty of Pharmacy
IFTM University, Moradabad

2016

THE MASTER OF PHARMACY (M. PHARM.)
COURSE REGULATION 2014

(Based on Notification in the Gazette of India No. 362, Dated December 11, 2014)

SCHEME AND SYLLABUS



PHARMACY COUNCIL OF INDIA Combined Council's Building, Kotla Road, Aiwan-E-Ghalib Marg, New Delhi-110 002. Website: www.pci.nic.

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असाधारण

EXTRAORDINARY

भाग III-खण्ड 4

PART III—Section 4 प्राधिकार से प्रकाशित

PUBLISHED BY AUTHORITY

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NEW DELIH, THURSDAY, DECEMBER 11, 2014/AGRAHAYANA 20, 1936

PHARMACY COUNCIL OF INDIA NOTIFICATION

New Deihi, the 10th December, 2014

The Master of Pharmacy (M.Pharm) Course Regulations, 2014

No. 14-136/ 2014-PCL—In exercise of the powers conferred by Sections 10 and 18 of the Pharmacy Act, 1948 (8 of 1948), the Pharmacy Council of India, with the approval of the Central Government hereby makes the following regulations: namely—

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CHAPTER –I: REGULATIONS

1. Short Title and Commencement

These regulations shall be called as "The Revised Regulations for the Master of Pharmacy (M. Pharm.)Degree Program – Credit Based Semester System (CBSS) of the Pharmacy Council of India, New Delhi". They shall come into effect from the Academic Year 2016–17. The regulations framed are subject to modifications from time to time by the authorities of the university.

2. Minimum qualification for admission

A Pass in the following examinations

- a) B. Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55% of the maximum marks (aggregate of 4 years of B. Pharm.)
- b) Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (B.Pharm.)

3. Duration of the program

The program of study for M.Pharm. shall extend over a period of four semesters (two academic years). The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June July to November/December and the even semesters shall be conducted from the month of December January to May June in every calendar year.

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6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, practical classes, seminars, assignments, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly the credit associated with any of the other academic, co/extracurricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

Credit assignment

Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having four lectures per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2. The contact hours of seminars, assignments and research work shall betreated as that of practical courses for the purpose of calculating credits. i.e.,the contact hours shall be multiplied by 1/2. Similarly, the contact hours ofjournal club, research work presentations and discussions with thesupervisor shall be considered as theory course and multiplied by 1.

Minimum credit requirements

The minimum credit points required for the award of M. Pharm. degree is 95. However based on the credit points earned by the students under thehead of co-curricular activities, a student shall earn a maximum of 100 credit points. These credits are divided into Theory courses, Practical, Seminars, Assignments, Research work, Discussions with the supervisor, Journal club and Co-Curricular activities over the duration of four semesters. The credits

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are distributed semester-wise as shown in Table 14. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

8. Academic work

A regular record of attendance both in Theory, Practical, Seminar, Assignment, Journal club, Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respective courses.

9. Course of study

The specializations in M.Pharm program is given in Table 1.

Table – 1: M.Pharm. Specialization (Pharmacology) with Code

S. No.	Specialization	Code
1.	Pharmacology	MPL

The course of study for M.Pharm specializations shall include Semester wise Theory & Practical as given in Table – 2. The number of hours to be devoted to each theory and practical course in any semester shall not be less than that shown in Table – 2.

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Sanjel Dosawa REGISTRAR IFTM UNIVERSITY MORADABAD. Table - 2: Course of study for M. Pharm. (Pharmacology)

Course Code	Course		Credit Points	Hrs./wk	Marks
	Semes	ter I			
MPL101T	Modern Pharmaceutical Analytical Techniques		4	4	100
MPL102T	Advanced Pharmacology-I	4	4	4	100
MPL103T	Pharmacological and Toxicological Screening Methods-I	4	4	4	100
MPL104T	Cellular and Molecular Pharmacology	4	4	4	100
MPL105P	MPL105P Pharmacology Practical I		6	12	150
MPL111P	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650
	Semes	ter II			
MPL201T	Advanced Pharmacology II	4	4	4	100
MPL202T	Pharmacological and MPL202T Toxicological Screening Methods-II		4	4	100
MPL203T Principles of Drug Discovery		4	4	4	100
MPL204T Clinical Research And Pharmacovigilance		4	4	4	100
MPL205P	Pharmacology Practical II	12	6	12	150
MPL222P	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

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Table - 3: Course of study for M. Pharm (Pharmacology). III Semester

Course Code	Course	Credit Hours	Credit Points
MRM 301T	Research Methodology and Biostatistics*	4	4
MPL302	Journal club	1	1
MPL303	Discussion / Presentation (Proposal Presentation)	2	2
MPL304	Research Work	28	14
	Total	35	21

^{*} Non University Exam

Table - 4: Course of study for M. Pharm (Pharmacology). IV Semester

Course Code	Course	Credit Hours	Credit Points
MPL 401	Journal Club	1	1
MPL 402	Discussion / Presentation (Proposal Presentation)	3	3
MPL 403	Research Work and Colloquium	31	16
	Total	35	20

Table - 5: Semester wise credits distribution

Semester	Credit Points		
I	26		
II	26		
Ш	21		
IV	20		
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholarly Activities)	Minimum=02 Maximum=07*		
Total Credit Points	Minimum=95 Maximum=100*		

^{*}Credit Points for Co-curricular Activities

MPL- Pharmacology

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Table - 6: Guidelines for Awarding Credit Points for Co-curricular Activities

Name of the Activity	Maximum Credit Points Eligible / Activity
Participation in National Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	01
Participation in international Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	02
Academic Award/Research Award from State Level/National Agencies	01
Academic Award/Research Award from International Agencies	02
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	01
Research / Review Publication in International Journals (Indexed in Scopus / Web of Science)	02

Note: International Conference: Held Outside India

International Journal: The Editorial Board Outside India

*The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

10. Program Committee

- 1. The M. Pharm. programme shall have a Programme Committee constituted by the Head of the institution in consultation with all the Heads of the departments.
- 2. The composition of the Programme Committee shall be as follows: A teacher at the cadre of Professor shall be the Chairperson; One Teacher from each M.Pharm specialization and four student representatives (two from each academic year), nominated by the Head of the institution.
- 3. Duties of the Programme Committee:
- i. Periodically reviewing the progress of the classes.
- ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
- iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.

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- iv. Communicating its recommendation to the Head of the institution on academic matters.
- v. The Programme Committee shall meet at least twice in a semester preferably at the end of each sessional exam and before the end semester exam.

11. Examinations/Assessments

The schemes forinternal assessment and end semester examinations are given in Table - 7.

End semester examinations

The End Semester Examinations for each theory and practical course through semesters I to IV shall be conducted by the respectiveuniversity except for the subject with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts atcollege level and the marks/grades shall be submitted to the university.

