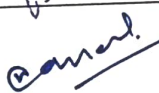
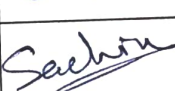
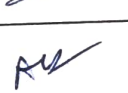
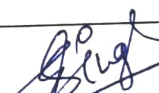
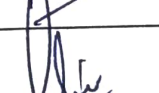


Board of Studies

Name of Faculty: Faculty of Pharmaceutical Sciences, Future University.

Attendance Sheet

S. No.	Name	Designation	Position	Signature
1	Prof. Dr. Hemendra Gautam	Professor	Dean	
2	Prof. Dr. Rahul Shukla	Professor	Chairperson	
3	Prof. (Dr.) Navneet Verma	Pro-Vice Chancellor IFTM university	Academic Expert (External Member)	
4	Mr. Sachin Sharma	Senior Research Manager	Industry Expert (External Member)	
5	Dr. Amar Kumar Saxena	Dean Academics	Member	
6	Mr. Gangeshwar Pratap Singh	Associate Professor	Member	
7	Dr. Ashish Kumar	Associate Professor	Member	
8	Dr. Jatin Jaiswal	Professor	Member Secretary	


 Chairperson of BOS


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Minutes of the Board of Studies (BOS) Meeting

Faculty of Pharmaceutical Sciences

Future University, Bareilly

Date: 04/10/2025

Venue: Future Institute of Pharmacy

Time: 9.30 am

1. The meeting commenced with a warm welcome by Dr. Rahul Shukla, Chairperson of the BOS.
2. A brief overview of the agenda was presented, highlighting the key areas of discussion: Approval of Course Structure, Syllabus, Scheme, and Appointment of External Examiners.
3. The proposed course structure for Session 2025-27 M. Pharmacy (Pharmaceutics, Pharmaceutical Chemistry & Pharmacognosy), D. Pharmacy & Ph.D in Pharmaceutical Sciences was presented.
4. Members reviewed the proposed structure, ensuring alignment with the curriculum standards and regulatory requirements.
5. After discussion, the course structure was **approved unanimously**.
6. **Mr. Gangeshwar Pratap Singh** circulates the final course structure to all faculty members.
7. The syllabus for the following courses was presented for approval:
 - o M. Pharmacy (Pharmaceutics, Pharmaceutical Chemistry, Pharmacognosy).
 - o D. Pharmacy.
 - o Ph.D in Pharmaceutical Sciences.
8. Each syllabus was discussed in detail, with feedback provided by the faculty members.
9. Minor revisions were suggested in AI for All and AI for Pharmacy of the syllabus.
10. After revisions, the syllabus was **approved**.
11. **Dr. Jatin Jaiswal** implements the revisions and finalizes the syllabus.
12. The proposed scheme of examination, including distribution of marks, examination pattern, and evaluation methods, was presented for the following courses:
 - o M. Pharmacy (Pharmaceutics, Pharmaceutical Chemistry, Pharmacognosy).
 - o D. Pharmacy.
 - o Ph.D in Pharmaceutical Sciences.
13. The scheme was reviewed by the BOS members, and the scheme was **approved**.
14. A list of potential external examiners for practical examinations and paper setting was proposed.
15. After discussing the qualifications and expertise of the proposed examiners, the list was **approved**.
16. **Dr. Ashish Kumar** sent formal invitations to the external examiners.
17. The Chairperson thanked all members for their valuable contributions and participation.
18. The Chairperson concluded the meeting, noting that the decisions made would help enhance the quality of education at the Faculty of Pharmaceutical Sciences, Future University.
19. The meeting was adjourned at 4.00 pm.

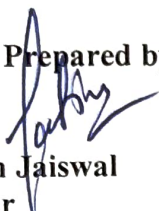
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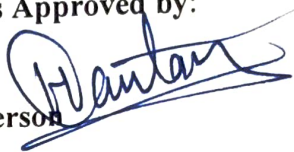
Action Points Summary

1. **Mr. Gangeshwar Pratap Singh** circulate the final course structure to all faculty members
2. **Dr. Jatin Jaiswal** implements the revisions and finalizes the syllabus.
3. **Dr. Ashish Kumar** sent formal invitations to the external examiners

Minutes Prepared by:


Dr. Jatin Jaiswal
Professor

Minutes Approved by:


Chairperson

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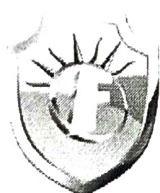
Study & Evaluation Scheme

Of

Master of Pharmacy (M. Pharm.)

[Applicable w.e.f. Academic Session 2025-26]

Approved by Academic Council



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Near Faridpur, Bareilly, Uttar Pradesh 243503

Website: www.futureuniversity.in

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Study & Evaluation Scheme of Master of Pharmacy

SUMMARY

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FUTURE UNIVERSITY

Faculty of Pharmaceutical Sciences

Future University notified vide U.P. Govt. Notification no. 212(2) LXXIX-V-I-2024-2-ka-6-2024 Leg. Dated 02nd July, 2024 and Future University (Establishment And Regulation Act, 2024) Act No. 2 of 2019. Uttar Pradesh Government Notification 212(2) LXXIX-V-I-2024-2-ka-6-2024 Leg. Dated 02nd July, 2024 and approved under section amendment of scheduled 2 of U.P act no.12-2019.

ACADEMIC REGULATIONS

2025-26

&

2026-27

For
Masters of Pharmacy (M. Pharm) Program

of

Faculty of Pharmacy
Future University

VISION

To establish knowledge creation and learning university to generate value based competent professionals and globally competitive human capital comparable with the best in the world through research driven multi-disciplinary and inter disciplinary approach, continuous learning, societal responsiveness and strategic partnership with the industry while being locally and globally responsive.

MISSION

Within a vibrant, ever-challenging and supportive learning environment, Future University discovers, disseminates and applies new knowledge through teaching and learning, research and creative activity, community involvement and partnerships. The Future University shall groom individuals for the day to day challenges of life by developing their intrinsic human abilities, provides a skilled human resource for the job market, who would contribute to the advancement of knowledge in the larger perspective. Future University, would thus, become a channel for giving a national and international voice to innovation, thus ultimately taking a lead role in placing India on the global forefront.

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FUTURE UNIVERSITY

Shri Rajendra Kumar Gupta Memorial Trust is at the forefront of uplifting the quality education in India for over 16 years now. By laying special emphasis on roping in highly skilled and experienced faculty and creating state of the art infrastructure, Future University is relentlessly creating new benchmarks in the education sector.

Future University notified vide U.P. Govt. Notification no. 212(2) LXXIX-V-I-2024-2-ka-6-2024 Leg. Dated 02nd July, 2024 and Future University (Establishment And Regulation Act, 2024) Act No. 2 of 2019. Uttar Pradesh Government Notification 212(2) LXXIX-V-I-2024-2-ka-6-2024 Leg. Dated 02nd July, 2024 and approved under section amendment of scheduled 2 of U.P act no.12-2019.

The main objective of Future University is to lay emphasis on:

- ❖ Curriculum based on Industry Focus
- ❖ Delivery focus on Learning, with Engagement and Involvement of Students
- ❖ Domain Skill, Soft Skill, Industry Interface as a part of Curriculum
- ❖ Choice Based Credit System accepted Nationally and Internationally
- ❖ Focus on Entrepreneurship Skill Development with International Exposure

At the core of the growing popularity of Future University among students and parents is the industry focus in curriculum adopted by it, which enables students to become employment-ready by the time they complete their course. The University believes in making learning effective by involving and engaging students. In line with this, students are provided ample opportunities to apply the knowledge acquired in real life scenarios.

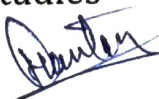
To help students adapt easily to the industry environment, the University has made Domain Skills, Soft Skills and Industry Interface an integral part of its Curriculum. In addition, the University aims to develop world-class Entrepreneurs with its focus on Entrepreneurship Skill Development with International Exposure.

Abbreviations

PCI	Pharmacy Council of India
CGPA	Cumulative Grade Point Average
SGPA	Semester Grade Point Average
COE	Controller of Examinations
RC	Registration Cancelled
UGC	University Grants Commission
AIU	Association of Indian Universities
BOS	Board of Studies

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B. Pharm	Bachelor of Pharmacy
M. Pharm	Master of Pharmacy
ATKT	Allowed to keep Terms

ACADEMIC REGULATIONS-POST GRADUATE PROGRAMS
(M. Pharm Pharmaceutics/Pharmacognosy/Pharmaceutical Chemistry)
Effective from 2025-26 academic session

1. Introduction

- 1.1. Admission to the M. Pharm. First Semester will be made as per the rules prescribed by the Academic Council of the University.
- 1.2 Admission or migration of a candidate from any other University to Bahra University is not permitted.

2. Eligibility for Admission:

2.1 Admission through Entrance Examination

- i) Candidates who have passed B. Pharm, examination from AICTE approved institutions with 60% marks.

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ii) Candidates with 60% marks and who are GPAT qualified will be given preference over Candidates who are not GPAT qualified in affiliated institutions/Colleges of the University where M. Pharm. courses are approved by the AICTE and the University.

iii) The Academic Council shall have the power to amend the eligibility criteria laid down in 2.1 (I) and 2.1 (ii) within the frame work of guidelines of the UGC & PCI.

3. Direct admissions on Vacant/Management seats at institutions/Colleges level:

The eligibility criteria for direct admissions on seats remaining vacant in the first year after entrance examination counseling as well as for Management seats shall be notified by the University from time to time.

4- Maximum Duration of Stay:

The maximum duration of stay of a student enrolled in M. Pharm. Courses shall be four academic years.

5- Cancellation of Admission:

The admission of a student at any stage of study shall be cancelled if:

(1) He I She is not found qualified as per AICTE norms/guidelines or the eligibility criteria prescribed by the University.

Or

(ii) He I She is found unable to complete the course within the four academic years of courses at section 3.

Or

(iii) He I She is found involved in creating indiscipline in the Institute I College or in the University.

6- Attendance:

Students are expected to attend 100% classes. Normally student shall be allowed to appear in a semester examination unless he/she has put in 75%

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attendance in all the theory/practical subjects in that semester. Attendance for dissertation work in third and fourth semester shall be verified by the supervisor/guide. However, an additional shortage by an amount not exceeding 15% of the total number of lectures delivered or practical work done in each subject may be condoned for special reasons as given below.

- (a) A shortage upto 5% of the total number of lectures delivered or practical work done in each subject may be condoned by the Head of the Department.
- (b) A further shortage upto 10% may be condoned by the Director/Principal of the Institute/College or the Dean of Faculty of the University on the specific recommendation of the concerned Head of Department.

