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 (Pharmaceutics)***
Course Level	:	***Post Graduate Degree***
Duration	:	***Four Semester (two academic year) Full Time***
Medium of instruction	:	***English***
Minimum Required Attendance	:	***80%***
Total Credit Points	:	***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.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Agrawal
REGISTRAR
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.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Bhardwaj
REGISTRAR
IFTM UNIVERSITY
MORADABAD

Table of Contents

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

रजिस्ट्री सं० डी० एल०-33004/99 REGD. NO. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

असाधारण
EXTRAORDINARY
भाग III—खण्ड 4
PART III—Section 4
प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 362] नई दिल्ली, बृहस्पतिवार, दिसम्बर 11, 2014/अग्रहायण 20, 1936
No. 362] NEW DELHI, THURSDAY, DECEMBER 11, 2014/AGRAHAYANA 20, 1936

PHARMACY COUNCIL OF INDIA

NOTIFICATION

New Delhi, the 10th December, 2014

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

No. 14-136/ 2014-PCI.—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–

Dean
Faculty of Pharmacy
IFTM University

Sanjeev Agrawal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

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 tomodifications 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 4years ofB.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 themonth of December/January to May/June in every calendar year.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

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/extra-curricular 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 coursesconsist of lecture (L) and Practical (P) courses consist of hours spent in thelaboratory. Credits (C) for a course is dependent on the number of hours ofinstruction 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 weekthroughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week through out 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 of journal club, research work presentations and discussions with the supervisor 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 the headof co-curricular activities, a student shall earn a maximum of 100 creditpoints. 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 are distributed semester-wise as shown in Table 14. Courses generallyprogress in sequence, building competencies and their positioning indicatescertain academic maturity on the part of the learners.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

Learners are expectedto 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 dub, Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respectivecourses.

9. Course of study

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

Table – 1: M.Pharm. Specialization with Code

S. No.	Specialization	Code
1.	Pharmaceutics	MPH

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 devotedto each theory and practical course in any semester shall not be lessthan thatshown in Table -

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

Table – 2: Course of study for M. Pharm. (Pharmaceutics)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPH101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPH102T	Drug Delivery System	4	4	4	100
MPH103T	Modern Pharmaceutics	4	4	4	100
MPH104T	Regulatory Affair	4	4	4	100
MPH105P	Pharmaceutics Practical I	12	6	12	150
MPH111P	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	4	4	4	100
MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	4	4	4	100
MPH203T	Computer Aided Drug Delivery System	4	4	4	100
MPH204T	Cosmetic and Cosmeceuticals	4	4	4	100
MPH205P	Pharmaceutics Practical II	12	6	12	150
MPH222P	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

Table – 3: Course of study for M. Pharm (Pharmaceutics) III Semester

Course Code	Course	Credit Hours	Credit Points
MRM 301T	Research Methodology and Biostatistics*	4	4
MPH302	Journal club	1	1
MPH303	Discussion / Presentation (Proposal Presentation)	2	2
MPH304	Research Work	28	14
Total		35	21

* Non-University Exam

Table – 4: Course of study for M. Pharm (Pharmaceutics) IV Semester

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

Table – 5: Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	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

MPH- Pharmaceutics

Dean
Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Agrawal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

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 beas 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

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

assessment for the course and the same shall be announced to the students at the beginning of respective semesters.

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 for internal 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 respective university except for the subject with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

Table – 7: Schemes for internal assessments and end semester (Pharmaceutics- MPH)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Durationon				
SEMESTER I								
MPH 101 T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPH 102 T	Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH 103 T	Modern Pharmaceutics	10	15	1 Hr	25	75	3 Hrs	100
MPH 104 T	Regulatory Affair	10	15	1 Hr	25	75	3 Hrs	100
MPH 105 P	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150
MPH111P	Seminar /Assignment	.	.	.	.	.	.	100
Total								650
SEMESTER II								
MPH 201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	10	15	1 Hr	25	75	3 Hrs	100
MPH 202T	Advanced Biopharmaceutics & Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100
MPH 203T	Computer Aided Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH	Cosmetic	10	15	1 Hr	25	75	3 Hrs	100

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

204T	and Cosmeceutic als							
MPH 205P	Pharmaceuti cs Practical I	20	30	6 Hrs	50	100	6 Hrs	150
MPH222 P	Seminar /Assignment	.	.	.	.	.	.	100
Total								650

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

Table–8: Schemes for internal assessments and end semester examinations (Semester III& IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Mark s
		Continuous Mode	Sessional Exams		Tot al	Mark s	Duration	
			Marks	Duration				
SEMESTER III								
MRM301T	Research Methodology Biostatics*	10	15	1 Hr	25	75	3 Hrs	100
MPH302	Journal club	.	.	.	25	.	.	25
MPH303	Discussion / Presentation (Proposal Presentation)	.	.	.	50	.	.	50
MPH304	Research work*	.	.	.	.	350	1 Hr	350
Total								525
SEMESTER IV								
MPH401	Journal club	.	.	.	25	.	.	25
MPH402	Discussion / Presentation (Proposal Presentation)	.	.	.	75	.	.	75
MPH403	Research work and Colloquium	.	.	.	.	400	1 Hr	400
Total								500

*Non University Examination

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

Internal assessment: Continuous mode

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 courseas per the schedule fixed by the college(s). The scheme of question paper for theory and practical sessional examinations is given in the table. Theaverage 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

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

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

14. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only oncein the sessional exam component of the internal assessment. The re-conduct of the sessional exam shall be completed before the commencement of next endsemester 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 notifiedfrom 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 be admitted 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 II semesters tillthe 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 ofthe courses of I to IV semesters within the stipulated time period as per thenorms.