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Table - 7: Schemes for internal assessments and end semester (Pharmacology- MPL)

		Int	ernal A	ssessmen	nt		emester kams	Tot
Course Code	Course	Conti nuous Sessional Exams			Tot	Mar	Durati	al Mar
		Mode	Mar ks	Durati on	al	ks	on	ks
		S	SEMEST	ER I				
MPL10 1T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPL10 2T	Advanced Pharmacology-l	10	15	1 Hr	25	75	3 Hrs	100
MPL10 3T	Pharmacological and Toxicological Screening Methods-I	10	15	1 Hr	25	75	3 Hrs	100
MPL10 4T	Cellular and Molecular Pharmacology	10	15	1 Hr	25	75	3 Hrs	100
MPL10 5P	Pharmacology Practical–I	20	30	6 Hrs	50	100	6 Hrs	150
MPL111P	Seminar /Assignment		-	•			•	100
		Γ	otal					650
		S	EMESTI	ER II				
MPL201T	Advanced Pharmacology II	10	15	1 Hr	25	75	3 Hrs	100
MPL202T	Pharmacological and Toxicological Screening Methods-II	10	15	1 Hr	25	75	3 Hrs	100
MPL203T	Principles of Drug Discovery	10	15	1 Hr	25	75	3 Hrs	100
MPL204T	Clinical research and Pharmacovigilance	10	15	1 Hr	25	75	3 Hrs	100
MPL205P	Pharmacology Practical-II	20	30	6 Hrs	50	100	6 Hrs	150
MPL222P	Seminar /Assignment						•	100
	Canel_	Т	otal					650

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Table - 8: Schemesfor internal assessments and end semester examinations (Semester III&IV)

Course Code	Course				End Ser Exams	End Semester Exams		
		Continu		Sessional Exams Tot al		al Mark s	Duration	
		Mode	Marks	Duration				
			SEMES	TER III				
MRM301T	Research Methodology Biostatics*	10	15	1 Hr	25	75	3 Hrs	100
MPL302	Journal club	-		-	25	-	-	25
MPL303	Discussion / Presentation (Proposal Presentation)	-	-	-	50	-	-	50
MPL304	Research work*	- 1		· ·	-	350	1 Hr	350
			Total					525
				TER IV				
MPL401	Journal club	-	-	-	25	-	-	25
MPL402	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	<u>-</u>	75
MPL403	Research work and Colloquium	-	-	-	-	400	1 Hr	400
			Total					500

*Non University Examination

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The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table - 9: Scheme for awarding internal assessment: Continuous mode

Theory		
Criteria	Maximum Marks	
Attendance (Refer Table – 28)	8	
Student – Teacher interaction	2	
Total	10	
Practical		
Attendance (Refer Table – 28	10	
Based on Practical Records, Regular viva voce, etc.	10	
Total	20	

Table - 10: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	8	10
90 – 94	6	7.5
85 – 89	4	5
80 – 84	2	2.5
Less than 80	0	0

Sessional Exams

Two sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical sessional examinations is given in the table. The average marks of two sessional exams shall be computed for internal assessment as per the requirements given in tables.

12. Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of M.Pharm. Programme if he/she secures at least 50% marks in that particular course including internal assessment.

13. Carry forward of marks

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In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment

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shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

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14. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the sessional exam component of the internal assessment. The re-conduct of the sessional exam shall be completed before the commencement of next end semester theory examinations.

15. Reexamination of end semester examinations

Reexamination of end semester examination shall be conducted as per the schedule given in table 11. The exact dates of examinations shall be notified from time to time.

Table - 11: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I and III	November / December	May / June
II and IV	May / June	November / December

16. Allowed to keep terms (ATKT):

No student shall beadmitted to any examination unless he/she fulfills the norms given in 6. ATKT rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I and IIsemesters till the III semester examinations. However, he/she shall not be eligible to attend the courses of IV semester until all the courses of I, II and III semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to IV semesters within the stipulated time period as per the norms.

Note: Grade AB should be considered as failed and treated as one head for deciding ATKT. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

17. Grading of performances

Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table - 12.

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Table – 12: Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 - 100	0	10	Outstanding
80.00 – 89.99	Α	9	Excellent
70.00 – 79.99	В	8 '	Good
60.00 – 69.99	С	7	Fair
50.00 - 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C1, C2, C3 and C4 and the student's grade points in these courses are G1, G2, G3 and G4, respectively, and then students' SGPA is equal to:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4}{C_1 + C_2 + C_3 + C_4}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a learner has a F or ABS grade in course 4, the SGPA shall then be computed as:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4 * ZERO}{C_1 + C_2 + C_3 + C_4}$$

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the IV semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all IV semesters and their courses. The CGPA shall reflect the failed statusin case of F grade(s), tillthe course(s) is/are passed. Whenthe course(s) is/are passedby obtaining a passgrade on subsequent examination(s) the CGPA

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shall only reflect the new grade and not the failgrades earned earlier. The CGPA is calculated as:

$$C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4$$

$$CGPA = C_1 + C_2 + C_3 + C_4$$

where C_1 , C_2 , C_3 ,... is the total number of credits for semester I,II,III,... and $S_1,S_2, S_3,...$ is the SGPA of semester I,II,III,....

20. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction = CGPA of. 7.50 and above

= CGPA of 6.00 to 7.49First Class

Second Class =CGPA of 5.00 to 5.99

21. Project work

All the students shall undertake a project under the supervision of a teacher in Semester III to IV and submit a report. 4 copies of the project report shall be submitted (typed & bound copy not less than 75 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). The projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done		50Marks
Methodologyadopted		150 Marks
Results and Discussions		250 Marks
Conclusions and Outcomes		50 Marks
	Total	500 Marks

Evaluation of Presentation:

Presentation of work	100 Marks
Communication skills	50 Marks
Question andanswer skills	100 Marks

Total 250 Marks

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22. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates whofail in one or more courses during the M.Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the M. Pharm program in minimum prescribed number of years, (two years) for the award of Ranks.

23. Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

24. Duration for completion of the program of study

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

25. Revaluation I Retotaling of answer papers

There is no provision for revaluation of the answer papers in any examination. However, the candidates can apply for retotaling by paying prescribed fee.

26. Re-admission after break of study

Candidate who seeks re-admission to the program after break of study hasto get the approval from the university by paying a condonation fee.