7- Examination:

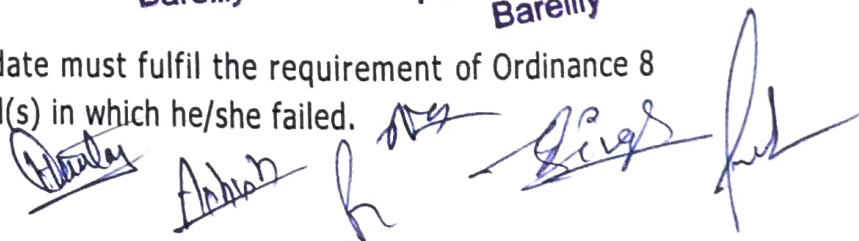
- (a) End semester examination shall be held as per the scheme of examination announced by the University. The examination may be conducted by means of written papers, practical and oral tests, project/dissertation work or by means of any combination of these methods.
- (b) The examination for theory papers and evaluation of sessional shall be conducted at the end of each semester.
- (c) A student enrolled in any one of the M. Pharm. courses shall be allowed to submit the dissertation with due permission of the supervisor/guide at least 46 weeks after getting registered in third semester but in any case not more than four academic years from admission to the course!
- (e) The supervisor/guide of the dissertation will be a regular faculty member of the department running the course.

(f) Dissertation Examination

- (ii) For passing in back papers, a candidate must fulfil the requirement of Ordinance 8
- (a) in those theory paper(s) or practical(s) in which he/she failed.

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The dissertation shall be sent to one external examiner. On receiving satisfactory report, a viva-voce examination shall be conducted by a panel of the following examiners:

- i) Head of the Department.
- ii) External Examiner who evaluated the dissertation.
- iii) Supervisor(s)/Guide(s)

8- Declaration of Result

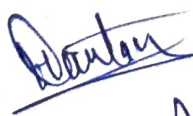
A candidate shall be declared pass in a semester if he/she obtains:

- (a) 40% marks in each end semester theory paper/practical examination and 50% marks in the total sum of theory paper/practical examination and concerned sessional marks.
- (b) 50% marks in dissertation examination.
- (c) 50% marks in the grand total of the semester examination.
- (d) (1) **For candidates admitted in courses 3(a) 1 (b) and (c) :**

A candidate who satisfies the requirement of Ordinance 8 (c) but fails to satisfy the requirement of Ordinance 8 (a) in not more than four theory papers/practicals in 1st & 2nd semester examination shall be allowed for promotion to the next semester. Hence, a candidate who fails in not more than two theory papers/practicals each in first and second semester examinations (i.e. not more than 4 theory I practicals at the end of 2nd semester) shall be eligible for promotion to third semester.


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- (iii) The marks awarded to candidate in back paper I special examination shall replace the previous marks.
- (iv) A candidate who satisfies the requirement of Ordinance 8 (c) but does not satisfy the requirement of Ordinance 8 (d) (1) shall be required to repeat the semester as a regular student or as an ex-student. In case of a regular student, he/she will be given re-admission in the semester and the remaining conditions will be at par as for the fresh candidates. In case of ex-student, he/she shall be allowed to appear in the end semester examination after he/she fills in the examination form and deposits the examination fees. However, his/her sessional mark will remain unaltered for declaration of result. A candidate declared promoted may also have an option to repeat the semester as a regular student only. The failed candidate opting for Ex-studentship shall be required to register in the Institute/College within 15 days after the declaration of result.

9. Declaration of Division

Division shall be awarded only in the final semester examination on the basis of grand total of marks obtained in all the semester examinations of the course. The award of division shall be carried on the following basis:

- (a) Candidate obtaining 50% or more but less than 60% of the grand total
SECOND DIVISION.
- (b) Candidate obtaining 60% or more but less than 75% of the grand total
FIRST DIVISION.
- (c) Candidate obtaining 75% or more of the grand total
FIRST DIVISION with HONOURS.

10. Merit List:

A candidate who passes all the examination in one attempt shall be eligible to inclusion in the merit list and shall be eligible for award of any medal.

11. Grace Marks:

A candidate shall be entitled for the award of grace marks upto a maximum of five marks in any one of the theory papers/practicals to pass a semester examination. No grace marks shall be awarded in back paper/special examination. The grace marks shall not be added to the grand total for the purpose of awarding division of honours.

12. Scrutiny

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A candidate shall be entitled for the scrutiny of his/her examination result according to the regulation laid down by the University.

13. Unfair means

Cases of unfair means shall be dealt as per the rules of the University rules if any in prevalence.

14. Special Examination :

A special examination shall be held after second / fourth semester examination for the benefit of those candidates admitted in courses 3 (a), (b) and (c) / course 3 (d) respectively provided they qualify for promotion with back paper(s), normally along with the junior batches.

15. Sessional Evaluation :

(a) Sessional marks for theory subjects / practicals shall be awarded on the basis of :

- (i). Performance in tests / viva-voce.
- (ii). Performance in tutorials / practical records.
- (iii). Regularity in attendance.

The distribution of sessional marks for theory subjects / practicals shall be as follows :

(a) Theory subject

Test	50%
Tutorial	30%
Attendance	20%

(b) Practicals

Viva-voce	30%
Practical Record	50%
Attendance	20%

(b) The sessional marks for the dissertation shall be awarded jointly by the supervisor(s)/ guides, Head of the Department and a Senior Faculty Member of the Department.


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16. Course of Study

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

Table – 1

S. No.	Specialization	Code
1	Pharmaceutics	MPH
2	Pharmaceutical Chemistry	MPC
3	Pharmacognosy	MPG

M. Pharm Pharmaceutics 1st Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
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
MPH106	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmaceutics 2nd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
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
MPH206	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmaceutics 3rd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM301T	Research Methodology and Biostatistics	4	-	-	4	4	100
MRM302	Journal Club	1	-	-	1	1	25
MRM303	Discussion/Presentation (Proposal Presentation)	2	-	-	2	2	50
MRM304	Research Work	-	-	28	14	28	350
TOTAL		7	-	28	21	35	525

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M. Pharm Pharmaceutics 4th Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM 401	Journal Club	1	-	-	1	1	25
MRM 402	Discussion/Presentation (Proposal Presentation)	3	-	-	3	3	400
MRM 403	Research Work and Colloquium	-	-	31	16	31	75
TOTAL		4	-	31	20	35	500

Total Credit 93

M. Pharm Pharmacognosy 1st Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MPG101T	Modern Pharmaceutical Analytical Techniques	4	-	-	4	4	100
MPG102T	Advanced Pharmacognosy-I	4	-	-	4	4	100
MPG103T	Phytochemistry	4	-	-	4	4	100
MPG104T	Industrial Pharmacognostical Technology	4	-	-	4	4	100
MPG105P	Pharmacognosy Practical I	-	-	12	6	12	150
MPG106	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmacognosy 2nd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MPG201T	Medicinal Plant Biotechnology	4	-	-	4	4	100
MPG202T	Advanced Pharmacognosy-II	4	-	-	4	4	100
MPG203T	Indian Systems of Medicine	4	-	-	4	4	100
MPG204T	Herbal Cosmetics	4	-	-	4	4	100
MPG205P	Herbal Cosmetics Practical I	-	-	12	6	12	150
MPG206	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23		12	26	35	650

M. Pharm Pharmacognosy 3rd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM301T	Research Methodology and Biostatistics	4	-	-	4	4	100
MRM302	Journal Club	1	-	-	1	1	25
MRM303	Discussion/Presentation (Proposal Presentation)	2	-	-	2	2	50
MRM304	Research Work	-	-	28	14	28	350
TOTAL		7	-	28	21	35	525

M. Pharm Pharmacognosy 4th Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM 401	Journal Club	1	-	-	1	1	25
MRM 402	Discussion/Presentation (Proposal Presentation)	3	-	-	3	3	400

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MRM 403	Research Work and Colloquium	-	-	31	16	31	75
TOTAL		4	-	31	20	35	500

Total Credit 93

M. Pharm Pharmaceutical Chemistry 1st Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MPC101T	Modern Pharmaceutical Analytical Techniques	4	-	-	4	4	100
MPC102T	Advanced Organic Chemistry -I	4	-	-	4	4	100
MPC103T	Advanced Medicinal Chemistry	4	-	-	4	4	100
MPC104T	Chemistry of Natural Products	4	-	-	4	4	100
MPC105P	Pharmaceutical Chemistry Practical I	-	-	12	6	12	150
MPC106	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmaceutical Chemistry 2nd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MPC201T	Advanced Spectral Analysis	4	-	-	4	4	100
MPC202T	Advanced Organic Chemistry -II	4	-	-	4	4	100
MPC203T	Computer Aided Drug Design	4	-	-	4	4	100
MPC204T	Pharmaceutical Process Chemistry	4	-	-	4	4	100
MPC205P	Pharmaceutical Chemistry Practical II	-	-	12	6	12	150
MPC206	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmaceutical Chemistry 3rd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM301T	Research Methodology and Biostatistics	4	-	-	4	4	100
MRM302	Journal Club	1	-	-	1	1	25
MRM303	Discussion/Presentation (Proposal Presentation)	2	-	-	2	2	50
MRM304	Research Work	-	-	28	14	28	350
TOTAL		7	-	28	21	35	525

M. Pharm Pharmaceutical Chemistry 4th Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM 401	Journal Club	1	-	-	1	1	25
MRM 402	Discussion/Presentation (Proposal Presentation)	3	-	-	3	3	400
MRM 403	Research Work and Colloquium	-	-	31	16	31	75
TOTAL		4	-	31	20	35	500

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Total Credit 93

12. Re-examination of End Semester Examinations

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

Table-II

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

13. Allowed To Keep Terms (ATKT)

No student shall be admitted to any examination unless he/she fulfills the norms given in 1.8 ATKT (Allowed to keep terms) rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I and II semesters 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.

14. Grading of Performances

- 14.1. 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 – III

Table-III

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 student who remains absent, for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero (0). He/she should reappear for the said evaluation/examination in due course.

15. Semester Grade Point Average (SGPA)

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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, C4 and C5 and the student's grade points in these courses are G1, G2, G3, G4 and G5, respectively, and then students' SGPA is equal to:

$$\text{SGPA} = \frac{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}{C1 + C2 + C3 + C4 + C5}$$

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:

$$\text{SGPA} = \frac{C1G1 + C2G2 + C3G3 + C4 * \text{ZERO} + C5G5}{C1 + C2 + C3 + C4 + C5}$$

16. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed status in 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 shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$\text{CGPA} = \frac{C1S1 + C2S2 + C3S3 + C4S4 + C5S5 + C6S6 + C7S7 + C8S8}{C1 + C2 + C3 + C4 + C5 + C6 + C7 + C8}$$

where C1, C2, C3,.... is the total number of credits for semester I,II,III,.... and S1,S2, S3,.... is the SGPA of semester I,II,III,....

17. 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

18. School of Pharmaceutical Sciences

According to the Pharmacy Council of India (PCI) Notification

I. Evaluation Scheme for M. Pharm (Pharmaceutics/Pharmacology/Pharm. Chemistry).

1. Theory Subjects

Exam	Mark Distribution				
	Mid Term Test-I & Test-II*	Continuous Mode			End Term Exam
		Attendance	Student Teacher	Total	

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			Interaction			
Theory	15	8	2	10	75	100

Note: * The average marks of two sessional exams shall be computed for internal assessment.

2. Practical Subjects

Exam	Mark Distribution				
	Type of Evaluation	Continuous Mode	Mid Term Test-I & Test-II*	End Term Exam	Total
Practical	Attendance	10	30	100	150
	Practical Records & Regular Viva Voce etc.,	10			

Note: * The average marks of two sessional exams shall be computed for internal assessment.