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 lettergrade at the end of the semester for each course. The letter grades and their

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

corresponding grade points are given in Table - 12.

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

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	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 obtainedin 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, theSGPA shall then be computed as:

$$SGPA = \frac{C_1G_1 + C_2 G_2 + C_3G_3 + C_4 * \text{ZERO}}{C_1 + C_2 + C_3 + C_4}$$

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), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA

Dean
Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Agarwal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

shall only reflect the new grade and not the fail grades earned earlier. The CGPAis calculated as:

$$CGPA = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4}{C_1 + C_2 + C_3 + C_4}$$

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
First Class	= CGPA of 6.00 to 7.49
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). Theprojects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done		50Marks
Methodology adopted		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 and answer skills		100 Marks
	Total	250 Marks

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

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 shallnot be eligible for award of ranks. Moreover, the candidates should have completed the M. Pharm program in minimum prescribed number of years, (twoyears) for the award of Ranks.

23. Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible foraward 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 theactual 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 hastoget the approval from the university by paying a condonation fee.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

PHARMACEUTICS (MPH)

MODERNPHARMACEUTICALANALYTICAL TECHNIQUES

(MPH101T)

Scope

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,

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

THEORY 60 HOURS

1.	a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV- Visible spectroscopy. b. 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. c. Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescencespectrophotometer. d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.	11 Hrs
2	NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMRsignals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy.	11 Hrs
3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy,	11 Hrs

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

	Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy	
4	**Chromatography:** Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: a) Paper chromatography b) Thin Layer chromatography c) Ion exchange chromatography d) Column chromatography e) Gas chromatography f) High Performance Liquid chromatography g) Affinity chromatography	11 Hrs
5.	a. Electrophoresis: Principle, Instrumentation, working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing b. X ray Crystallography: Production of X rays, Different X ray diffraction methods, Bragg's law, Rotating crystal technique, Xray powder technique, Types of crystals and applications of X-ray diffraction.	11 Hrs
6	Immunological assays: RIA (Radio immuno assay), ELISA, Bioluminescence assays.	5 Hrs

Course Outcomes:

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

CO1: Understand theory, instrumentation and applications of various spectroscopictechniques for skill development, entrepreneurship and employability.

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.

Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

CO4: Understand principle and instrumentation of various chromatographic methods for skill development, entrepreneurship and employability.

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

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	1	2	1	2	1	3	1	1	1	1	1	1
CO2	1	3	2	1	3	2	1	1	1	1	1	1
CO3	2	2	1	1	2	3	1	1	1	1	1	2
CO4	2	2	1	1	1	3	1	2	1	1	1	1
CO5	1	3	1	1	1	2	1	1	1	2	1	1

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	Entrepreneurshi pDevelopment
CO1	3	2	1
CO2	3	2	2
CO3	2	1	1
CO4	2	3	2
CO5	3	2	2

REFERENCES

1. 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.

4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS

Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Agrawal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

Publishers, New Delhi, 1997.

5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.

6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rdEdition, CBS Publishers, New Delhi, 1997.

7. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume11, Marcel Dekker Series.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Bansal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

DRUG DELIVERY SYSTEMS
(MPH 102T)

SCOPE

This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

OBJECTIVES

Upon completion of the course, student shall be able to understand

- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of delivering system
- The formulation and evaluation of Novel drug delivery systems.

THEORY 60Hrs

1.	Sustained Release (SR) and Controlled Release (CR) formulations: Introduction & basic concepts, advantages/disadvantages, factors influencing, Physicochemical & biological approaches for SR/CR formulation, Mechanism of Drug Delivery from SR/CR formulation. Polymers: introduction, definition, classification, properties and application Dosage Forms for Personalized Medicine: Introduction, Definition, Pharmacogenetics, Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3D printing of pharmaceuticals, Telepharmacy.	11Hrs
2.	Rate Controlled Drug Delivery Systems: Principles & Fundamentals, Types, Activation; Modulated Drug Delivery Systems; Mechanically activated, pH activated, Enzyme activated, and Osmotic activated Drug Delivery Systems Feedback regulated Drug Delivery Systems; Principles & Fundamentals.	10Hrs
3.	Gastro-Retentive Drug Delivery Systems: Principle, concepts, advantages and disadvantages, Modulation of GI transit time, approaches to extend GI transit. Buccal Drug Delivery Systems: Principle of mucoadhesion, advantages and disadvantages, Mechanism of drug permeation, Methods of Formulation and its evaluations.	10Hrs
4.	Occular Drug Delivery Systems: Barriers of drug permeation, Methods to overcome barriers.	06Hrs

Dean
Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Bansal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

5.	Transdermal Drug Delivery Systems: Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation and evaluation.	10Hrs
6.	Protein and Peptide Delivery: Barriers for protein delivery, Formulation and Evaluation of delivery systems of proteins and other macromolecules.	08Hrs
7.	Vaccine delivery systems: Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.	06Hrs

Course Outcomes:

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

CO1: Understand the principles and technology used in the design of sustained /controlled release drug delivery system and application of polymers in controlled drug delivery systems. Learn the concept of telepharmacy, personalized medicine and 3D printing in pharmacy for skill development and employability.