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PHARMACOLOGY (MPL)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES(MPL101T)

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about,

- Chemicals and Excipients
- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY 60 Hrs

1	UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation 10 Hrs
	associated with UV-Visible spectroscopy, Choice of solvents and solvent effect
	and Applications of UV-Visible spectroscopy, Difference/ Derivative
	spectroscopy.IR spectroscopy: Theory, Modes of Molecular vibrations, Sample
	handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer,
	Factors affecting vibrational frequencies and Applications of IR spectroscopy,
	Data Interpretation.
	Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence
	Flame emission spectroscopy and Atomic absorption spectroscopy:
	Principle, Instrumentation, Interferences and Applications.
2	NMR spectroscopy: Quantum numbers and their role in NMR, Principle, 10 Hrs
	Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals
	in various compounds, Chemical shift, Factors influencing chemical shift, Spin-
	Spincoupling, Coupling constant, Nuclear magnetic double resonance, Brief
	outline of principles of FT-NMR and 13C NMR. Applications
	of NMR spectroscopy.
3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, 10 Hrs
	Different types of ionization like electron impact, chemical, field, FAB and
	MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass

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	fragmentation and its rules, Metastable ions, Isotopic peaks and Applications of									
	Mass spectroscopy.									
4	Chromatography: Principle, apparatus, instrumentation, chromatographic	10 Hrs								
	parameters, factors affecting resolution, isolation of drug from excipients, data									
	interpretation and applications of the following:									
	Thin Layer chromatography									
	High Performance Thin Layer Chromatography									
	Ion exchange chromatography									
	Column chromatography									
	Gas chromatography									
	High Performance Liquid chromatography									
	Ultra High Performance Liquid chromatography									
	Affinity chromatography									
	Gel Chromatography									
5	Electrophoresis: Principle, Instrumentation, Working conditions, factors	10 Hrs								
	affecting separation and applications of the following:									
	Paper electrophoresis									
	Gel electrophoresis									
	Capillary electrophoresis									
	Zone electrophoresis									
	Moving boundary electrophoresis									
	Iso electric focusing									
	X ray Crystallography: Production of X rays, Different X ray									
	methods, Bragg's law, Rotating crystal technique, X ray powder technique,									
	Types of crystals and applications of X-ray diffraction.									
6	Potentiometry: Principle, working, Ion selective Electrodes and Application of	10 Hrs								
	potentiometry.									
	Thermal Techniques: Principle, thermal transitions and									
	Instrumentation (Heat flux and power-compensation and designs), Modulated									
	DSC, Hyper DSC, experimental parameters (sample preparation, experimental									

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conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. **Differential Thermal Analysis** (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). **TGA**: Principle, instrumentation, factors affecting results, advantages and disadvantages, pharmaceutical applications.

Course Outcomes:

Upon completion of this course, the student should be able to:

CO1: Understand theory, instrumentation and applications of various spectroscopic techniques for skill development, entrepreneurship and employability at local, regional and global platform.

CO2: Know about the concept and applications of NMR spectroscopy for skill development, entrepreneurship and employability.

CO3: Learn theory, instrumentation and applications of Mass spectroscopy for skill development, entrepreneurship and employability.

CO4: Understand the principle and instrumentation of various chromatographic methods for skill development, entrepreneurship and employability at national and international level.

CO5: Understand electrophoresis, X-Ray Crystallography, potentiometry, different thermal techniques and/or immunological assay for skill development, entrepreneurship and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3	2	2	2	1	3	1	1
CO2	1	3	2	2	2	1	2	2	2	2	1	1
CO3	1	3	1	2	3	3	2	2	2	2	2	2
CO4	1	1	1	3	3	3	2	2	2	2	1	2
CO5	3	3	3	3	2	2	1	2	1	2	1	2

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CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship
,			Development
CO1	3	3	2
CO2	2	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	2	2

REFERENCES

- Spectrometric Identification of Organic compounds Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
- 2. Principles of Instrumental Analysis Doglas A Skoog, F. James Holler, Timothy A.Nieman, 5th edition, Eastern press, Bangalore, 1998.
- 3. Instrumental methods of analysis Willards, 7th edition, CBS publishers.
- Practical Pharmaceutical Chemistry Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
- 5. Organic Spectroscopy William Kemp, 3rd edition, ELBS, 1991.
- Quantitative Analysis of Drugs in Pharmaceutical formulation P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
- 7. Pharmaceutical Analysis Modern Methods Part B J W Munson, Vol 11, Marcel.Dekker Series
- 8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley Estern Ltd., Delhi.
- 9. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons,1982.

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ADVANCED PHARMACOLOGY-I(MPL102T)

Scope

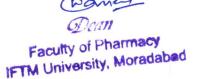
The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved.

Objectives

- Upon completion of the course the student shall be able to
- Discuss the pathophysiology and pharmacotherapy of certain diseases
- * Explain the mechanism of drug actions at cellular and molecular level
- Understand the adverse effects, contraindications and clinical uses of drugs used intreatment of diseases

THEORY 60 Hrs

1	General Pharmacology	12 Hrs							
	a. Pharmacokinetics: The dynamics of drug absorption, distribution,								
	biotransformation and elimination. Concepts of linear and non-linear								
	compartment models. Significance of Protein binding.								
	o. Pharmacodynamics: Mechanism of drug action and the relationship between								
	drug concentration and effect. Receptors, structural and functional families of								
	receptors, quantitation of drug receptors interaction and elicited effects.								
2	Neurotransmission	12 Hrs							
	General aspects and steps involved in neurotransmission.								
	b. Neurohumoral transmission in autonomic nervous system (Detailed study								
	about neurotransmitters- Adrenaline and Acetyl choline).								
	c. Neurohumoral transmission in central nervous system (Detailed study about								
	neurotransmitters- histamine, serotonin, dopamine, GABA, glutamate and								
	glycine].								
	Non adrenergic non cholinergic transmission (NANC). Co- transmission								
	Systemic Pharmacology								





	A detailed study on pathophysiology of diseases, mechanism of action,	
	pharmacology and toxicology of existing as well as novel drugs used in the	
	following systems	
	Autonomic Pharmacology	
	Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting	
	neuromuscular junction	
3	Central nervous system Pharmacology	12 Hrs
	General and local anesthetics	
	Depression, psychosis, mania, epilepsy, neurodegenerative diseases. Narcotic and	
	non-narcotic analgesics.	
4	Cardiovascular Pharmacology	12 Hrs
	Diuretics, antihypertensives, antiischemics, anti-arrhythmic, drugs for heart	
	failure and hyperlipidemia	
	Hematinics, coagulants, anticoagulants, fibrinolytics and anti-platelet drugs	
5	Autocoid Pharmacology	12 Hrs
	The physiological and pathological role of Histamine, Serotonin, Kinins	
	Prostaglandins Opioid autocoids.	
	Pharmacology of antihistamines, 5HT antagonists.	

Course Outcomes:

Upon completion of this course, the student should be able to:

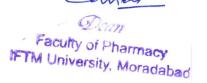
CO1: Understand general pharmacology including pharmacokinetics and pharmacodynamics for skill development, entrepreneurship and employability at national and international level.

CO2: Understand the concepts of neurohumoral synthesis, release and transmission of various neurotransmitters along with peripheral nervous system pharmacology for skill development, entrepreneurship and employability.

CO3: Understand the central nervous system and associated diseases with their drug classification and pharmacological activity for skill development, entrepreneurship and employability.

CO4: Understand drug classification and pharmacological actions of cardiovascular and haematopoetic system along with associated diseases for skill development, entrepreneurship and employability.