3. Seminar

Exam	Type of Evaluation	Max Marks	
Seminar (I & II Semester)	Presentation & Communication	25	50
	Content Quality	25	

4. Assignments

Exam	Type of Evaluation	Max Marks	
Assignments (I & II Semester)	Content	40	50
	Punctuality	10	

5. Special Subjects

Exam					Type of Evaluation	Max Marks	Total
	Internal Assessment		End Term				
	3 rd Sem	4 th Sem	3 rd Sem	4 th Sem			
Journal Club	25	25	-	-	Presentation	100	250
Discussion/ Presentation	50	75	-	-	Communication	50	
					Question and Answer Skills	100	
Research Work	-	-	350	400			

6. Dissertation

	Max. Marks
Objectives of the work done	50
Methodology adopted	150
Results and Discussions	250
Conclusions and Outcomes	50

II. Question Paper Pattern: for M. Pharm

1. Mid Term Test Theory

Question paper will be divided into three parts:

(Total Marks= 30* & Maximum Time duration 1 hrs)

* To be conducted for 30 marks and will be computed for 15 marks.

Part	Questions Type	Total no of Questions*	No. of questions to be attempted	Each question carry marks	Total Marks
Part-I	Multiple Choice	10	All	1	

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	Question				
Part-II	Short Answer	3	2	5	10
Part-III	Long Answer	2	1	10	10
Total Max Marks					30

2. End Term Exam Theory

Question paper will be divided into three parts:

(Total Marks = 75 & Maximum Time duration 3 hrs)

Part	Questions Type	Total no of Questions	No. of questions to be attempted	Each question carry marks	Total Marks
Part-I	Multiple Choice Question	20	All	1	20
Part-II	Short Answer	9	7	5	35
Part-III	Long Answer	3	2	10	20
Total Max Marks					75

3. Mid Term Practical Exam

It is divided in to four parts: (Total Marks = 30 & Maximum Time duration. 6 hrs)

- | | | | |
|----|-----------------------|---|-----------------|
| a) | Synopsis | : | 05 Marks |
| b) | Practical Performance | : | 10 Marks |
| c) | Viva-Voce | : | 10 Marks |
| d) | Practical Copy | : | 05 Marks |
| | Total | : | 30 Marks |

4. End Term Practical Exam

It is divided in to five parts: (Total Marks = 100 & Maximum Time duration. 6 hrs)

- | | | | |
|----|-----------------------------|---|------------------|
| a) | Synopsis | : | 20 Marks |
| b) | Major Practical Performance | : | 30 Marks |
| c) | Minor Practical Performance | : | 20 Marks |
| d) | Viva-Voce | : | 20 Marks |
| e) | Practical Copy | : | 10 Marks |
| | Total | : | 100 Marks |

5. Attendance Evaluation Scheme

% 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

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M. Pharm (Pharmaceutics)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards
M. Pharm Pharmaceutics 1st Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
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
MPH106	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmaceutics 2nd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
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
MPH206	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmaceutics 3rd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM301T	Research Methodology and Biostatistics	4	-	-	4	4	100
MRM302	Journal Club	1	-	-	1	1	25
MRM303	Discussion/Presentation (Proposal Presentation)	2	-	-	2	2	50
MRM304	Research Work	-	-	28	14	28	350
TOTAL		7	-	28	21	35	525

M. Pharm Pharmaceutics 4th Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM 401	Journal Club	1	-	-	1	1	25
MRM 402	Research Work	-	-	31	16	31	75
MRM 403	Discussion/Final Presentation	3	-	-	3	3	400
TOTAL		4	-	31	20	35	500
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholar Activities)						Minimum=02 Maximum=07*	
Total Credits						Minimum=93 Maximum=100*	

* Credit Points for Co-curricular Activities

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M. Pharm (Pharmaceutics)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards

GUIDELINES FOR AWARDING CREDIT POINTS FOR CO-CURRICULAR ACTIVITIES

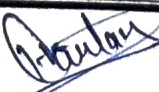
Name of the Activity	Maximum Credit Points Eligible/Activity
Participation in National Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	01
Participation in International Level Seminar/Conference/Workshop/Symposium/ Training Programs (related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

Total Credit 93
Minimum Credit 93+2=95
Maximum Credit 93+7=100

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M. Pharm (Pharmaceutics)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continuous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester I									
MPH101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hrs	25	75	3 Hrs	100	4
MPH102T	Drug Delivery System	10	15	1 Hrs	25	75	3 Hrs	100	4
MPH103T	Modern Pharmaceutics	10	15	1 Hrs	25	75	3 Hrs	100	4
MPH104T	Regulatory Affairs	10	15	1 Hrs	25	75	3 Hrs	100	4
MPH105P	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150	6
MPH 106	Seminar/Assignment	-	-	-	-	-	-	100	4
Total								650	26
Semester II									
MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	10	15	1 Hr	25	75	3 Hrs	100	4
MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100	4
MPH203T	Computer Aided Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100	4
MPH204T	Cosmetic and Cosmeceuticals	10	15	1 Hr	25	75	3 Hrs	100	4
MPH205P	Pharmaceutics Practical II	20	30	6 Hrs	50	100	6 Hrs	150	6
MPH 206	Seminar /Assignment	-	-	-	-	-	-	100	4
Total								650	26

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M. Pharm (Pharmaceutics)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continu- ous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester III									
MRM301T	Research Methodology and Biostatistics	40	60	2 Hr	100	-	-	100	4
MRM302	Journal Club	-	-	-	25	-	-	25	1
MRM303	Discussion /Presentation (Proposal Presentation)	-	-	-	50	-	-	50	2
MRM304	Research Work	350	-	-	-	-	-	350	14
Total								525	21
Semester IV									
MRM401	Journal Club	-	-	-	25	-	-	25	1
MRM402	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75	3
MRM403	Research Work and Colloquium	-	-	-	-	400	1 Hr	400	16
Total								500	20

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Master of Pharmacy (M. Pharm.)

SCHEMES FOR INTERNAL ASSESSMENTS AND END SEMESTER EXAMINATIONS (SEM. I & II)

(W.E.F. Session 2025-26)

PHARMACEUTICS- MPH

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continu- ous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester I									
MPH101T (New)	Modern Pharmaceutical Analytical Techniques	10	15	1 Hrs	25	75	3 Hrs	100	4
MPH102T (New)	Drug Delivery System	10	15	1 Hrs	25	75	3 Hrs	100	4
MPH103T (New)	Modern Pharmaceutics	10	15	1 Hrs	25	75	3 Hrs	100	4
MPH104T (New)	Regulatory Affairs	10	15	1 Hrs	25	75	3 Hrs	100	4
MPH105P (New)	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150	6
-	Seminar/Assignment	-	-	-	-	-	-	100	4
Total								650	26
Semester II									
MPH201T (New)	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	10	15	1 Hr	25	75	3 Hrs	100	4
MPH202T (New)	Advanced Biopharmaceutics & Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100	4
MPH203T (New)	Computer Aided Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100	4
MPH204T (New)	Cosmetic and Cosmeceuticals	10	15	1 Hr	25	75	3 Hrs	100	4
MPH205P (New)	Pharmaceutics Practical II	20	30	6 Hrs	50	100	6 Hrs	150	6
-	Seminar /Assignment	-	-	-	-	-	-	100	4
Total								650	26

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Schemes for Internal Assessments and End Semester Examinations (Semester III & IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continu- ous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester III									
MRM301T (New)	Research Methodology and Biostatistics	40	60	2 Hr	100	-	-	100	4
MRM302T (New)	Journal Club	-	-	-	25	-	-	25	1
MRM303P (New)	Discussion /Presentation (Proposal Presentation)	-	-	-	50	-	-	50	2
MRM304P (New)	Research Work	350	-	-	-	-	-	350	14
Total								525	21
Semester IV									
MRM401T (New)	Journal Club	-	-	-	25	-	-	25	1
MRM402P (New)	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75	3
MRM403P (New)	Research Work and Colloquium	-	-	-	-	400	1 Hr	400	16
Total								500	20

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Future Institute of Pharmacy

Syllabus

For
M.Pharm. (Pharmaceutics)
(Effective from the Session: 2025-26)

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FIRST SEMESTER

PHARMACEUTICS (MPH) **MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES** (MPH 101T)

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 Hrs

- UV-Visible spectroscopy:** Introduction, theory, laws, instrumentation associated with UV-Visible spectroscopy. Choice of solvents and solvent effect. Applications of UV- visible spectroscopy. 11 Hrs
 - IR Spectroscopy:** Theory, modes of molecular vibrations, sample handling. Instrumentation of dispersive and Fourier-Transform IR spectrometer. Factors affecting vibrational frequencies. Applications of IR spectroscopy.
 - Spectrofluorimetry:** Theory of fluorescence, factors affecting fluorescence, quenchers. Instrumentation and applications of fluorescence spectrophotometer.
 - Flame Emission spectroscopy and Atomic Absorption Spectroscopy:** Principle, instrumentation, interferences and applications.
- NMR Spectroscopy:** Quantum numbers and their role in NMR. Principle, instrumentation, solvent requirement in NMR, relaxation process, NMR signals 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
- Mass Spectroscopy:** Principle, theory, instrumentation of mass spectroscopy. Different types of ionization like electron impact, chemical, field, FAB and MALDI, APPI analyzers of quadrupole and time of flight. Mass Fragmentation and its rules, meta stable ions, isotopic peaks. Applications of mass spectroscopy. 11 Hrs
- Chromatography:** Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and application of the following: 11 Hrs
 - 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

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5. **a. Electrophoresis:** Principle, instrumentation, working conditions, factors affecting separation and applications of the following:
- Paper electrophoresis
 - Gel electrophoresis
 - Capillary electrophoresis
 - Zone electrophoresis
 - Moving boundary electrophoresis
 - Isoelectric focusing.
- b. X-ray Crystallography:** Production of X-rays, different X-ray diffraction methods, Bragg's law, rotating crystal technique, X-ray powder technique, types of crystals and applications of X-ray diffraction.
6. **a. Potentiometry:** Principle, working, Ion selective electrodes and application of potentiometry. 5 Hrs
- b. Thermal Techniques:** Principle, thermal transitions and instrumentation (Heat flux and power-compensation and designs), modulated DSC, hyper DSC, experimental parameters (Sample preparation, experimental 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, advantage and disadvantages, pharmaceutical applications.
- c. Immunological Assays:** RIA (Radio immune assay), ELISA, bioluminescence assays.

REFERENCES

- Spectrometric Identification of Organic Compounds by Robert M Silverstein, Sixth Edition, John Wiley & Sons, 2004.
- Principles of Instrumental Analysis by Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
- Instrumental Methods of Analysis by Willards, 7th edition, CBS publishers.
- Practical Pharmaceutical Chemistry by Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
- Organic Spectroscopy by William Kemp, 3rd Edition, ELBS, 1991.
- Quantitative Analysis of Drugs in Pharmaceutical Formulation by P.D. Sethi, 3rd Edition, CBS Publishers New Delhi, 1997.
- Pharmaceutical Analysis Modern Methods- Part B by J. W. Munson, Volume 11, Marcel Dekker Series.
- Pharmacopoeia of India, Ministry of Health, Govt. of India.
- Introduction to Spectroscopy by Pavia D.L., Lampman G.M., and Kriz G.S., 3rd Edition, Harcourt College Publishers, Philadelphia.
- Analytical Profile of Drug Substance (All volume) by Florey K., Academic Press, Elsevier, Massachusetts.
- Spectroscopy of Organic Compounds by Kalsi P.S., New Age International Publishers, New Delhi.