CO2: Understand the principles and fundamentals of mechanically activated, pH activated, osmotic activated and enzyme activated drug delivery systems for skill development and employability.

CO3: Learn the principle, concepts and various approaches of gastro-retentive drug delivery systems and buccal drug delivery system for skill development and employability at national and international level.

CO4: Understand the barriers of occular drug permeation and methods to overcome them and learn the formulation and evaluation of transdermal drug delivery system for skill development and employability.

CO5: Understand the formulation of protein and peptide drug delivery system and various aspects of vaccine drug delivery system for skill development and employability at local, regional and global platform.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

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	3	2	3	2	3	2	2	1	1	1	1
CO2	2	2	2	2	2	3	2	3	1	1	1	1
CO3	3	2	3	3	3	3	2	2	1	1	1	1
CO4	2	3	2	3	2	2	2	3	1	1	2	1
CO5	2	3	2	2	3	3	2	2	1	1	2	1

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

REFERENCES

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.

2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker,Inc., New York, 1992.

3. Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by WileyInterscience Publication, John Wiley and Sons, Inc, New York! Chichester/Weinheim

4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).

5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002

JOURNALS

1. Indian Journal of Pharmaceutical Sciences (IPA)

Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

2. Indian drugs (IDMA)
3. Journal of controlled release (Elsevier Sciences) desirable
4. Drug Development and Industrial Pharmacy (Marcel & Decker) desirable

Dean
Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Bansal

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

MODERN PHARMACEUTICS

(MPH 103T)

SCOPE

Course designed to impart advanced knowledge and skills required to learn various aspects and concepts at pharmaceutical industries

OBJECTIVES

Upon completion of the course, student shall be able to understand

- The elements of pre-formulation studies.
- The Active Pharmaceutical Ingredients and Generic drug Product development
- Industrial Management and GMP Considerations.
- Optimization Techniques & Pilot Plant Scale Up Techniques
- Stability Testing, sterilization process & packaging of dosage forms.

THEORY 60 HRS

1.	a. Preformation Concepts – Drug Excipients interactions - different methods, kinetics of stability, Stability testing. Theories of dispersion and pharmaceutical Dispersion (Emulsion and Suspension, SMEDDS) preparation and stability large and small volume parental – physiological and formulation consideration, Manufacturing and evaluation. b. Optimization techniques in Pharmaceutical Formulation: Concept and parameters of optimization, Optimization techniques in pharmaceutical formulation and processing. Statistical design, Response surface method, Contour designs, Factorial designs and application in formulation	10Hrs 10Hrs
2.	Validation: Introduction to Pharmaceutical Validation, Scope & merits of Validation, Validation and calibration of Master plan, ICH & WHO guidelines for calibration and validation of equipments, Validation of specific dosage form, Types of validation. Government regulation, Manufacturing Process Model, URS, DQ, IQ, OQ & P.Q. of facilities.	10Hrs
3.	cGMP & Industrial Management: Objectives and policies of current good manufacturing practices, layout of buildings, services, equipments and their maintenance Production management: Production organization, materials management, handling and transportation, inventory management and control, production and planning control, Sales forecasting, budget and cost control, industrial and personal relationship. Concept of Total Quality Management.	10Hrs

Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Agrawal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

4.	Compression and compaction: Physics of tablet compression, compression, consolidation, effect of friction, distribution of forces, compaction profiles, Solubility.	10Hrs
5.	Study of consolidation parameters; Diffusion parameters, Dissolution parameters and Pharmacokinetic parameters, Heckel plots, Similarity factors – f2 and f1, Higuchi and Peppas plot, Linearity Concept of significance, Standard deviation, Chi square test, students T-test, ANOVA test.	10Hrs

Course Outcomes:

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

CO1: Understand the preformulation concept, stability testing, dispersion systems and factorial design optimization for skill development and employability.

CO2: Know about validation concept, ICH and WHO guidelines for skill development and employability at local, regional and global platform.

CO3: Observe about current good manufacturing practics(cGMP), inventory management and sale forecast during industrial production for skill development and employability.

CO4: Analyze the principles of solubility, tablet compression and compaction profiles of tablet for skill development and employability.

CO5: Develop the consolidation parameter sand release kinetics principles and the interpretation during evaluation studies for skill development and employability at national and international level.