CO5: Understand the physiology and pharmacology of different autocoids along with their drug



Sanjely Brawy REGISTRAR IFTM UNIVERSITY MORADABAD. classification for skill development, entrepreneurship and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	2	2	1	2	2	3	3	1
CO2	2	2	2	3	3	2	2	2	3	3	3	2
CO3	2	2	3	2	1	2	2	3	3	2	2	2
CO4	2	3	2	3	3	2	2	2	3	3	3	2
CO5	3	1	2	2	3	3	2	2	2	2	2	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	2
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	2

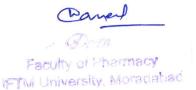
REFERENCES

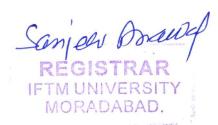
- 1. The Pharmacological Basis of Therapeutics, Goodman and Gillman's
- 2. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers.
- 3. Basic and Clinical Pharmacology by B.G Katzung
- 4. Handbook of Clinical Pharmacokinetics by Gibaldi and Prescott.
- 5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.

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- 6. Graham Smith. Oxford textbook of Clinical Pharmacology.
- 7. Avery Drug Treatment
- 8. Dipiro Pharmacology, Pathophysiological approach.
- 9. Green Pathophysiology for Pharmacists.
- 10. Robbins & Cortan Pathologic Basis of Disease, 9th Ed. (Robbins Pathology)
- 11. A Complete Textbook of Medical Pharmacology by Dr. S.K Srivastava published by APCAvichal Publishing Company
- 12. KD. Tripathi. Essentials of Medical Pharmacology.
- 13. Modern Pharmacology with Clinical Applications, Craig Charles R. & Stitzel Robert E., Lippincott Publishers.
- 14. Clinical Pharmacokinetics & Pharmacodynamics: Concepts and Applications Malcolm Rowland and Thomas N.Tozer, Wolters Kluwer, Lippincott Williams & Wilkins Publishers.
- 15. Applied biopharmaceutics and Pharmacokinetics, Pharmacodynamics and Drug metabolism for industrial scientists.
- 16. Modern Pharmacology, Craig CR. & Stitzel RE, Little Brown & Company.





PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS – I(MPL103T) Scope

This subject is designed to impart the knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development. The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines, basic knowledge of various in-vitro and in-vivo preclinical evaluation processes.

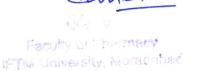
Objectives

Upon completion of the course the student shall be able to:

- Appraise the regulations and ethical requirement for the usage of experimental animals.
- Describe the various animals used in the drug discovery process and good laboratorypractices in maintenance and handling of experimental animals
- Describe the various newer screening methods involved in the drug discovery process
- Appreciate and correlate the preclinical data to humans

THEORY 60 Hrs

1	Laboratory Animals	12 Hrs
	Common laboratory animals: Description, handling and applications of	
	different species and strains of animals.	
	Transgenic animals: Production, maintenance and applications Anaesthesia	
	and euthanasia of experimental animals.	
	Maintenance and breeding of laboratory animals. CPCSEA guidelines to	
	conduct experiments on animals	
	Good laboratory practice.	
	Bioassay-Principle, scope and limitations and methods	
2	Preclinical screening of new substances for the pharmacological activity using in	12 Hrs
	vivo, in vitro, and other possible animal alternative models.	
	General principles of preclinical screening. CNS Pharmacology: behavioral and	
	muscle coordination, CNS stimulants and depressants, anxiolytics, anti-	
	psychotics, anti-epileptics and nootropics. Drugs for neurodegenerative diseases	
	like Parkinsonism, Alzheimers and multiple sclerosis. Drugs acting on	
	Autonomic Nervous System.	





3	Preclinical screening of new substances for the pharmacological activity using in 12 Hrs
	vivo, in vitro, and other possible animal alternative models.
	Respiratory Pharmacology: anti-asthmatics, drugs for COPD and anti- allergics.
	Reproductive Pharmacology: Aphrodisiacs and antifertility agents Analgesics,
	antiinflammatory and antipyretic agents. Gastrointestinal drugs: anti-ulcer, anti-
	emetic, anti-diarrheal and laxatives.
4	Preclinical screening of new substances for the pharmacological activity usingin 12 Hrs
	vivo, in vitro, and other possible animal alternative models.
	Cardiovascular Pharmacology: antihypertensives, antiarrythmics, antianginal,
	antiatherosclerotic agents and diuretics. Drugs for metabolic disorders like anti-
	diabetic, antidyslipidemic agents. Anticancer agents. Hepatoprotective
	screening methods.
5	Preclinical screening of new substances for the pharmacological activity usingin 12 Hrs
	vivo, in vitro, and other possible animal alternative models.
	Iimmunomodulators, Immunosuppressants and immunostimulants
	General principles of immunoassay: theoretical basis and optimization of
	immunoassay, heterogeneous and homogenous immunoassay systems.
	Immunoassay methods evaluation; protocol outline, objectives and preparation.
	Immunoassay for digoxin and insulin
	Limitations of animal experimentation and alternate animal experiments.
	Extrapolation of in vitro data to preclinical and preclinical to humans

Course Outcomes:

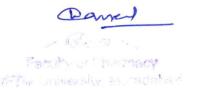
Upon completion of this course, the student should be able to:

CO1: Understand various regulations and ethical requirements for the usage of experimental animals and bioassay concept for skill development and employability at national and international level.

CO2: Learn various screening methods involved in the drug discovery process in CNS and ANS for skill development, entrepreneurship and employability.

CO3: Learn screening methods involved in the drug discovery process in respiratory pharmacology, reproductive pharmacology, analysesics, anti-inflammatory and antipyretic agents along with gastrointestinal drugs for skill development, entrepreneurship and employability.

CO4: Describe the various screening methods involved in the drug discovery process in





cardiovascular pharmacology and drugs for metabolic disorders and hepatoprotective agents for skill development and employability at local, regional and global platform.

CO5: Understand general principles of immunoassay along with extrapolation of in vitro data to preclinical and preclinical to humans for skill development, entrepreneurship and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	2	2	3	2	2	1	3	2	1
CO2	1	3	3	2	2	2	1	2	2	2	2	3
CO3	2	3	3	1	2	3	2	2	3	2	2	3
CO4	1	3	2	1	2	3	2	2	2	3	2	2
CO5	3	2	2	3	3	3	3	1	3	1	3	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship
			Development
CO1	2	2	1
CO2	3	2	2
CO3	3	2	2
CO4	3	3	2
CO5	3	3	1

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CELLULAR AND MOLECULAR PHARMACOLOGY(MPL104T)

Scope

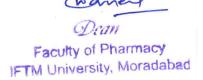
The subject imparts a fundamental knowledge on the structure and functions of cellular components and helps to understand the interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process.