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12. Undergraduate Instrumental Analysis by Obonson J.W.R., Marcel Dekker Inc, New York.
13. Absorption Spectroscopy of Organic Molecules by Parikh V.H., Addison-Wesley Publishing Co., London.
14. Thin Layer Chromatography: A Laboratory Handbook by Stahl E., Springer, Berlin.
15. A Text Book of Pharmaceutical Chemistry by Chatten L.G., Vol. I & II, Marcel Dekker, New York.

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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

	60 Hrs
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.	10 Hrs
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.	10 Hrs
3. Gastro-Retentative 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.	10 Hrs
4. Ocular Drug Delivery Systems: Barriers of drug permeation, methods to overcome barriers.	06 Hrs
5. Transdermal Drug Delivery Systems: Structure of skin and 10 barriers, penetration enhancers, transdermal drug delivery systems, Formulation and evaluation.	10 Hrs
6. Protein and Peptide Delivery: Barriers for protein delivery. Formulation and evaluation of delivery systems of proteins and other macromolecules.	08 Hrs
7. Vaccine Delivery Systems: Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.	06 Hrs

REFERENCES

1. Novel Drug Delivery Systems by Chien, Y W., 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Controlled Drug Delivery Systems by Robinson, J. R., Lee V. H. L, Marcel Dekker, Inc., New York, 1992.

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3. Chichester and Weinheim Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by WileyInterscience Publication, John Wiley and Sons, Inc, New York! Chichester/Weinheim.
4. Controlled and Novel Drug Delivery by Jain, N.K. CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. Controlled Drug Delivery - concepts and advances by Vyas S.P. and Khar, R.K. Vallabh Prakashan, New Delhi, First edition 2002.
6. Modern Pharmaceutics by Banker G.S. and Rhodes C.T., Marcel Dekker, New York.
7. Microparticulate Systems for the Delivery of Proteins and Vaccines by Cohen S. and Bernstein H., Marcel Dekker, New York.

JOURNALS

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

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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). Pre-formation Concepts:** Drug excipient 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. **12 Hrs**
(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.
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. **12 Hrs**
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. **12 Hrs**
4. **Compression and Compaction:** Physics of tablet compression, compression, consolidation, effect of friction, distribution of forces, compaction profiles, solubility. **12 Hrs**
5. **Study of Consolidation Parameters:** Diffusion parameters, dissolution parameters and pharmacokinetic parameters, Heckel plots, similarity factors – f_2 and f_1 , Higuchi and Peppas plot, linearity Concept of significance, standard deviation, Chi square test, students T-test , ANOVA test. **12 Hrs**

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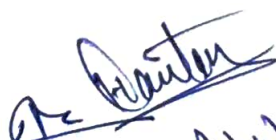
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5. Modern Pharmaceutics by Gillbert and S. Banker.
6. Remington's Pharmaceutical Sciences.
7. Advances in Pharmaceutical Sciences Vol. 1-5 by H.S. Bean & A.H. Beckett.
8. Physical Pharmacy by Alfred Martin.
9. Bentley's Textbook of Pharmaceutics – by Rawlins.
10. Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control, by Sidney H. Willig. Second edition.
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.

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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.
- To know the chemistry, manufacturing controls and their regulatory importance.
- To learn the documentation requirements.
- To learn the importance.

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

60Hrs

1. **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. 12 Hrs
2. **Regulatory Requirement for Product Approval:** API, biologics, novel, therapies obtaining NDA, ANDA for generic drugs ways and means of US registration for foreign drugs. 12 Hrs
3. 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. 12 Hrs
4. **Non Clinical Drug Development:** Global submission of IND, NDA, ANDA. Investigation of medicinal products dossier (IMPD) and investigator brochure (IB). 12 Hrs
5. **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. 12 Hrs

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1. Generic Drug Product Development, Solid Oral Dosage Forms by Leon Shargel and Isader Kaufer, 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 Healthcare 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>.
11. Drugs and Cosmetics Act 1940 and Rules 1945 by Malik V.
12. New Drug Approval Process, by Guarino R.A., Marcel Dekker, New York.
13. Guidebook for Drug Regulatory Submissions by Weinberg S., John Wiley and Sons, New Jersey.

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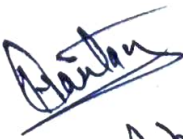
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PHARMACEUTICS PRACTICALS – I
(MPH 105P)

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 pre-formulation 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.

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SECOND SEMESTER

MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS) (NTDS) (MPH 201T)

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

60Hrs

- | | |
|---|--------|
| 1. Targeted Drug Delivery Systems: Concepts, events and biological process involved in drug targeting. Tumor targeting and brain specific delivery. | 12 Hrs |
| 2. Targeting Methods: introduction preparation and evaluation. Nano Particles & Liposomes: Types, preparation and evaluation. | 12 Hrs |
| 3. Micro Capsules/ Micro Spheres: Types, preparation and evaluation. Monoclonal antibodies; Preparation and application, preparation and application of niosomes, aquasomes, phytosomes, electrosomes. | 12 Hrs |
| 4. Pulmonary Drug Delivery Systems: Aerosols, propellents, containers types, preparation and evaluation, intra nasal route delivery systems: Types, preparation and evaluation. | 12 Hrs |
| 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. | 12 Hrs |

REFERENCES

1. Novel Drug Delivery Systems by Y W. Chien, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Controlled Drug Delivery - concepts and advances, S.P.Vyas and R.K.Khar, 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).
4. Drug Targeting Technology Physical, Chemical and Biological Methods, Schreier H., Marcel Dekker, New York.
5. Roland A., Particulate Carriers: Therapeutic Applications, Marcel Dekker, New York.

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ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS (MPH 202T)

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 biopharmaceutical studies involving drug product equivalency.
- The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutical parameters.
- The potential clinical pharmacokinetic problems and application of basics of pharmacokinetic.

THEORY

60Hrs

1. Drug Absorption from the Gastrointestinal Tract:

12 Hrs

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.

2. Biopharmaceutical Considerations in Drug Product Design and In Vitro Drug Product Performance:

12 Hrs

Introduction, biopharmaceutical factors affecting drug 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:

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12 Hrs

Basic considerations, pharmacokinetic models, compartment modeling. one compartment model- IV bolus, IV infusion, extra-vascular. Multi compartment model: two compartment

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n-linearity, Michelis Menton equation, estimation of K_{max} and V_{max} . Drug interactions: Introduction, the effect of protein binding interactions, the effect of tissue- binding interactions, cytochrome p450-based drug cytochrome p450-based drug interactions, and drug interactions linked to transporters.

4. Drug Product Performance, in vivo: Bioavailability and Bioequivalence: 12 Hrs

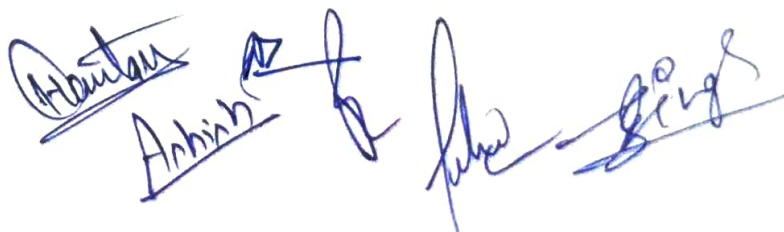
Drug product performance, purpose of bioavailability studies, relative and absolute availability. Methods for assessing bioavailability, bioequivalence studies, design and evaluation of bioequivalence studies, study designs, crossover study designs, evaluation of the data, bioequivalence example, study 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.

5. Application of Pharmacokinetics: 12 Hrs

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.

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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., Vallab Prakashan, Pitampura, Delhi.
3. Applied Biopharmaceutics and Pharmacokinetics by Shargel. Land Yu ABC, 2nd edition, Connecticut Appleton Century Crofts, 1985
4. Textbook of Biopharmaceutics and Pharmacokinetics by 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, Lea and Febiger, Philadelphia, 1970.
7. Clinical Pharmacokinetics, Concepts and Applications 3rd edition by Malcolm Rowland and 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 expanded by Robert. E. Notari, Marcel Dekker Inc, New York and Basel, 1987.
10. Biopharmaceutics and Relevant Pharmacokinetics by John. G Wagner and M. Pamarowski, 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 Jambhekar and 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.

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COMPUTER AIDED DRUG DEVELOPMENT (MPH 203T)

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 Hrs

1. a. Computers in Pharmaceutical Research and Development: 12 Hrs

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 guidelines, regulatory and industry views on QbD, scientifically based QbD - Examples of application.

2. Computational Modeling of Drug Disposition: 12 Hrs

Introduction, modeling techniques: Drug absorption, solubility, intestinal permeation, drug distribution, drug excretion, active transport: P-gp, BCRP, nucleoside transporters, hPEPT1, ASBT, OCT, OATP, BBB- choline transporter.

3. Computer-Aided Formulation Development: 12 Hrs

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.

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4. **Computer-Aided Biopharmaceutical Characterization:** **12 Hrs**
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.
- **Computer Simulations in Pharmacokinetics and Pharmacodynamics:**
Introduction, computer simulation; Whole organism, isolated tissues, organs, cell, proteins and genes.
 - **Computers in Clinical Development:** Clinical data collection and management, regulation of computer systems.
5. **Artificial Intelligence (AI), Robotics and Computational Fluid Dynamics:** **12 Hrs**
General overview, pharmaceutical automation, pharmaceutical applications, advantages and disadvantages. Current challenges and future directions.

REFERENCES

1. Computer Applications in Pharmaceutical Research and Development by Sean Ekins, 2006, John Wiley & Sons.
2. Computer-Aided Applications in Pharmaceutical Technology, 1st Edition by Jelena Djuris, Woodhead Publishing.
3. Encyclopedia of Pharmaceutical Technology, Vol 13 by James Swarbrick, James. G. Boylan, Marcel Dekker Inc, New York, 1996.

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COSMETICS AND COSMECEUTICALS (MPH 204T)

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 Hrs

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 of cosmetics: Conditions for obtaining license, prohibition of manufacture and sale of certain cosmetics, loan license, offences and penalties. 12 Hrs
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. 12 Hrs
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 syndet bars. Perfumes: Classification of perfumes, perfume ingredients listed as allergens in EU regulation. Controversial ingredients: Parabens, formaldehyde liberators, dioxane. 12 Hrs
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, skincare and oral care. Review of guidelines for herbal cosmetics by private bodies like ~~cosmos~~ ^{Council} with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics. 12 Hrs

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REFERENCES

1. Harry's Cosmeticology. 8th edition.
2. Poucher's Perfume Cosmetics and Soaps, 10th edition.
3. Cosmetics - Formulation, Manufacture and Quality Control, P.P. Sharma, 4th edition.
4. Handbook of Cosmetic Science and Technology A.O. Barel, M. Paye and H.I. Maibach. 3rd edition.
5. Cosmetic and Toiletries Recent Suppliers' Catalogue.
6. CTFA Directory.
7. Cosmetic Technology by Nanda S., Nanda A., Birla Publication, Delhi.
8. SCCS's Notes of Guidance for the Testing of Cosmetic Ingredients and their Safety Evaluation, European Commission, Brussels.
9. Indian Pharmacopoeia, Ministry of Health and Family Welfare, Govt. of India.
10. Paye M., Basel A.O., Maibach H.I., Handbook of Cosmetic Science and Technology, Informa Healthcare. New York.
11. Balsam M.S., Sagarin E., Cosmetics: Science and Technology, Wiley Interscience, New York.
12. Rao Y.M., Shayeda, Cosmeceuticals, PharmaMed Press, Hyderabad.