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	3	3	2	2	2	2	1	1	1	1	1
CO2	2	2	2	3	3	3	1	2	1	1	1	1
CO3	3	3	2	2	2	2	1	2	2	1	1	1
CO4	3	1	3	3	2	1	1	1	1	1	1	1
CO5	2	3	2	3	3	3	1	1	1	1	1	1

Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

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	3	1
CO2	2	3	2
CO3	3	1	1
CO4	2	3	1
CO5	3	2	2

REFERENCES

1. Theory and Practice of Industrial Pharmacy By Lachmann and Libermann
2. Pharmaceutical dosage forms: Tablets Vol. 1-3 by Leon Lachmann.
3. Pharmaceutical Dosage forms: Disperse systems, Vol, 1-2; By Leon Lachmann.
4. Pharmaceutical Dosage forms: Parenteral medications Vol. 1-2; By Leon Lachmann.
5. Modern Pharmaceutics; By Gillbert and S. Banker.
6. Remington's Pharmaceutical Sciences.
7. Advances in Pharmaceutical Sciences Vol. 1-5; By H.S. Bean & A.H. Beckett.
8. Physical Pharmacy; By Alfred martin
9. Bentley's Textbook of Pharmaceutics – by Rawlins.
10. Good manufacturing practices for Pharmaceuticals: A plan for total quality control, Second edition; By Sidney H. Willig.
11. Quality Assurance Guide; By Organization of Pharmaceutical producers of India.
12. Drug formulation manual; By D.P.S. Kohli and D.H.Shah. Eastern publishers, New Delhi.
13. How to practice GMPs; By P.P.Sharma. Vandhana Publications, Agra.
14. Pharmaceutical Process Validation; By Fra. R. Berry and Robert A. Nash.
15. Pharmaceutical Preformulations; By J.J. Wells.
16. Applied production and operations management; By Evans, Anderson, Sweeney and Williams.
17. Encyclopaedia of Pharmaceutical technology, Vol I – III.

Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

REGULATORY AFFAIRS

(MPH 104T)

SCOPE

Course designed to impart advanced knowledge and skills required to learn the concept of generic drug and their development, various regulatory filings in different countries, different phases of clinical trials and submitting regulatory documents: filing process of IND, NDA and ANDA

- To know the approval process of
- To know the chemistry, manufacturing controls and their regulatory importance
- To learn the documentation requirements for
- To learn the importance and

OBJECTIVES

Upon completion of the course, it is expected that the students will be able to understand

- The Concepts of innovator and generic drugs, drug development process
- The Regulatory guidance's and guidelines for filing and approval process
- Preparation of Dossiers and their submission to regulatory agencies in different countries
- Post approval regulatory requirements for actives and drug products
- Submission of global documents in CTD/ eCTD formats
- Clinical trials requirements for approvals for conducting clinical trials
- Pharmacovigilance and process of monitoring in clinical trials.

THEORY 60 Hrs

1.	a. Documentation in Pharmaceutical industry: Master formula record, DMF (Drug Master File), distribution records, Generic drugs product development Introduction, Hatch-Waxman act and amendments, CFR (CODE OF FEDERAL REGULATION), drug product performance, in-vitro, ANDA Regulatory approval process, NDA approval process, BE and drug product assessment, in –vivo, scale up process approval changes, post marketing surveillance, outsourcing BA and BE to CRO. b. Regulatory requirement for product approval: API, biologics, novel, therapies obtaining NDA, ANDA for generic drugs ways and means of US registration for foreign drugs	12Hrs 12Hrs

Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Agrawal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

2.	CMC, post approval regulatory affairs. Regulation for combination products and medical devices.CTD and ECTD format, industry and FDA liaison. ICH - Guidelines of ICH-Q, S E, M. Regulatory requirements of EU, MHRA, TGA and ROW countries.	12Hrs
3.	Non clinical drug development: Global submission of IND, NDA, ANDA. Investigation of medicinal products dossier, dossier (IMPD) and investigator brochure (IB).	12Hrs
4.	Clinical trials: Developing clinical trial protocols. Institutional review board/ independent ethics committee Formulation and working procedures informed Consent process and procedures. HIPAA- new, requirement to clinical study process, Pharmacovigilance safety monitoring in clinical trials.	12Hrs

Course Outcomes:

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

CO1: Course impart advanced knowledge and learn concepts of generic drugs and their development with regulatory filings for skill development and employability at local, regional and global platform.

CO2: Understand about regulatory requirements for product approval for skill development and employability.

CO3: Learn about CMC and post approval regulatory affairs for skill development and employability at national and international level.

CO4: Understand about process of nonclinical drug development for skill development and employability.