Objectives

Upon completion of the course the student shall be able to:

- Explain the receptor signal transduction processes.
- Explain the molecular pathways affected by drugs.
- Appreciate the applicability of molecular pharmacology and biomarkers in drug discoveryprocess.
- Demonstrate molecular biology techniques as applicable for pharmacology
- THEORY 60 Hrs

1	Cell biology	12 Hrs
	Structure and functions of cell and its organelles	
	Genome organization. Gene expression and its regulation, importance of siRNA	
	and micro RNA, gene mapping and gene sequencing	
	Cell cycles and its regulation.	
	Cell death- events, regulators, intrinsic and extrinsic pathways of apoptosis.	
	Necrosis and autophagy.	
2	Cell signaling	12 Hrs
	Intercellular and intracellular signaling pathways.	
	Classification of receptor family and molecular structure ligand-gated ion	
	channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear	
	receptors.	
8	Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1,4,5-	
	trisphosphate, (IP3), NO, and diacylglycerol. Detailed study of following	
	intracellular signaling pathways: cyclic AMP signaling pathway, mitogen-	
	activated protein kinase(MAPK) signaling, Janus kinase (JAK)/signal	
	transducer and activator of transcription (STAT) signaling pathway.	



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3	Principles and applications of genomic and proteomic tools DNA electrophoresis,	12 Hrs							
	PCR (reverse transcription and real-time), Gene sequencing, microarray								
	technique, SDS page, ELISA and western blotting, Recombinant DNA								
	technology and gene therapy								
	Basic principles of recombinant DNA technology-Restriction enzymes, various								
	types of vectors. Applications of recombinant DNA technology.								
	Gene therapy- Various types of gene transfer techniques, clinical applications								
	and recent advances in gene therapy.								
4	Pharmacogenomics	12 Hrs							
	Gene mapping and cloning of disease gene. Genetic variation and its role in health/								
	pharmacology Polymorphisms affecting drug metabolism Genetic variation in								
	drug transporters								
	Genetic variation in G protein-coupled receptors Applications of proteomics								
	science: Genomics, proteomics, metabolomics, functionomics, nutrigenomics								
	Immunotherapeutics								
	Types of immunotherapeutics, humanisation antibody therapy,								
	Immunotherapeutics in clinical practice								
5	Cell culture techniques	12 Hrs							
	Basic equipments used in cell culture lab. Cell culture media, various types of cell								
	culture, general procedure for cell cultures; isolation of cells, subculture,								
	cryopreservation, characterization of cells and their application.								
	Principles and applications of cell viability assays, glucose uptake assay, Calcium								
	influx assays								
	Principles and applications of flow cytometry								
	Biosimilars								

Course Outcomes:

Upon completion of this course, the student should be able to:

CO1: Understand the cell biology for skill development and employability.



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CO2: Understand outline of cells communication and main sequences of events essential for cell-cell communication for skill development and employability at national and international level.

CO3: Understand critical analysis of methods and principles of genome sequencing and genome mapping for skill development and employability at local, regional and global platform.

CO4: Understand the Pharmacogeomics and immunotherapeutics for skill development and employability.

CO5: Learn the cell culture techniques and biosimilars for skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	3	2	2	2	3	3	2	3	2
CO2	2	2	2	3	2	2	2	3	3	2	3	2
CO3	2	2	3	3	2	3	1	3	2	2	2	2
CO4	2	3	3	2	2	3	2	2	3	2	2	2
CO5	2	3	3	2	1	3	2	1	1	3	3	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	2	3	1
CO3	2	3	1
CO4	3	2	2
CO5	3	1	1

REFERENCES:

- 1. The Cell, A Molecular Approach. Geoffrey M Cooper.
- 2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M-L.Wong

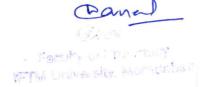
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- 3. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al
- 4. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al
- 5. Basic Cell Culture protocols by Cheril D.Helgason and Cindy L.Miller
- 6. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
- 7. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
- 8. Current protocols in molecular biology vol I to VI edited by Frederick M.Ausuvel et al

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PHARMACOLOGICAL PRACTICAL – I(MPL105P)

- 1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
- 2. Simultaneous estimation of multicomponent containing formulations by UV spectrophotometry
- 3. Experiments based on HPLC
- 4. Experiments based on Gas Chromatography
- 5. Estimation of riboflavin/quinine sulphate by fluorimetry
 - 6. Estimation of sodium/potassium by flame photometryHandling of laboratory animals.
- 1. Various routes of drug administration.
- 2. Techniques of blood sampling, anesthesia and euthanasia of experimental animals.
- 3. Functional observation battery tests (modified Irwin test)
- 4. Evaluation of CNS stimulant, depressant, anxiogenics and anxiolytic, anticonvulsantactivity.
- 5. Evaluation of analgesic, anti-inflammatory, local anesthetic, mydriatic and miotic activity.
- 6. Evaluation of diuretic activity.
- 7. Evaluation of antiulcer activity by pylorus ligation method.
- 8. Oral glucose tolerance test.
- 9. Isolation and identification of DNA from various sources (Bacteria, Cauliflower, onion, Goat liver).
- 10. Isolation of RNA from yeast
- 11. Estimation of proteins by Braford/Lowry's in biological samples.
- 12. Estimation of RNA/DNA by UV Spectroscopy
- 13. Gene amplification by PCR.
- 14. Protein quantification Western Blotting.
- 15. Enzyme based in-vitro assays (MPO, AChEs, α amylase, α glucosidase).
- 16. Cell viability assays (MTT/Trypan blue/SRB).
- 17. DNA fragmentation assay by agarose gel electrophoresis.



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- 18. DNA damage study by Comet assay.
- 19. Apoptosis determination by fluorescent imaging studies.
- 20. Pharmacokinetic studies and data analysis of drugs given by different routes of administration using softwares
- 21. Enzyme inhibition and induction activity
- 22. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (UV)
- 23. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (HPLC)

REFERENCES

- 1. CPCSEA, OECD, ICH, USFDA, Schedule Y, EPA guidelines,
- 2. Fundamentals of Experimental Pharmacology by M.N.Ghosh
- 3. Handbook of Experimental Pharmacology by S.K. Kulkarni.
- 4. Drug discovery and Evaluation by Vogel H.G.
- 5. Spectrometric Identification of Organic compounds Robert M Silverstein,
- 6. Principles of Instrumental Analysis Doglas A Skoog, F. James Holler, Timothy A.Nieman,
- 7. Vogel's Text book of quantitative chemical analysis -Jeffery, Basset, Mendham, Denney,
- 8. Basic Cell Culture protocols by Cheril D. Helgason and Cindy L.Mille
- 9. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
- 10. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
- 11. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi(Author), Ajay Prakash (Author) Jaypee brothers' medical publishers Pvt. Ltd

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ADVANCED PHARMACOLOGY - II(MPL201T)

Scope

The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, the subject helps the student to understand the concepts of drug action and mechanism involved.