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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 WinnolineR 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.

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**M. Pharm (Pharmaceutical Chemistry)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards**

M. Pharm Pharmaceutical Chemistry 1st Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MPC101T	Modern Pharmaceutical Analytical Techniques	4	-	-	4	4	100
MPC102T	Advanced Organic Chemistry -I	4	-	-	4	4	100
MPC103T	Advanced Medicinal Chemistry	4	-	-	4	4	100
MPC104T	Chemistry of Natural Products	4	-	-	4	4	100
MPC105P	Pharmaceutical Chemistry Practical I	-	-	12	6	12	150
MPC106	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmaceutical Chemistry 2nd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MPC201T	Advanced Spectral Analysis	4	-	-	4	4	100
MPC202T	Advanced Organic Chemistry -II	4	-	-	4	4	100
MPC203T	Computer Aided Drug Design	4	-	-	4	4	100
MPC204T	Pharmaceutical Process Chemistry	4	-	-	4	4	100
MPC205P	Pharmaceutical Chemistry Practical II	-	-	12	6	12	150
MPC206	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmaceutical Chemistry 3rd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM301T	Research Methodology and Bio-statistics	4	-	-	4	4	100
MRM302	Journal Club	1	-	-	1	1	25
MRM303	Discussion/Presentation (Proposal Presentation)	2	-	-	2	2	50
MRM304	Research Work	-	-	28	14	28	350
TOTAL		7	-	28	21	35	525

M. Pharm Pharmaceutical Chemistry 4th Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM 401	Journal Club	1	-	-	1	1	25
MRM 402	Discussion/Presentation (Proposal Presentation)	3	-	-	3	3	400
MRM 403	Research Work and Colloquium	-	-	31	16	31	75
TOTAL		4	-	31	20	35	500

Total Credit 93

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**M. Pharm (Pharmaceutical Chemistry)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards
M. Pharm Pharmaceutical Chemistry 1st Semester**

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MPC101T	Modern Pharmaceutical Analytical Techniques	4	-	-	4	4	100
MPC102T	Advanced Organic Chemistry -I	4	-	-	4	4	100
MPC103T	Advanced Medicinal Chemistry	4	-	-	4	4	100
MPC104T	Chemistry of Natural Products	4	-	-	4	4	100
MPH105P	Pharmaceutics Practical I	-	-	12	6	12	150
MPH106	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmaceutical Chemistry 2nd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MPC201T	Advanced Spectral Analysis	4	-	-	4	4	100
MPC202T	Advanced Organic Chemistry -II	4	-	-	4	4	100
MPC203T	Computer Aided Drug Design	4	-	-	4	4	100
MPC204T	Pharmaceutical Process Chemistry	4	-	-	4	4	100
MPC205P	Pharmaceutical Chemistry Practical II	-	-	12	6	12	150
MPH206	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmaceutical Chemistry 3rd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM301T	Research Methodology and Biostatistics	4	-	-	4	4	100
MRM302	Journal Club	1	-	-	1	1	25
MRM303	Discussion/Presentation (Proposal Presentation)	2	-	-	2	2	50
MRM304	Research Work	-	-	28	14	28	350
TOTAL		7	-	28	21	35	525

M. Pharm Pharmaceutical Chemistry 4th Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM 401	Journal Club	1	-	-	1	1	25
MRM 402	Research Work	-	-	31	16	31	75
MRM 403	Discussion/Final Presentation	3	-	-	3	3	400
TOTAL		4	-	31	20	35	500

Co-curricular Activities
(Attending Conference, Scientific Presentations and Other Scholar Activities)

Minimum=02
Maximum=07*

Total Credits

**Minimum=93
Maximum=100***

* **Credit Points for Co-curricular Activities**

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GUIDELINES FOR AWARDING CREDIT POINTS FOR CO-CURRICULAR ACTIVITIES

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**M. Pharm (Pharmaceutical Chemistry)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards**

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 National Journals (indexed in Scopus/Web of Science)	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.

**Total Credit 93
Minimum Credit 93+2=95
Maximum Credit 93+7=100**

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M. Pharm (Pharmaceutical Chemistry)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continu- uous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester I									
MPC101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hrs	25	75	3 Hrs	100	4
MPC102T	Advanced Organic Chemistry -I	10	15	1 Hrs	25	75	3 Hrs	100	4
MPC103T	Advanced Medicinal Chemistry	10	15	1 Hrs	25	75	3 Hrs	100	4
MPC104T	Chemistry of Natural Products	10	15	1 Hrs	25	75	3 Hrs	100	4
MPH105P	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150	6
MPH 106	Seminar/Assignment	-	-	-	-	-	-	100	4
Total								650	26
Semester II									
MPC201T	Advanced Spectral Analysis	10	15	1 Hr	25	75	3 Hrs	100	4
MPC202T	Advanced Organic Chemistry -II	10	15	1 Hr	25	75	3 Hrs	100	4
MPC203T	Computer Aided Drug Design	10	15	1 Hr	25	75	3 Hrs	100	4
MPC204T	Pharmaceutical Process Chemistry	10	15	1 Hr	25	75	3 Hrs	100	4
MPC205P	Pharmaceutical Chemistry Practical II	20	30	6 Hrs	50	100	6 Hrs	150	6
MPH 206	Seminar /Assignment	-	-	-	-	-	-	100	4
Total								650	26

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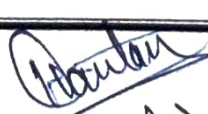
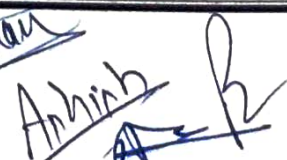
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M. Pharm (Pharmaceutical Chemistry)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continuous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester III									
MRM301T	Research Methodology and Biostatistics	40	60	2 Hr	100	-	-	100	4
MRM302	Journal Club	-	-	-	25	-	-	25	1
MRM303	Discussion /Presentation (Proposal Presentation)	-	-	-	50	-	-	50	2
MRM304	Research Work	350	-	-	-	-	-	350	14
Total								525	21
Semester IV									
MRM401	Journal Club	-	-	-	25	-	-	25	1
MRM402	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75	3
MRM403	Research Work and Colloquium	-	-	-	-	400	1 Hr	400	16
Total								500	20

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FUTURE UNIVERSITY
Future Institute of Pharmacy

Syllabus

For
M.Pharm. (Pharmaceutical Chemistry)

(Effective from the Session: 2025-26)

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Master of Pharmacy (M. Pharm.)

SCHEMES FOR INTERNAL ASSESSMENTS AND END SEMESTER EXAMINATIONS (SEM. I & II)

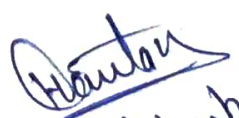
(W.E.F. Session 2025-26)

PHARMACEUTICAL CHEMISTRY-MPC

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continuous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester I									
MPC101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hrs	25	75	3 Hrs	100	4
MPC102T	Advanced Organic Chemistry-I	10	15	1 Hrs	25	75	3 Hrs	100	4
MPC103T	Advanced Medicinal Chemistry	10	15	1 Hrs	25	75	3 Hrs	100	4
MPC104T	Chemistry of Natural Products	10	15	1 Hrs	25	75	3 Hrs	100	4
MPC105P	Pharmaceutical Chemistry Practical-I	20	30	6 Hrs	50	100	6 Hrs	150	6
MPC106	Seminar/Assignment	-	-	-	-	-	-	100	4
Total								650	26
Semester II									
MPC201T	Advanced Spectral Analysis	10	15	1 Hr	25	75	3 Hrs	100	4
MPC202T	Advanced Organic Chemistry-II	10	15	1 Hr	25	75	3 Hrs	100	4
MPC203T	Computer Aided Drug Design (CADD)	10	15	1 Hr	25	75	3 Hrs	100	4
MPC204T	Pharmaceutical Process Chemistry	10	15	1 Hr	25	75	3 Hrs	100	4
MPC205P	Pharmaceutical Chemistry Practical-II	20	30	6 Hrs	50	100	6 Hrs	150	6
MPC206	Seminar /Assignment	-	-	-	-	-	-	100	4
Total								650	26


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Schemes for Internal Assessments and End Semester Examinations (Semester III & IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continuous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester III									
MRM301T	Research Methodology and Biostatistics	40	60	2 Hr	100	-	-	100	4
MRM302T	Journal Club	-	-	-	25	-	-	25	1
MRM303P	Discussion /Presentation (Proposal Presentation)	-	-	-	50	-	-	50	2
MRM304P	Research Work	350	-	-	-	-	-	350	14
Total								525	21
Semester IV									
MRM401T	Journal Club	-	-	-	25	-	-	25	1
MRM402P	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75	3
MRM403P	Research Work and Colloquium	-	-	-	-	400	1 Hr	400	16
Total								500	20

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FIRST SEMESTER

PHARMACEUTICAL CHEMISTRY (MPC)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPC 101T)

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 Hrs

- 1. a. UV-Visible spectroscopy:** Introduction, theory, laws, instrumentation associated with UV-Visible spectroscopy. Choice of solvents and solvent effect. Applications of UV- visible spectroscopy. **11 Hrs**
- b. IR Spectroscopy:** Theory, modes of molecular vibrations, sample handling. Instrumentation of dispersive and Fourier-Transform IR spectrometer. Factors affecting vibrational frequencies. Applications of IR spectroscopy.
- c. Spectrofluorimetry:** Theory of fluorescence, factors affecting fluorescence, quenchers. Instrumentation and applications of fluorescence spectrophotometer.
- 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, NMR signals 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. Different types of ionization like electron impact, chemical, field, FAB and MALDI, APPI analyzers of quadrupole and time of flight. Mass Fragmentation and its rules, meta stable ions, isotopic peaks. Applications of mass spectroscopy. **11 Hrs**
- 4. Chromatography:** Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and application 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

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5. a. **Electrophoresis:** Principle, instrumentation, working conditions, factors affecting separation and applications of the following:

11 Hrs

- i. Paper electrophoresis
- ii. Gel electrophoresis
- iii. Capillary electrophoresis
- iv. Zone electrophoresis
- v. Moving boundary electrophoresis
- vi. Isoelectric focusing.

b. **X-ray Crystallography:** Production of X-rays, different X-ray diffraction methods, Bragg's law, rotating crystal technique, X-ray powder technique, types of crystals and applications of X-ray diffraction.