CO5: Understand requirements for approvals to conducting clinical trials 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	1	2	1	2	1	2	2	3	2	3	2	2
CO2	2	1	2	1	1	3	2	2	3	2	2	2
CO3	3	2	1	1	2	2	3	2	2	2	1	2
CO4	2	1	1	1	1	1	2	2	2	2	2	3
CO5	1	2	1	2	1	2	2	3	3	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	2	2	1
CO2	3	2	2
CO3	3	2	1
CO4	2	3	1
CO5	3	2	2

REFERENCES

1. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and IsaderKaufer, Marcel Dekker series, Vol.143
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185, Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations by Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons.Inc.
5. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics/edited By Douglas J. Pisano, David Mantus.
6. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A.Rozovsky and Rodney K. Adams
7. www.ich.org/
8. www.fda.gov/
9. europa.eu/index_en.htm
10. https://www.tga.gov.au/tga-basics

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

PHARMACEUTICS PRACTICALS - I

(MPH 105P)

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component 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 photometry
7. To perform In-vitro dissolution profile of CR/ SR marketed formulation
8. Formulation and evaluation of sustained release matrix tablets
9. Formulation and evaluation osmotically controlled DDS
10. Preparation and evaluation of Floating DDS- hydro dynamically balanced DDS
11. Formulation and evaluation of Mucoadhesive tablets.
12. Formulation and evaluation of transdermal patches.
13. To carry out preformulation studies of tablets.
14. To study the effect of compressional force on tablets disintegration time.
15. To study Micromeritic properties of powders and granulation.
16. To study the effect of particle size on dissolution of a tablet.
17. To study the effect of binders on dissolution of a tablet.
18. To plot Heckal plot, Higuchi and peppas plot and determine similarity factors.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS) (NTDS) (MPH201T)

Scope

This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

Objectives

Upon completion of the course student shall be able to understand

- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of NTDS
- The formulation and evaluation of novel drug delivery systems.

THEORY 60 HOURS

1.	Targeted Drug Delivery Systems: Concepts, Events and biological process involved in drug targeting. Tumor targeting and Brain specific delivery.	12Hrs
2	Targeting Methods: introduction preparation and evaluation. Nano Particles & Liposomes: Types, preparation and evaluation.	12Hrs
3	Micro Capsules / Micro Spheres: Types, preparation and evaluation, Monoclonal Antibodies; preparation and application, preparation and application of Niosomes, Aquasomes, Phytosomes, Electrosomes.	12Hrs
4	Pulmonary Drug Delivery Systems: Aerosols, propellents, ContainersTypes, preparation and evaluation, Intra Nasal Route Delivery systems; Types, preparation and evaluation.	12Hrs
5	Nucleic acid based therapeutic delivery system: Gene therapy, introduction (ex-vivo & in-vivo gene therapy). Potential target diseases for gene therapy (inherited disorder and cancer). Gene expression systems (viral and nonviral gene transfer). Liposomal gene delivery systems. Biodistribution and Pharmacokinetics. knowledge of therapeutic antisense molecules and aptamers as drugs of future.	12Hrs

Course Outcomes:

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

CO1: Understand concept of targeted drug delivery: tumor targeting and brain specific

Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

delivery for skill development and employability.

CO2: Understand about preparations and evaluation of nanoparticles and liposomes for skill development and employability.

CO3: Understand about preparation and evaluation of microcapsules, microspheres, niosomes, aquasomes, phtosomes and electrosomes for skill development and employability at national and international level.

CO4: Understand about preparation and evaluation of pulmonary and nasal drug delivery system. Also, to know about types of Aerosols, propellants and containers used for skill development and employability.

CO5: Understand about nucleic acid based therapeutic delivery system, gene therapy for inherited disorder and cancer disease and liposomal gene delivery system 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	3	3	2	2	2	2	1	1	1	1	1
CO2	2	2	2	3	3	3	1	2	1	1	1	1
CO3	3	3	2	2	2	2	1	2	2	1	1	1
CO4	2	2	3	3	3	1	1	1	1	1	1	1
CO5	2	3	2	3	3	3	1	1	1	1	1	1

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	3	2	1
CO4	2	3	2
CO5	3	2	2

Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

REFERENCES

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.

2. S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

3. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).

ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS

(MPH202T)

Scope

This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply biopharmaceutics theories in practical problem solving. Basic theoretical discussions of the principles of biopharmaceutics and pharmacokinetics are provided to help the students to clarify the concepts.

Objectives

Upon completion of this course, it is expected that students will be able understand,

- The basic concepts in biopharmaceutics and pharmacokinetics.
- The use raw data and derive the pharmacokinetic models and parameters the best describe the process of drug absorption, distribution, metabolism and elimination.
- The critical evaluation of biopharmaceutic studies involving drug product equivalency.
- The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.
- The potential clinical pharmacokinetic problems and application of basics of pharmacokinetic.