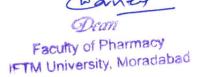
Objectives

Upon completion of the course the student shall be able to:

- Explain the mechanism of drug actions at cellular and molecular level
- Discuss the Pathophysiology and pharmacotherapy of certain diseases
- Understand the adverse effects, contraindications and clinical uses of drugs used intreatment of diseases

THEORY 60 Hrs

1	Endocrine Pharmacology	12 Hrs						
	Molecular and cellular mechanism of action of hormones such as growth							
	hormone, prolactin, thyroid, insulin and sex hormones							
	Anti-thyroid drugs, Oral hypoglycemic agents, Oral contraceptives,							
	Corticosteroids.							
	Drugs affecting calcium regulation							
2	Chemotherapy	12 Hrs						
	Cellular and molecular mechanism of actions and resistance of antimicrobial							
	agents such as β-lactams, aminoglycosides, quinolones, Macrolide antibiotics.							
	Antifungal, antiviral, and anti-TB drugs							
3	Chemotherapy	12 Hrs						
	Drugs used in Protozoal Infections							
	Drugs used in the treatment of Helminthiasis Chemotherapy of cancer							
	Immunopharmacology							
	Cellular and biochemical mediators of inflammation and immune response.							
	Allergic or hypersensitivity reactions. Pharmacotherapy of asthma and COPD.							
	Immunosuppressants and Immunostimulants							
4	GIT Pharmacology	12 Hrs						



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	Antiulcer drugs, Prokinetics, antiemetics, anti-diarrheals and drugs for	
	constipation and irritable bowel syndrome.	
	Chronopharmacology	
	Biological and circadian rhythms, applications of chronotherapy in various	
	diseases like cardiovascular disease, diabetes, asthma and peptic ulcer	
5	Free radicals Pharmacology	12 Hrs
	Generation of free radicals, role of free radicals in etiopathology of various	
	diseases such as diabetes, neurodegenerative diseases and cancer. Protective	
	activity of certain important antioxidants	
	Recent Advances in Treatment:	
	Alzheimer's disease, Parkinson's disease, Cancer, Diabetes mellitus	

Upon completion of this course, the student should be able to:

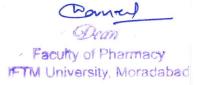
CO1: Attain detailed knowledge about Endocrine Pharmacology, Molecular & cellular mechanism of action of hormones, anti-thyroid drugs, oral hypoglycemic agents, oral contraceptives and Corticosteroids for skill development and employability.

CO2: Understand the chemotherapy, molecular and cellular mechanism of action of antimicrobial agents for skill development and employability.

CO3: Understand the drugs used in protozoal infections, helminthiasis. Also, learn about chemotherapy of cancer, immunopharmacology, immunosuppressants and immunostimulants for skill development and employability at national and international level.

CO4: Understand the pharmacology related to GIT and chronopharmacology for skill development and employability.

CO5: Understand Free radical pharmacology and recent advances in treatment such as Alzheimer's disease, Parkinson's disease, Cancer, Diabetes Mellitus for skill development and employability.





PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	2	2	3	2	3	3	2	2
CO2	2	3	2	2	2	3	2	1	2	2	2	2
CO3	3	2	3	2	2	2	2	2	2	3	3	3
CO4	3	3	2	3	2	2	1	2	2	1	2	2
CO5	2	3	2	2	2	3	2	2	2	2	1	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship
			Development
CO1	3	2	3
CO2	3	2	2
CO3	3	3	2
CO4	3	2	1
CO5	2	3	2

REFERENCES

- 1. The Pharmacological basis of therapeutics- Goodman and Gill man's
- 2. Principles of Pharmacology. The Pathophysiologic Basis of drug therapy by David E Golanet al.
- 3. Basic and Clinical Pharmacology by B.G -Katzung
- 4. Pharmacology by H.P. Rang and M.M. Dale.
- 5. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
- 6. Text book of Therapeutics, drug and disease management by E T. Herfindal and Gourley.
- 7. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
- 8. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism forIndustrial

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Sinjel Drawf REGISTRAR IFTM UNIVERSITY MORADABAD.

Scientists

- 9. Robbins & Cortan Pathologic Basis of Disease, 9th Ed. (Robbins Pathology)
- 10. A Complete Textbook of Medical Pharmacology by Dr. S.K Srivastava published by APCAvichal Publishing Company.
- 11. KD. Tripathi. Essentials of Medical Pharmacology
- 12. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J,Armstrong, April W, Armstrong, Wolters, Kluwer- LippincottWilliams &Wilkins Publishers

Dean
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PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS-II(MPL202T)

Scope

This subject imparts knowledge on the preclinical safety and toxicological evaluation of drug & new chemical entity. This knowledge will make the student competent in regulatory toxicological evaluation.

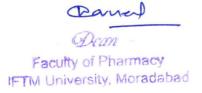
Objectives

Upon completion of the course the student shall be able to:

- Explain the various types of toxicity studies.
- Appreciate the importance of ethical and regulatory requirements for toxicity studies.
- Demonstrate the practical skills required to conduct the preclinical toxicity studies.

THEORY 60 Hrs

1	Basic definition and types of toxicology (general, mechanistic, regulatory and	12 Hrs
1		12 1115
	descriptive)	
	Regulatory guidelines for conducting toxicity studies OECD, ICH, EPA and	
	ScheduleY	
	OECD principles of Good laboratory practice (GLP)	
	History, concept and its importance in drug development	
2	Acute, sub-acute and chronic- oral, dermal and inhalational studies as per	12 Hrs
	OECD guidelines.	
	Acute eye irritation, skin sensitization, dermal irritation & dermal toxicity	
	studies.	
	Test item characterization- importance and methods in regulatory toxicology	
	studies	
3	Reproductive toxicology studies, Male reproductive toxicity studies, female	12 Hrs
	reproductive studies (segment I and segment III), teratogenicity studies (segment	
	II)	
	Genotoxicity studies (Ames Test, in vitro and in vivo Micronucleus and	
	Chromosomal aberrations studies)	
	In vivo carcinogenicity studies	



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4	IND enabling studies (IND studies) - Definition of IND, importance of IND,	12 Hrs
	industry perspective, list of studies needed for IND submission.	
	Safety pharmacology studies- origin, concepts and importance of safety	
	pharmacology.	
	Tier1- CVS, CNS and respiratory safety pharmacology, HERG assay. Tier2-	
	GI, renal and other studies	
5	Toxicokinetics- Toxicokinetic evaluation in preclinical studies, saturation	12 Hrs
	kinetics Importance and applications of toxicokinetic studies.	
	Alternative methods to animal toxicity testing.	

Upon completion of this course, the student should be able to:

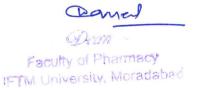
CO1: Learn about the toxicology, OECD, ICH, EPA guidelines, ScheduleY and OECD principles of good laboratory practice for skill development and employability.

CO2: Attain detailed knowledge about Acute, sub-acute, chronic-oral, dermal, inhalational, acuteeye irritation, skin sensitization, dermal irritation & dermal toxicity studies and test item characterization for skill development and employability.