6. a. **Potentiometry:** Principle, working, Ion selective electrodes and application of potentiometry.

5 Hrs

b. **Thermal Techniques:** Principle, thermal transitions and instrumentation (Heat flux and power-compensation and designs), modulated DSC, hyper DSC, experimental parameters (Sample preparation, experimental 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, advantage and disadvantages, pharmaceutical applications.

c. **Immunological Assays:** RIA (Radio immune assay), ELISA, bioluminescence assays.

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Four handwritten signatures in blue ink are present at the bottom right of the page. The first signature is the most legible and appears to be 'Anish'. The other three are more stylized and difficult to decipher.

Scope
ADVANCED ORGANIC CHEMISTRY (MPC 102T)

To subject is designed to provide in-depth knowledge about advances in organic chemistry, different techniques of organic synthesis and their applications to process chemistry as well as drug discovery.

Objectives

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

- The principles and applications of retro-synthesis.
- The mechanism & applications of various named reactions.
- The concept of disconnection to develop synthetic routes for small target molecule.
- The various catalysts used in organic reactions.
- The chemistry of heterocyclic compounds.

THEORY

60 Hrs

1. Basic Aspects of Organic Chemistry:

- a) Organic intermediates: Carbocations, carbanions, free radicals, carbenes and nitrenes. Their method of formation, stability and synthetic applications.
- b) Types of reaction mechanisms and methods of determining them,
- c) Detailed knowledge regarding the reactions, mechanisms and their relative reactivity and orientations.
 - i. Addition reactions
 - ii. Substitution reactions (Nucleophilic uni- & bimolecular i.e. SN1 and SN2)
 - iii. Elimination reactions (E1 & E2; Hoffman & Saytzeff's rule).
 - iv. Rearrangement reactions.

2. Study of Mechanism and Synthetic Applications of Following Named Reactions: Ugi reaction, Brook rearrangement, Ullmann coupling reactions, Dieckmann Reaction, Doebner-Miller Reaction, Sandmeyer Reaction, Mitsunobu reaction, Mannich reaction, Vilsmeier-Haack Reaction, Sharpless asymmetric epoxidation, Baeyer-Villiger oxidation, Shapiro & Suzuki reaction, Ozonolysis and Michael addition reaction

12 Hrs

3. Synthetic Reagents & Applications: Aluminium isopropoxide, N-bromosuccinamide, diazomethane, dicyclohexyl-carbodiimide, Wilkinson reagent, Wittig reagent. Osmium tetroxide, titanium chloride, diazopropane, diethyl azodicarboxylate, Triphenylphosphine, Benzotriazol-1-yloxy) tris (dimethylamino) phosphonium hexafluoro-phosphate (BOP). **Protecting Groups:**

12 Hrs

- a) Role of protection in organic synthesis.
- b) Protection for the hydroxyl group, including 1,2- and 1,3 diols: ethers, esters, carbonates, cyclic acetals & ketals
- c) Protection for the carbonyl group: Acetals and Ketals
- d) Protection for the carboxyl group: Amides and hydrazides, esters
- e) Protection for the amino group and amino acids: Carbamates

12 Hrs

4. Heterocyclic Chemistry: Organic Name reactions with their respective mechanisms and application involved in synthesis of drugs containing five, six membered and fused heterocyclics such as Debus-Radziszewski imidazole synthesis, Knorr Pyrazole Synthesis, Pinner Pyrimidine Synthesis, Combes Quinoline Synthesis, Bernthsen Acridine

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Smiles rearrangement and Traube purine synthesis. Synthesis of few representative drugs containing these heterocyclic nucleus such as Ketoconazole, Metronidazole, Miconazole, celecoxib, antipyrin, Metamizole sodium, Terconazole, Alprazolam, Triamterene, Sulfamerazine, Trimethoprim, Hydroxychloroquine, Quinine, Chloroquine, Quinacrine, Amsacrine, Prochlorperazine, Promazine, Chlorpromazine, Theophylline, Mercaptopurine and Thioguanine.

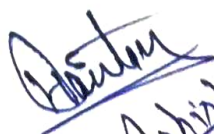
5. Synthon Approach and Retrosynthesis Applications:

12 Hrs

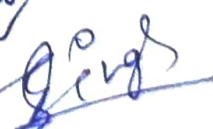
- Basic principles, terminologies and advantages of retrosynthesis; guidelines for
- dissection of molecules. Functional group interconversion and addition (FGI and FGA)
 - C-X disconnections; C-C disconnections – alcohols and carbonyl compounds; 1,2-, 1,3-, 1,4-, 1,5-, 1,6-difunctionalized compounds.
 - Strategies for synthesis of three, four, five and six-membered rings.


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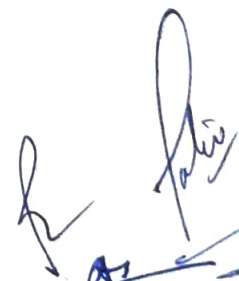

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ADVANCED MEDICINAL CHEMISTRY (MPG 103T)

Scope

The subject is designed to impart knowledge about recent advances in the field of medicinal chemistry at the molecular level including different techniques for the rational drug design.

Objectives

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

- Different stages of drug discovery.
- Role of medicinal chemistry in drug research.
- Different techniques for drug discovery.
- Various strategies to design and develop new drug like molecules for biological targets.
- Peptidomimetics.

THEORY

- | | | |
|----|--|--------|
| | | 60 Hrs |
| 1. | Drug Discovery: Stages of drug discovery, lead discovery; identification, validation and diversity of drug targets.
Biological Drug Targets: Receptors, types, binding and activation, theories of drug receptor interaction, drug receptor interactions, agonists vs antagonists, artificial enzymes. | 12 Hrs |
| 2. | History Prodrug Design and Analog design:
a) Prodrug design: Basic concept, Carrier linked prodrugs/Bio-precursors, Prodrugs of functional group, 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.
b) Combating Drug Resistance: Causes for drug resistance, strategies to combat drug resistance in antibiotics and anticancer therapy, Genetic principles of drug resistance.
c) Analog Design: Introduction, Classical & Non classical, Bio-isosteric replacement strategies, rigid analogs, alteration of chain branching, changes in ring size, ring position isomers, design of stereo isomers and geometric isomers, fragments of a leadmolecule, variation in inter atomic distance. | 12 Hrs |
| 3. | a) Medicinal Chemistry Aspects of the Following Class of Drugs: Systematic study, SAR, Mechanism of action and synthesis of new generation molecules of following classof drugs:
Anti-hypertensive drugs, psychoactive drugs, anticonvulsant drugs, H1 & H2 receptor antagonist, COX1 & COX2 inhibitors, adrenergic & cholinergic agents, antineoplastic and antiviral agents.
b) Stereochemistry and Drug Action: Realization that stereo selectivity is a pre-requisite for evolution. Role of chirality in selective and specific therapeutic agents. Case studies, Enantioselectivity in drug adsorption, metabolism, distribution and elimination. | 12 Hrs |
| 4. | Rational Design of Enzyme Inhibitors: Enzyme kinetics & primary amine inhibitors, enzyme inhibitors in medicine, enzyme inhibitors in basic research, rational design of non-covalently and covalently binding enzyme inhibitors. | 12 Hrs |

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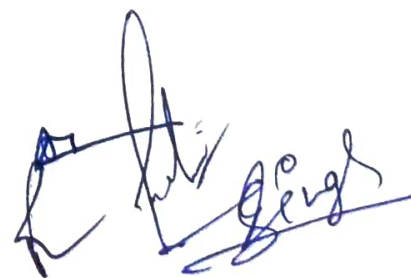
5. **Peptidomimetics:**
Hrs

Therapeutic values of peptidomimetics, design of peptidomimetics by manipulation of the amino acids, modification of the peptide backbone, incorporating conformational constraints locally or globally. Chemistry of prostaglandins, leukotrienes and thromboxones.


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Dr. Singh

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CHEMISTRY OF NATURAL PRODUCTS (MPC104T)

Scope

Course is designed to provide detail knowledge about chemistry of medicinal compounds from natural origin and general methods of structural elucidation of such compounds. It also emphasizes on isolation, purification and characterization of medicinal compounds from natural origin.

Objectives:

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

- Different types of natural compounds and their chemistry and medicinal importance.
- The importance of natural compounds as lead molecules for new drug discovery.
- The concept of rDNA technology tool for new drug discovery
- General methods of structural elucidation of compounds of natural origin.
- Isolation, purification and characterization of simple chemical constituents from natural source.

THEORY

60Hrs

1. Study of Natural products as leads for new pharmaceuticals for the following class of drugs- **12 Hrs**
 - a) Drugs affecting the central nervous system: Morphine alkaloids
 - b) Anticancer drugs: Paclitaxel and Docetaxel, Etoposide, and Teniposide
 - c) Cardiovascular drugs: Lovastatin, Teprotide and Dicoumarol
 - d) Neuromuscular blocking drugs: Curare alkaloids
 - e) Anti-malarial drugs and analogues
 - f) Chemistry of macrolide antibiotics (Erythromycin, Azithromycin, Roxithromycin, and Clarithromycin) and β - Lactam antibiotics (Cephalosporins and Carbapenem)
2. **12 Hrs**
 - a) **Alkaloids:** General introduction, classification, isolation, purification, molecular modification and biological activity of alkaloids, general methods of structural determination of alkaloids, structural elucidation and stereochemistry of Ephedrine, Morphine, Ergot, Emetine and Reserpine.
 - b) **Flavonoids:** Introduction, isolation and purification of flavonoids, General methods of structural determination of flavonoids- Structural elucidation of Quercetin.
 - c) **Steroids:** General introduction, chemistry of sterols, sapogenin and cardiac glycosides. Stereochemistry and nomenclature of steroids, chemistry of contraceptive agents male & female sex hormones (Testosterone, Estradiol, Progesterone), adrenocorticoids (Cortisone), contraceptive agents and steroids (Vitamin D).
3. **12 Hrs**
 - a) **Terpenoids:** Classification, isolation, isoprene rule and general methods of structural elucidation of terpenoids; Structural elucidation of drugs belonging to mono (citral, menthol, camphor), di (Retinol, Phytol, Taxol) and tri terpenoids (Squalene, Ginsenoside) carotinoids (β -Carotene).
 - b) **Vitamins:** Chemistry and physiological significance of vitamin A, B1, B2, B12, C, E, Folic acid and Niacin.
4. **12 Hrs**
 - a) **Recombinant DNA technology** and drug discovery rDNA technology, new pharmaceuticals derived from biotechnology. Oligonucleotide therapy: Introduction, clinical application and recent advances in genetherapy, principles of RNA & DNA estimation
 - b). Active constituent of crude drugs used in Indigenous system-Diabetic therapy-

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Gymnema sylvestre, Salacia reticulata, Pterocarpus marsupium, Swertia chirata, Trigonella foenum graecum; Liver dysfunction – Phyllanthus niruri; Antitumor – Curcuma longa Linn..

12 Hrs

5. **Structural characterization** of natural compounds structural characterization of natural compounds using IR, ¹H NMR, ¹³C NMR and MS Spectroscopy of specific drugs e.g., Penicillin, Morphine, Camphor, Vit-D, Quercetin and Digitalis glycosides.