THEORY 60 HOURS

1.	Drug Absorption from the Gastrointestinal Tract: Gastrointestinal tract, Mechanism of drug absorption, Factors affecting drug absorption, pH–partition theory of drug absorption. Formulation and physicochemical factors: Dissolution rate, Dissolution process, Noyes–Whitney equation and drug dissolution, Factors affecting the dissolution rate. Gastrointestinal absorption: role of the dosage form: Solution (elixir, syrup and solution) as a dosage form, Suspension as a dosage form, Capsule as a dosage form, Tablet as a dosage form, Dissolution methods, Formulation and processing factors, Correlation of in vivo data with in vitro dissolution data. Transport model: Permeability-Solubility-Charge State and the pH Partition Hypothesis, Properties of the Gastrointestinal Tract (GIT), pH Microclimate Intracellular pH Environment, Tight-Junction Complex.	12Hrs
2.	Biopharmaceutic considerations in drug product design and In Vitro Drug Product Performance: Introduction, biopharmaceutic factors affecting drug	12Hrs

	bioavailability, rate-limiting steps in drug absorption, physicochemical nature of the drug formulation factors affecting drug product performance, in vitro: dissolution and drug release testing, compendial methods of dissolution, alternative methods of dissolution testing, meeting dissolution requirements, problems of variable control in dissolution testing performance of drug products. In vitro–in vivo correlation, dissolution profile comparisons, drug product stability, considerations in the design of a drug product.	
3.	Pharmacokinetics: Basic considerations, pharmacokinetic models, compartment modeling: one compartment model- IV bolus, IV infusion, extra-vascular. Multi compartment model: two compartment - model in brief, non-linear pharmacokinetics: cause of non-linearity, Michaelis – Menten equation, estimation of kmax and vmax. Drug interactions: introduction, the effect of protein binding interactions, the effect of tissue-binding interactions, cytochrome p450-based drug interactions, drug interactions linked to transporters.	12Hrs
4.	Drug Product Performance, in vivo: Bioavailability and Bioequivalence: drug product performance, purpose of bioavailability studies, relative and absolute availability. Methods for assessing bioavailability, bioequivalence studies, design and evaluation of bioequivalence studies, study designs, crossover study designs, evaluation of the data, bioequivalence example, study submission and drug review process. Biopharmaceutics classification system, methods. Permeability: In-vitro, in-situ and In-vivo methods. generic biologics (biosimilar drug products), clinical significance of bioequivalence studies, special concerns in bioavailability and bioequivalence studies, generic substitution.	12Hrs
5.	Application of Pharmacokinetics: Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. Introduction to Pharmacokinetics and pharmacodynamic, drug interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs. Introduction, Proteins and peptides, Monoclonal antibodies, Oligonucleotides, Vaccines (immunotherapy), Gene therapies.	12Hrs

Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

Course Outcomes:

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

CO1: Understand the concept of drug absorption from GIT, factors affecting, pH-partition theory, Dissolution method and correlation of data and permeability-solubility-charge state transport model for skill development and employability.

CO2: Understand the concept of biopharmaceutical factor affecting bioavailability, physicochemical nature of drug and formulation factors affecting drug product performance and dissolution testing and drug product stability for skill development and employability at local, regional and global platform.

CO3: Understand about the concept of pharmacokinetics models, compartment modeling and drug interactions for skill development and employability.

CO4: Understand the concept of bioavailability, permeability methods and bioequivalence studies for skill development and employability.

CO5: Understand the concept of modified release drug product, targeted drug delivery system and biotechnological products pharmacokinetic and pharmacodynamics 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	3	2	3	2	3	2	2	1	1	1	1
CO2	2	2	2	2	2	3	3	3	1	1	1	1
CO3	3	2	3	3	2	3	2	2	1	2	1	1
CO4	2	3	3	3	2	2	3	3	2	1	2	1
CO5	2	2	2	2	3	3	2	2	1	1	2	1

Dean
Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Agrawal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

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

REFERENCES

1. Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi, 4th edition,Philadelphia, Lea and Febiger, 1991

2. Biopharmaceutics and Pharmacokinetics, A. Treatise, D. M. Brahmankar and Sunil B. Jaiswal., VallabPrakashan, Pitampura, Delhi

3. Applied Biopharmaceutics and Pharmacokinetics by Shargel. Land YuABC, 2ndedition, Connecticut Appleton Century Crofts, 1985

4. Textbook of Biopharmaceutics and Pharmacokinetics, Dr. Shobha Rani R. Hiremath, Prism Book

5. Pharmacokinetics by Milo Gibaldi and D. Perrier, 2nd edition, Marcel Dekker Inc.,New York, 1982

6. Current Concepts in Pharmaceutical Sciences: Biopharmaceutics, Swarbrick. J, Leaand Febiger, Philadelphia, 1970

7. Clinical Pharmacokinetics, Concepts and Applications 3rd edition by Malcolm Rowland and Thom~ N. Tozer, Lea and Febiger, Philadelphia, 1995

8. Dissolution, Bioavailability and Bioequivalence, Abdou. H.M, Mack Publishing Company, Pennsylvania 1989

9. Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4th edition, revised and expande by Robert. E. Notari, Marcel Dekker Inc, New York and Basel,1987.

10. Biopharmaceutics and Relevant Pharmacokinetics by John. G Wagner and M. Pemarowski, 1st edition, Drug Intelligence Publications, Hamilton, Illinois, 1971.

11. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G.Boylan, Marcel Dekker Inc, New York, 1996.

12. Basic Pharmacokinetics,1st edition, Sunil S Jambhekarand Philip J Breen, pharmaceutical press, RPS Publishing,2009.

13. Absorption and Drug Development- Solubility, Permeability, and Charge State, Alex Avdeef, John Wiley & Sons, Inc,2003.

Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Agrawal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

COMPUTER AIDED DRUG DEVELOPMENT

(MPH203T)

Scope

This course is designed to impart knowledge and skills necessary for computer Applications in pharmaceutical research and development who want to understand the application of computers across the entire drug research and development process. Basic theoretical discussions of the principles of more integrated and coherent use of computerized information (informatics) in the drug development process are provided to help the students to clarify the concepts.

Objectives

Upon completion of this course, it is expected that students will be able to understand,

- History of Computers in Pharmaceutical Research and Development
- Computational Modeling of Drug Disposition
- Computers in Preclinical Development
- Optimization Techniques in Pharmaceutical Formulation
- Computers in Market Analysis
- Computers in Clinical Development
- Artificial Intelligence (AI) and Robotics
- Computational fluid dynamics (CFD)

THEORY 60 HOURS

1.	a. Computers in Pharmaceutical Research and Development: A General Overview: History of Computers in Pharmaceutical Research and Development. Statistical modeling in pharmaceutical research and development: Descriptive versus Mechanistic Modeling, Statistical Parameters, Estimation, Confidence Regions, Nonlinearity at the Optimum, Sensitivity Analysis, Optimal Design, Population Modeling b. Quality-by-Design in Pharmaceutical Development: Introduction, ICH Q8 guideline, Regulatory and industry views on QbD, scientifically based QbD - examples of application.	12Hrs
2.	Computational Modeling of Drug Disposition: Introduction, Modeling Techniques: Drug Absorption, Solubility, Intestinal Permeation, Drug Distribution, Drug Excretion, Active Transport; P-gp, BCRP, Nucleoside	12 Hrs

	Transporters, hPEPT1, ASBT, OCT, OATP, BBB-Choline Transporter.	
3.	Computer-aided formulation development: Concept of optimization, Optimization parameters, Factorial design, Optimization technology & Screening design. Computers in Pharmaceutical Formulation: Development of pharmaceutical emulsions, microemulsion drug carriers Legal Protection of Innovative Uses of Computers in R&D, The Ethics of Computing in Pharmaceutical Research, Computers in Market analysis.	12 Hrs
4.	a. Computer-aided biopharmaceutical characterization: Gastrointestinal absorption simulation. Introduction, Theoretical background, Model construction, Parameter sensitivity analysis, Virtual trial, Fed vs. fasted state, In vitro dissolution and in vitro-in vivo correlation, Biowaiver considerations b. Computer Simulations in Pharmacokinetics and Pharmacodynamics: Introduction, Computer Simulation: Whole Organism, Isolated Tissues, Organs, Cell, Proteins and Genes. c. Computers in Clinical Development: Clinical Data Collection and Management, Regulation of Computer Systems.	12 Hrs
5.	Artificial Intelligence (AI), Robotics and Computational fluid dynamics: General overview, Pharmaceutical Automation, Pharmaceutical applications, Advantages and Disadvantages. Current Challenges and Future Directions.	12 Hrs

Course Outcomes:

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

CO1: Understand the concept of computer in pharmaceutical research and development for skill development, entrepreneurship and employability.

CO2: Understand the concept of computational modeling of drug disposition for skill development, entrepreneurship and employability.

CO3: Understand the concept of Computer aided formulation development for skill development, entrepreneurship and employability.

CO4: Understand the concept of Artificial Intelligence (AI), Robotics and computational fluid dynamics for skill development, entrepreneurship and employability at national and international level.

CO5: Understand the concept of Artificial Intelligence (AI), Robotics and computationalfluid dynamics 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	2	2	1	2	1	2	1	1	1	1	2	1
CO2	1	3	2	1	3	2	2	2	1	2	1	1
CO3	2	2	1	2	2	3	2	1	1	1	1	2
CO4	2	2	1	1	1	3	1	2	1	1	2	1
CO5	2	3	1	2	1	2	1	1	1	2	1	1

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	3	1
CO2	2	3	2
CO3	3	2	2
CO4	2	3	1
CO5	3	2	1

REFERENCES

1. Computer Applications in Pharmaceutical Research and Development, Sean Ekins, 2006, John Wiley & Sons.

2. Computer-Aided Applications in Pharmaceutical Technology, 1st Edition, Jelena Djuris, Woodhead Publishing

3. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G.Boylan, Marcel Dekker Inc, New York, 1996.

Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

COSMETICS AND COSMECEUTICALS

(MPH204T)

Scope

This course is designed to impart knowledge and skills necessary for the fundamental need for cosmetic and cosmeceutical products.

Objectives

Upon completion of the course, the students shall be able to understand

Key ingredients used in cosmetics and cosmeceuticals.