CO3: Attain detailed knowledge about reproductive toxicology studies, genotoxicity studies and in vivo carcinogenicity studies for skill development and employability at local, regional and global platform.

CO4: Understand the IND enabling studies and safety pharmacology studies for skill development and employability.

CO5: Understand the toxicokinetics and alternative methods to animal toxicity testing for skill development and employability.





PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	2	3	3	2	2	2	2
CO2	3	2	3	3	3	2	3	3	2	2	2	2
CO3	2	3	3	3	3	3	2	2	2	2	2	2
CO4	2	3	1	3	3	3	2	1	1	2	3	2
CO5	1	3	3	2	2	2	2	3	2	3	2	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship
			Development
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	2	2
CO5	2	2	. 2

REFERENCES

- 1. Handbook on GLP, Quality practices for regulated non-clinical research and development (http://www.who.int/tdr/publications/documents/glp- handbook.pdf).
- 2. Schedule Y Guideline: drugs and cosmetics (second amendment) rules, 2005, ministry ofhealth and family welfare (department of health) New Delhi
- 3. Drugs from discovery to approval by Rick NG.
- 4. Animal Models in Toxicology, 3rd Edition, Lower and Bryan
- 5. OECD test guidelines.
- 6. Principles of toxicology by Karen E. Stine, Thomas M. Brown.
- 7. Guidance for Industry M3(R2) Nonclinical Safety Studies for the Conduct of HumanClinical

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Faculty or Pharmacy IFTM University, Moradabac Trials and marketing Authorization for Pharmaceuticals http://www.fda.gov/downloads/drugs/guidancecomplianceregulatoryinformation/guidances/ucm073246.pdf)

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PRINCIPLES OF DRUG DISCOVERY(MPL203T)

Scope

The subject imparts basic knowledge of drug discovery process. This information will make the student competent in drug discovery process.

Objectives

Upon completion of the course the student shall be able to:

- Explain the various stages of drug discovery.
- Appreciate the importance of the role of genomics, proteomics and bioinformatics in drugdiscovery
- Explain various targets for drug discovery.
- Explain various lead seeking methods and lead optimization Appreciate the importance of the role of computer aided drug design in drug discovery

THEORY 60 Hrs

1	An overview of modern drug discovery process: Target identification, target	12 Hrs
	validation, lead identification and lead Optimization. Economics of drug	
	discovery.	
	Target Discovery and validation-Role of Genomics, Proteomics and	
	Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense	
	technologies, siRNAs, antisense oligonucleotides, Zinc finger	
	proteins. Role of transgenic animals in target validation.	
2	Lead Identification- combinatorial chemistry & high throughput screening, in	12 Hrs
	silico lead discovery techniques, Assay development for hit identification.	
	Protein structure	
	Levels of protein structure, Domains, motifs, and folds in protein structure.	
	Computational prediction of protein structure: Threading and homology modeling	
	methods. Application of NMR and X-ray crystallography in protein	
	structure prediction	
3	Rational Drug Design	12 Hrs

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	Traditional vs rational drug design, Methods followed in traditional drugdesign,
	High throughput screening, Concepts of Rational Drug Design, RationalDrug
	Design Methods: Structure and Pharmacophore based approaches Virtual
	Screening techniques: Drug likeness screening, Concept of
	pharmacophore mapping and pharmacophore-based Screening
4	Molecular docking: Rigid docking, flexible docking, manual docking; Docking 12 Hrs
	based screening. De novo drug design. Quantitative analysis of StructureActivity
	Relationship
	History and development of QSAR, SAR versus QSAR, Physicochemical
	parameters, Hansch analysis, Fee Wilson analysis and relationship between them.
5	QSAR Statistical methods - regression analysis, partial least square analysis 12 Hrs
	(PLS) and other multivariate statistical methods. 3D-QSAR approaches like
	COMFA and COMSIA
	Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug
	solubility, Drug absorption and distribution, site specific drug delivery and
	sustained drug action. Rationale of prodrug design and practical consideration
	of prodrug design

Upon completion of this course, the student should be able to:

CO1: Learn about the modern drug discovery process, target discovery and validation for skill development and employability.

CO2: Attain detailed knowledge about lead identification, combinatorial chemistry, high throughput screening, lead discovery techniques, protein structure and application of NMR & X- ray crystallography in protein structure prediction for skill development and employability.

CO3: Attain detailed knowledge about rational drug design, traditional vs rational drug design, high throughput screening and virtual screening techniques for skill development and employability.

CO4: Understand the molecular docking, QSAR, SAR versus QSAR, Hansch analysis and Fee Wilson analysis for skill development and employability at national and international level.

CO5: Understand the QSAR statistical methods, COMFA, COMSIA and Prodrug design for skill development and employability.

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PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	2	3	2	3	2	3	2	2
CO2	2	3	3	3	3	2	3	3	2	2	2	1
CO3	2	3	3	2	1	2	2	3	3	2	1	3
CO4	2	3	2	3	3	2	3	3	2	2	2	1
CO5	3	3	3	2	1	2	2	3	3	2	1	3

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship
			Development
CO1	3	3	2
CO2	3	3	2
CO3	2	2	2
CO4	3	3	3
CO5	3	2	1

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Sanjew Adamed REGISTRAR IFTM UNIVERSITY MORADABAD.

REFERENCES

- 1. Mouldy Sioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targets and Treatment Options. 2007 Humana Press Inc.
- Darryl León. Scott MarkelIn. Silico Technologies in Drug Target Identification and Validation. 2006 by Taylor and Francis Group, LLC.
- 3. Johanna K. Di Stefano. Disease Gene Identification. Methods and Protocols. Springer New York Dordrecht Heidelberg London.
- 4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
- 5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
- 6. Abby L. Parrill. M. Rami Reddy. Rational Drug Design. Novel Methodology and Practical Applications. ACS Symposium Series; American Chemical Society: Washington, DC, 1999.
- 7. J. Rick Turner. New drug development design, methodology and, analysis. John Wiley &Sons, Inc., New Jersey.



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CLINICAL RESEARCH AND PHARMACOVIGILANCE (MPL204T)

Scope

This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials. This subject also focuses on global scenario of Pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in Pre-clinical, Clinical phases of Drug development and post market surveillance.