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**PHARMACEUTICAL CHEMISTRY PRACTICALS – I (MPC
105P)**

1. Analysis of Pharmacopoeial compounds and their formulations by UV Vis spectrophotometer, RNA & DNA estimation.
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry.
3. Experiments based on Column chromatography.
4. Experiments based on HPLC.
5. Experiments based on Gas Chromatography.
6. Estimation of riboflavin/quinine sulphate by fluorimetry.
7. Estimation of sodium/potassium by flame photometry.

To perform the following reactions of synthetic importance-

8. Purification of organic solvents, column chromatography
9. Claisen-Schmidt reaction.
10. Benzyllic acid rearrangement.
11. Beckmann rearrangement.
12. Hoffmann rearrangement.
13. Mannich reaction.
14. Synthesis of medicinally important compounds involving more than one step along with purification and Characterization using TLC, melting point and IR spectroscopy (4 experiments).
15. Estimation of elements and functional groups in organic natural compounds.
16. Isolation, characterization like melting point, mixed melting point, molecular weight determination, functional group analysis, co-chromatographic technique for identification of isolated compounds and interpretation of UV and IR data.
17. Some typical degradation reactions to be carried on selected plant constituents

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SECOND SEMESTER

ADVANCED SPECTRAL ANALYSIS (MPC 201T)

Scope

This course is designed to explore various hyphenated analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are LC-MS, GC-MS, ATR-IR, DSC etc

Objectives

Upon completion of the course student shall be able to understand

- Interpretation of the NMR, Mass and IR spectra of various organic compounds.
- Theoretical and practical skills of the hyphenated instruments.
- Identification of organic compounds.

THEORY

60Hrs

1. **Introduction to Plant biotechnology:** Historical **UV and IR Spectroscopy:** Woodward – Fieser rule for 1,3- butadienes, cyclic dienes and α,β -carbonyl compounds and interpretation compounds of enones. ATR-IR, IR Interpretation of organic compounds. 12 Hrs
2. **Different tissue culture techniques:** Organogenesis **NMR Spectroscopy:** 1-D and 2-D NMR, NOESY and COSY, HECTOR, INADEQUATE techniques, interpretation of organic compounds. 15 Hrs
3. **Mass Spectroscopy:** Mass fragmentation and its rules, fragmentation of important functional groups like alcohols, amines, carbonyl groups and alkanes, meta stable ions, Mc-Lafferty rearrangement, ring rule, isotopic peaks, interpretation of organic compounds. 15 Hrs
4. **Biotransformation and Transgenesis:** Biotransformation. **Chromatography:** Principle, instrumentation and applications of the following : 13 Hrs
 - a) GC-MS
 - b) GC-AAS.
 - c) LC-MS.
 - d) LC-FTIR.
 - e) LC-NMR.
 - f) CEMS.
 - g) High performance thin layer chromatography.
 - h) Supercritical fluid chromatography.
 - i) Ion chromatography.
 - j) I-EC (Ion-Exclusion Chromatography).
 - k) Flash chromatography.
5. **a).Thermal Methods of Analysis:** Introduction, principle, instrumentation and application of DSC,DTA and TGA. 05 Hrs
b). Raman Spectroscopy: Introduction, principle, instrumentation and applications.
c).Radioimmunoassay: Biological standardization, Radioimmunoassay of digitalis and Insulin.

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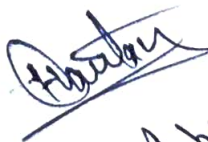
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3. Organic Spectroscopy by Kemp W., Palgrave, New York.
4. Spectrometric Identification of Organic Compounds by Silverstein R. M., 6th Edition, John Wiley and Sons, New Jersey.
5. Introduction to Spectroscopy by Pavia D.L., Lampman G.M., and Kriz G.S., Harcourt College Publishers, Philadelphia.
6. Quantitative Analysis of Drugs in Pharmaceutical Formulations by HPTLC by Sethi P. D., CBS Publishers, New Delhi.
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8. Pharmaceutical Analysis- Modern Methods- Part B by Munson J. W., Volume 11, Marcel Dekker Series, New York.
9. British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
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13. Methods in Plant Biochemistry: Plant Phenolics by Harborne J.B. and Dey P.M., Academic Press Inc. New York.
14. The Chemistry of Flavonoid Compounds by Geissman T.A., Pergamon Press, Oxford.
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ADVANCED ORGANIC CHEMISTRY (MPC 202T)

Scope

The subject is designed to provide in-depth knowledge about advances in organic chemistry, different techniques of organic synthesis and their applications to process chemistry as well as drug discovery.

Objectives

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

- The principles and applications of green chemistry
- The concept of peptide chemistry.
- The various catalysts used in organic reactions.
- The concept of stereochemistry and asymmetric synthesis.

THEORY

60Hrs

1. Green Chemistry:

- Introduction, principles of green chemistry.
- Microwave assisted reactions: Merit and demerits of its use, increased reaction rates, mechanism, superheating effects of microwave, effects of solvents in microwave assisted synthesis, microwave technology in process optimization, its applications in various organic reactions and heterocycles synthesis.
- Ultrasound assisted reactions: Types of sonochemical reactions, homogenous, heterogeneous liquid-liquid and liquid-solid reactions, synthetic applications
- Continuous flow reactors: Working principle, advantages and synthetic applications.

12 Hrs

2. Chemistry of peptides:

- Coupling reactions in peptide synthesis
- Principles of solid phase peptide synthesis, t-BOC and FMOC protocols, various solid supports and linkers: Activation procedures, peptide bond formation, deprotection and cleavage from resin, low and high HF cleavage protocols, formation of free peptides and peptide amides, purification and case studies, site-specific chemical modifications of peptides.
- Segment and sequential strategies for solution phase peptide synthesis with any two case studies.
- Side reactions in peptide synthesis: Deletion peptides, side reactions initiated by proton abstraction, protonation, overactivation and side reactions of individual amino acids.

12 Hrs

3. Photochemical Reactions: Basic principles of photochemical reactions. Photo-oxidation, photo-addition and photo-fragmentation.

12 Hrs

Pericyclic reactions: Mechanism, types of pericyclic reactions such as cycloaddition, electrocyclic reaction and sigmatropic rearrangement reactions with examples.

4. Catalysis:

- Types of catalysis, heterogeneous and homogeneous catalysis, advantages and disadvantages
- Heterogeneous catalysis – preparation, characterization, kinetics, supported catalysts, catalyst deactivation and regeneration, some examples of heterogeneous catalysts used in synthesis of drugs.

12 Hrs

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- c. Homogenous catalysis, hydrogenation, hydroformylation, hydrocyanation, Wilkinson Wilkinson catalysts, chiral ligands and chiralinduction, Ziegler-Natta catalysts, some examples of homogenous catalysis used in synthesis of drugs.
- d. Transition-metal and Organo-catalysis in organic synthesis: Metal-catalyzed reactions
- e. Biocatalysis: Use of enzymes in organic synthesis, immobilized enzymes/cells in organic reaction.
- f. Phase transfer catalysis: Theory and applications.

12 Hrs

5. **Stereochemistry & Asymmetric Synthesis:**

- a. Basic concepts in stereochemistry: Optical activity, specificrotation, racemates and resolution of racemates, the Cahn-Ingold-Prelog (CIP) sequence rule, meso compounds, pseudoasymmetric centres, axes of symmetry, Fischers D and L notation, cis-trans isomerism, E and Z notation.
- b. Methods of asymmetric synthesis using chiral pool, chiral auxiliaries and catalytic asymmetric synthesis, enantiopure separation and Stereo selective synthesis with examples.

REFERENCES

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COMPUTER AIDED DRUG DESIGN (MPC 203T)

Scope

The subject is designed to impart knowledge on the current state of the art techniques involved in computerassisted drug design.

Objectives

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

- Role of CADD in drug discovery.
- Different CADD techniques and their applications.
- Various strategies to design and develop new drug like molecules.
- Working with molecular modeling softwares to design new drug molecules.
- The in silico virtual screening protocols

THEORY

60 Hrs

1. **Introduction to Computer Aided Drug Design (CADD):** History, different techniques and applications: Quantitative structure activity relationships: Basics, history and development of QSAR: Physicochemical parameters and methods to calculate physicochemical parameters: Hammett equation and electronic parameters (sigma), lipophilicity effects and parameters (log P, pi-substituent constant), steric effects (Taft steric and MR parameters) Experimental and theoretical approaches for the determination of these physicochemical parameters. 12 Hrs
2. **Quantitative Structure Activity Relationships:** Applications: Hansch analysis, Free Wilson analysis and relationship between them, Advantages and disadvantages; Deriving 2D-QSAR equations. 3D-QSAR approaches and contour map analysis. Statistical methods used in QSAR analysis and importance of statistical parameters. 12 Hrs
3. **Molecular Modeling and Docking:**
 - a) Molecular and Quantum Mechanics in drug design.
 - b) Energy Minimization Methods: comparison between global minimum conformation and bioactive conformation.
 - c) Molecular docking and drug receptor interactions: Rigid docking, flexible docking and extra-precision docking. Agents acting on enzymes such as DHFR, HMG-CoA reductase and HIV protease, choline esterase (AChE & BChE).12 Hrs
4. **Molecular Properties and Drug Design:**
 - a) Prediction and analysis of ADMET properties of new molecules and its importance in drug design. Receptor/enzyme-interaction and its analysis, Receptor/enzyme cavity size prediction, predicting the functional components of cavities, Fragment based drug design.
 - b) Homology modeling and generation of 3D-structure of protein.12 Hrs
5. **Pharmacophore Mapping and Virtual Screening:** Concept of pharmacophore, pharmacophore mapping, identification of Pharmacophore features and Pharmacophore modeling; Conformational search used in pharmacophore mapping. In Silico Drug Design and Virtual Screening Techniques Similarity based methods and Pharmacophore based screening, structure based In-silico virtual screening protocols 12 Hrs

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1. Computational and Structural Approaches to Drug Design by Stroud R.M., Moore J. F., RSC Publisher, London.
2. Quantitative Drug Design: A Critical Introduction by Martin Y.C., CRC Press, London.
3. Drug Design by Ariens E.J., Volume 1 to 10, Academic Press, Cambridge.
4. Molecular Modeling: Basics Principles and Applications by Holtje H.D., Sippl W., Rognan D., Folkers G., Wiley-VCH, New Jersey.
5. Molecular Modeling: Principles and Applications by Leach A., Pearson, New York.
6. Molecular Modeling and Drug Design by Vinter J. G. and Gardner M., CRC Press, Florida.
7. Comprehensive Medicinal Chemistry by Hansch C., Pergamon Press, Oxford.
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17. Strategy of Drug Design: A Guide to Biological Activity by Purcell W.P., Bass G.E., Clayton J.M., PharmaMed Press, Hyderabad.
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PHARMACEUTICAL PROCESS CHEMISTRY (MPH 204T)

Scope

Process chemistry is often described as scale up reactions, taking them from small quantities created in the research lab to the larger quantities that are needed for further testing and then to even larger quantities required for commercial production. The goal of a process chemist is to develop synthetic routes that are safe, cost-effective, environmentally friendly, and efficient. The subject is designed to impart knowledge on the development and optimization of a synthetic route/s and the pilot plant procedure for the manufacture of Active Pharmaceutical Ingredients (APIs) and new chemical entities (NCEs) for the drug development phase.