- Key building blocks for various formulations.
- Current technologies in the market
- Various key ingredients and basic science to develop cosmetics and cosmeceuticals
- Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

THEORY 60 HOURS

1.	Cosmetics – Regulatory: Definition of cosmetic products as per Indian regulation. Indian regulatory requirements for labeling of cosmetics Regulatory provisions relating to import of cosmetics., Misbranded and spurious cosmetics. Regulatory provisions relating to manufacture ofcosmetics – Conditions for obtaining license, prohibition of manufacture and sale of certain cosmetics, loan license, offences and penalties.	12Hrs
2	Cosmetics - Biological aspects: Structure of skin relating to problems like dry skin, acne, pigmentation, prickly heat, wrinkles and body odor. Structure of hair and hair growth cycle. Common problems associated with oral cavity. Cleansing and care needs for face, eye lids, lips, hands, feet, nail, scalp, neck, body and under-arm.	12Hrs
3	Formulation Building blocks: Building blocks for different product formulations of cosmetics/cosmeceuticals. Surfactants –Classification and application. Emollients, rheological additives: classification and application. Antimicrobial used as preservatives, their merits and demerits. Factors affecting microbial preservative efficacy. Building blocks for formulation of a moisturizing cream, vanishing cream, cold cream, shampoo and toothpaste. Soaps and syndetbars.	12Hrs

Dean Council
Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Agrawal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

	Perfumes; Classification of perfumes. Perfume ingredients listed as allergens in EU regulation. Controversial ingredients: Parabens, formaldehyde liberators, dioxane.	
4	Design of cosmeceutical products: Sun protection, sunscreens classification and regulatory aspects. Addressing dry skin, acne, sun-protection, pigmentation, prickly heat, wrinkles, body odor., dandruff, dental cavities, bleeding gums, mouth odor and sensitive teeth through cosmeceutical formulations.	12 Hrs
5.	Herbal Cosmetics: Herbal ingredients used in Hair care, skin care and oral care. Review of guidelines for herbal cosmetics by private bodies like cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics.	12 Hrs

Course Outcomes:

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

CO1: Understand the concept of Cosmetics regulatory provisions for skill development and employability.

CO2: Understand the concept of Biological barriers in Cosmetics such as skin, hair for skill development and employability.

CO3: Understand the concept of formulation building blocks for cosmetic formulations, Classification of Perfumes for skill development and employability at local, regional and global platform.

CO4: Understand the concept of design of cosmetic products such as sun protection, sunscreens for skill development and employability.

CO5: Understand the concept of Herbal Cosmetics and review of guidelines and challenges in formulation for skill development and employability.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

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	3	2	2	2	2	2	1	2	1	2	1
CO2	2	2	2	3	2	3	1	2	1	2	1	2
CO3	2	3	2	2	2	2	2	2	2	1	2	1
CO4	3	2	3	2	2	2	1	1	1	2	1	2
CO5	2	3	2	2	3	3	1	1	2	1	2	1

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	Entrepreneurshi pDevelopment
CO1	2	2	1
CO2	2	3	2
CO3	3	2	1
CO4	3	2	1
CO5	2	2	1

REFERENCES

1. Harry's Cosmeticology. 8th edition.
2. Poucher'sperfumecosmeticsandSoaps,10th edition.
3. Cosmetics - Formulation, Manufacture and quality control, PP.Sharma,4th edition
4. Handbook of cosmetic science and Technology A.O.Barel, M.Paye and H.I. Maibach. 3 rd edition
5. Cosmetic and Toiletries recent suppliers catalogue.
6. CTFA directory.

Dean
Faculty of Pharmacy
IFTM University, Moradabad

Sanjeev Agrawal
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

PHARMACEUTICS PRACTICALS - II
(MPH 205P)

1. To study the effect of temperature change, non-solvent addition, incompatible polymer addition in microcapsules preparation.
2. Preparation and evaluation of Alginate beads.
3. Formulation and evaluation of gelatin /albumin microspheres.
4. Formulation and evaluation of liposomes/niosomes.
5. Formulation and evaluation of spherules.
6. Improvement of dissolution characteristics of slightly soluble drug by Solid dispersion technique.
7. Comparison of dissolution of two different marketed products /brands.
8. Protein binding studies of a highly protein bound drug & poorly protein bound drug.
9. Bioavailability studies of Paracetamol in animals.
10. Pharmacokinetic and IVIVC data analysis by Winnoline® software.
11. In vitro cell studies for permeability and metabolism.
12. DoE Using Design Expert® Software.
13. Formulation data analysis Using Design Expert® Software.
14. Quality-by-Design in Pharmaceutical Development.
15. Computer Simulations in Pharmacokinetics and Pharmacodynamics.
16. Computational Modeling of Drug Disposition.
17. To develop Clinical Data Collection manual.
18. To carry out Sensitivity Analysis, and Population Modeling.
19. Development and evaluation of Creams.
20. Development and evaluation of Shampoo and Toothpaste base.
21. To incorporate herbal and chemical actives to develop products.
22. To address Dry skin, acne, blemish, Wrinkles, bleeding gums and dandruff

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

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 (wilcoxan 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.

Course Outcomes:

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

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

Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.

CO2: Learn the 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.

CO3: Attain detailed knowledge about medical Research for skill development and employability at local, regional and global platform.

CO4: Understand the CPCSEA guidelines for laboratory animal facility 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

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

Dean
Faculty of Pharmacy
IFTM University, Moradabad

REGISTRAR
IFTM UNIVERSITY
MORADABAD.