Objectives

Upon completion of the course the student shall be able to:

- Explain the regulatory requirements for conducting clinical trial Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials Execute safetymonitoring,
 reporting and close-out activities Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment Perform the adverse drug reactionreporting systems and communication in Pharmacovigilance

THEORY 60 Hrs

1	Regulatory Perspectives of Clinical Trials:	12 Hrs
	Origin and Principles of International Conference on Harmonization - Good	
	Clinical Practice (ICH-GCP) guidelines Ethical Committee: InstitutionalReview	
	Board, Ethical Guidelines for Biomedical Research and Human Participant-	
	Schedule Y, ICMR	
	Informed Consent Process: Structure and content of an Informed Consent	
	Process Ethical principles governing informed consent process	
2	Clinical Trials: Types and Design Experimental Study- RCT and Non RCT,	12 Hrs
	Observation Study: Cohort, Case Control, Cross sectional	
	Clinical Trial Study Team	
	Roles and responsibilities of Clinical Trial Personnel: Investigator, Study	
	Coordinator, Sponsor, Contract Research Organization and its management	

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3	Clinical Trial Documentation- Guidelines to the preparation of documents,	12 Hrs
	Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study	
	Report Clinical Trial Monitoring- Safety Monitoring in CT	
	Adverse Drug Reactions: Definition and types. Detection and reporting methods.	
	Severity and seriousness assessment. Predictability and preventability	
	assessment, Management of adverse drug reactions; Terminologies of ADR.	
4	Basic aspects, terminologies and establishment of pharmacovigilance	12 Hrs
	History and progress of pharmacovigilance, Significance of safety monitoring,	
	Pharmacovigilance in India and international aspects, WHO international drug	
	monitoring programme, WHO and Regulatory terminologies of ADR, evaluation	
	of medication safety, Establishing pharmacovigilance centres in Hospitals,	
	Industry and National programmes related to pharmacovigilance.	
	Roles and responsibilities in Pharmacovigilance	
5	Methods, 5ADR reporting and tools used in Pharmacovigilance	12 Hrs
	International classification of diseases, International Non- proprietary names for	
	drugs, Passive and Active surveillance, Comparative observational studies,	
	Targeted clinical investigations and Vaccine safety surveillance. Spontaneous	
	reporting system and Reporting to regulatory authorities, Guidelines for ADRs	6
	reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for	
	evaluating medication safety data.	
6	Pharmacoepidemiology, pharmacoeconomics, safety pharmacology	12 Hrs
	L	

Upon completion of this course, the student should be able to:

CO1: Learn the regulatory perspectives of clinical trials, ICH-GCP, ethical committee, ICMR and informed consent process for skill development and employability at national and international level.

CO2: Attain detailed knowledge about clinical trials, experimental study, observation study, rolesand responsibilities of clinical trial personnel for skill development and employability.

CO3: Attain detailed knowledge about clinical trial documentation and adverse drug reactions for skill development and employability.

CO4: Understand the basic aspects, terminologies and establishment of pharmacovigilance for skill development and employability.

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Sanjew Dorawa REGISTRAR IFTM UNIVERSITY MORADABAD. CO5: Understand the methods, ADR reporting and tools used in pharmacovigilance. Also, learn pharmacoepidemiology, pharmacoeconomics, safety pharmacology for skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	2	2	2	2	2	2	2	3
CO2	3	2	3	3	2	2	2	2	2	2	2	3
CO3	3	2	3	3	2	2	2	2	2	2	2	3
CO4	3	2	3	3	2	3	3	3	3	3	2	2
CO5	3	2	3	3	2	3	3	3	3	3	2	2

CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship		
			Development		
CO1	3	3	1		
CO2	3	2	2		
CO3	2	2	2		
CO4	3	3	1		
CO5	3	3	2		

REFERENCES

- Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health;2001.
- 2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for GoodClinical Practice.E6; May 1996.

3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical

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Research, New Delhi.

- 4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March2005, John Wiley and Sons.
- 5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
- 6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
- 7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.

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PHARMACOLOGICAL PRACTICAL - II

(MPL 205P)

- 1. To record the DRC of agonist using suitable isolated tissues preparation.
- 2. To study the effects of antagonist/potentiating agents on DRC of agonist using suitable isolated tissue preparation.
- To determine to the strength of unknown sample by matching bioassay by using suitabletissue preparation.
- 4. To determine to the strength of unknown sample by interpolation bioassay by using suitabletissue preparation
- 5. To determine to the strength of unknown sample by bracketing bioassay by using suitabletissue preparation
- 6. To determine to the strength of unknown sample by multiple point bioassay by using suitable tissue preparation.
- 7. Estimation of PA2 values of various antagonists using suitable isolated tissue preparations.
- 8. To study the effects of various drugs on isolated heart preparations
- 9. Recording of rat BP, heart rate and ECG.
- 10. Recording of rat ECG
- 11. Drug absorption studies by averted rat ileum preparation.
- 12. Acute oral toxicity studies as per OECD guidelines.
- 13. Acute dermal toxicity studies as per OECD guidelines.
- 14. Repeated dose toxicity studies- Serum biochemical, haematological, urine analysis, functional observation tests and histological studies.
- 15. Drug mutagenicity study using mice bone-marrow chromosomal aberration test.
- 16. Protocol design for clinical trial.(3 Nos.)
- 17. Design of ADR monitoring protocol.
- 18. In-silico docking studies. (2 Nos.)
- 19. In-silico pharmacophore based screening.
- 20. In-silico QSAR studies.
- 21. ADR reporting

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Sanjelv Boraust REGISTRAR IFTM UNIVERSITY MORADABAD.

REFERENCES

- 1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
- 2. Handbook of Experimental Pharmacology-S.K.Kulkarni
- 3. Text book of in-vitro practical Pharmacology by Ian Kitchen
- 4. Bioassay Techniques for Drug Development by Atta-ur-Rahman, Iqbal choudhary and William Thomsen
- 5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
- Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism forIndustrial Scientists.

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Semester III

MRM301T -Research Methodology & Biostatistics

UNIT - I

General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques.

UNIT-II

Biostatistics: Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests(students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (Wilcoxon rank tests, analysis of variance, correlation, chi-square test), null hypothesis, P values, degree of freedom, interpretation of P values.

UNIT - III

Medical Research: History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth-telling,online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.

UNIT - IV

CPCSEA guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.

UNIT - V

Declaration of Helsinki: History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care.

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Upon completion of this course, the student should be able to:

CO1: Learn the general research methodology for skill development and employability.

CO2: Learn biostatistics, sample size, statistical tests of significance, parametric tests, non-parametric tests, null hypothesis, P values, degree of freedom and interpretation of P values for skill development and employability at local, regional and global platform.

CO3: Attain detailed knowledge about medical Research for skill development and employability.

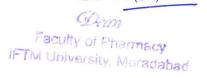
CO4: Understand the CPCSEA guidelines for laboratory animal facilities for skill development and employability at national and international level.

CO5: Understand the declaration of Helsinki, basic principles for all medical research and additional principles for medical research combined with medical care for skill development and employability.

PO-CO Mapping (Please write 3, 2, 1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	1	2	1	1	2	1	2	1
CO2	1	3	2	1	3	2	2	2	1	2	1	1
CO3	1	2	1	2	2	2	2	1	1	2	1	2
CO4	2	2	1	1	1	3	1	2	2	1	2	1
CO5	1	3	1	2	1	2	1	1	1	2	1	2



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CO-Curriculum Enrichment Mapping (Please write 3, 2, 1 wherever required) (Note: 3 for highly mapped, 2 for medium mapped and 1 for low mapped)

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	2
CO2	2	3	2
CO3	3	2	1
CO4	2	3	1
CO5	3	2	2

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