Objectives

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

- The strategies of scale up process of APIs and intermediates.
- The various unit operations and various reactions in process chemistry.

THEORY

1. Process Chemistry:

60Hrs

12 Hrs

Introduction, Synthetic strategy. Stages of scale up process: Bench, pilot and large scale process. In-process control and validation of large scale process. Case studies of some scale up process of APIs. Impurities in API, types and their sources including genotoxic impurities.

2. Unit Operations:

12 Hrs

- Extraction: Liquid equilibria, extraction with reflux, extraction with agitation, counter current extraction.
- Filtration: Theory of filtration, pressure and vacuum filtration, centrifugal filtration.
- Distillation: azeotropic and steam distillation.
- Evaporation: Types of evaporators, factors affecting evaporation.
- Crystallization: Crystallization from aqueous, non-aqueous solutions factors affecting crystallization, nucleation. Principle and general methods of preparation of polymorphs, hydrates, solvates and amorphous APIs.

3. Unit Processes-I:

12Hrs

- Nitration: Nitrating agents, Aromatic nitration, kinetics and mechanism of aromatic nitration, process equipment for technical nitration, mixed acid for nitration.
- Halogenation: Kinetics of halogenations, types of halogenations, catalytic halogenations. Case study on industrial halogenation process.
- Oxidation: Introduction, types of oxidative reactions, Liquid phase oxidation with oxidizing agents. Nonmetallic Oxidizing agents such as H_2O_2 , sodium, ozonolysis.

4. Unit Processes-II:

12 Hrs

- Reduction: Catalytic hydrogenation, heterogeneous and homogeneous catalyst; hydrogen transfer reactions, metal hydrides. Case study on industrial reduction process.
- Fermentation: Aerobic and anaerobic fermentation. Production of
 - Antibiotics; Penicillin and Streptomycin.
 - Vitamins: B2 and B12

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- iii. Statins: Lovastatin, Simvastatin
- c) Reaction progress kinetic analysis.
 - i. Streamlining reaction steps, route selection.
 - ii. Characteristics of expedient routes, characteristics of cost-effective routes, reagent selection, families of reagents u
useful for scale-up.

5. Industrial Safety:

12 Hrs

- a) MSDS (Material Safety Data Sheet), hazard labels of chemicals and Personal Protection Equipment (PPE)
- b) Fire hazards, types of fire & fire extinguishers.
- c) Occupational Health & Safety Assessment Series 1800 (OHSAS-1800) and ISO-14001(Environmental Management System), Effluents and its management.

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2. Safety and Health in Industry A Handbook by Sharma A.M., BS Publications Hyderabad.
3. Pharmaceutical Manufacturing Encyclopedia, Volume 2.
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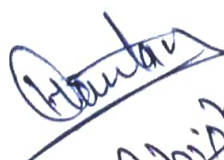
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PHARMACEUTICAL CHEMISTRY PRACTICALS - II (MPC 205P)

1. Synthesis of organic compounds by adapting different approaches involving (3 experiments)
 - a) Oxidation.
 - b) Reduction/hydrogenation.
 - c) Nitration.
2. Comparative study of synthesis of APIs/intermediates by different synthetic routes (2 experiments).
3. Assignments on regulatory requirements in API (2 experiments).
4. Comparison of absorption spectra by UV and Woodward – Fieser rule.
5. Interpretation of organic compounds by FT-IR.
6. Interpretation of organic compounds by NMR.
7. Interpretation of organic compounds by MS.
8. Determination of purity by DSC in pharmaceuticals.
9. Identification of organic compounds using FT-IR, NMR, CNMR and Mass spectra.
10. To carry out the preparation of following organic compounds.
11. Preparation of 4-chlorobenzhydrylpiperazine. (An intermediate for cetirizine HCl).
12. Preparation of 4-iodotoluene from p-toluidine.
13. NaBH₄ reduction of vanillin to vanillyl alcohol.
14. Preparation of Umbelliferon by Pechmann reaction.
15. Preparation of triphenyl imidazole.
16. To perform the Microwave irradiated reactions of synthetic importance (Any two).
17. Determination of log P, MR, hydrogen bond donors and acceptors of selected drugs using software.
18. Calculation of ADMET properties of drug molecules and its analysis using Software, Pharmacophore modeling.
19. 2D-QSAR based experiments.
20. 3D-QSAR based experiments.
21. Docking study-based experiment.
22. Virtual screening-based experiment.

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Study & Evaluation Scheme

Of

Master of Pharmacy (M. Pharm.)

[Applicable w.e.f. Academic Session 2025-26]

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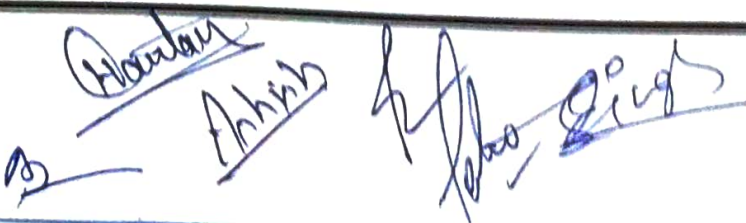
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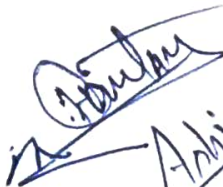
(Established under Govt. of U. P. Act No. 12, 2024)

**Study & Evaluation Scheme
of
Master of Pharmacy**

SUMMARY

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M. Pharm (Pharmacognosy)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards
M. Pharm Pharmacognosy 1st Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MPG101T	Modern Pharmaceutical Analytical Techniques	4	-	-	4	4	100
MPG102T	Advanced Pharmacognosy-I	4	-	-	4	4	100
MPG103T	Phytochemistry	4	-	-	4	4	100
MPG104T	Industrial Pharmacognostical Technology	4	-	-	4	4	100
MPG105P	Pharmacognosy Practical I	-	-	12	6	12	150
MPG106	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmacognosy 2nd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MPG201T	Medicinal Plant Biotechnology	4	-	-	4	4	100
MPG202T	Advanced Pharmacognosy-II	4	-	-	4	4	100
MPG203T	Indian Systems of Medicine	4	-	-	4	4	100
MPG204T	Herbal Cosmetics	4	-	-	4	4	100
MPG205P	Herbal Cosmetics Practical I	-	-	12	6	12	150
MPG206	Seminar/Assignment	7	-	-	4	7	100
TOTAL		23	-	12	26	35	650

M. Pharm Pharmacognosy 3rd Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM301T	Research Methodology and Biostatistics	4	-	-	4	4	100
MRM302	Journal Club	1	-	-	1	1	25
MRM303	Discussion/Presentation (Proposal Presentation)	2	-	-	2	2	50
MRM304	Research Work	-	-	28	14	28	350
TOTAL		7	-	28	21	35	525

M. Pharm Pharmacognosy 4th Semester

Course code	Subject Name	L	T	P	Credit Point	Hours	Marks
MRM 401	Journal Club	1	-	-	1	1	25
MRM 402	Research Work	-	-	31	16	31	75
MRM 403	Discussion/Final Presentation	3	-	-	3	3	400
TOTAL		4	-	31	20	35	500
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholar Activities)						Minimum=02 Maximum=07*	
Total Credits						Minimum=93 Maximum=100*	

* Credit Points for Co-curricular Activities

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M. Pharm (Pharmacognosy)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards

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 National Journals (indexed in Scopus/Web of Science)	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.

Total Credit 93
Minimum Credit 93+2=95
Maximum Credit 93+7=100

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**M. Pharm (Pharmacognosy)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards**

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continu- ous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester I									
MPG101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hrs	25	75	3 Hrs	100	4
MPG102T	Advance Pharmacognosy-I	10	15	1 Hrs	25	75	3 Hrs	100	4
MPG103T	Phytochemistry	10	15	1 Hrs	25	75	3 Hrs	100	4
MPG104T	Industrial Pharmacognostical Technology	10	15	1 Hrs	25	75	3 Hrs	100	4
MPG105P	Pharmacognosy Practical I	20	30	6 Hrs	50	100	6 Hrs	150	6
MPG106	Seminar/Assignment	-	-	-	-	-	-	100	4
Total								650	26
Semester II									
MPG201T	Medicinal Plant Biotechnology	10	15	1 Hr	25	75	3 Hrs	100	4
MPG202T	Advanced Pharmacognosy-II	10	15	1 Hr	25	75	3 Hrs	100	4
MPG203T	Indian Systems of Medicine	10	15	1 Hr	25	75	3 Hrs	100	4
MPG204T	Herbal Cosmetics	10	15	1 Hr	25	75	3 Hrs	100	4
MPG205P	Herbal Cosmetics Practical	20	30	6 Hrs	50	100	6 Hrs	150	6
MPG206	Seminar /Assignment	-	-	-	-	-	-	100	4
Total								650	26

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M. Pharm (Pharmacognosy)
Course Scheme As Per PCI
Post Graduate Program: 2 Years (4 Semesters)
BATCH 2025 Onwards

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Contin uous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester III									
MRM301T	Research Methodology and Biostatistics	40	60	2 Hr	100	-	-	100	4
MRM302	Journal Club	-	-	-	25	-	-	25	1
MRM303	Discussion /Presentation (Proposal Presentation)	-	-	-	50	-	-	50	2
MRM304	Research Work	350	-	-	-	-	-	350	14
Total								525	21
Semester IV									
MRM401	Journal Club	-	-	-	25	-	-	25	1
MRM402	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75	3
MRM403	Research Work and Colloquium	-	-	-	-	400	1 Hr	400	16
Total								500	20

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FUTURE UNIVERSITY
Future Institute of Pharmacy

Syllabus

For
M.Pharm. (Pharmacognosy)
(Effective from the Session: 2025-26)

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Master of Pharmacy (M. Pharm.)

SCHEMES FOR INTERNAL ASSESSMENTS AND END SEMESTER EXAMINATIONS (SEM. I & II)

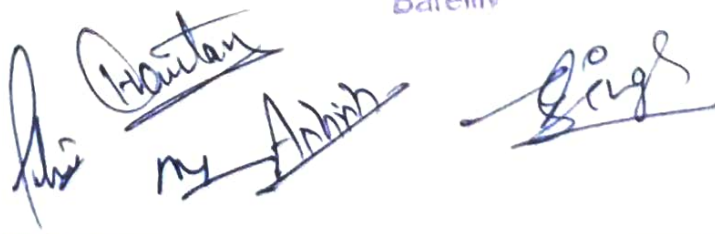
(W.E.F. Session 2025-26)

PHARMACOGNOSY-MPG

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continuous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester I									
MPG101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hrs	25	75	3 Hrs	100	4
MPG102T	Advanced Pharmacognosy-I	10	15	1 Hrs	25	75	3 Hrs	100	4
MPG103T	Phytochemistry	10	15	1 Hrs	25	75	3 Hrs	100	4
MPG104T	Industrial Pharmacognostical Technology	10	15	1 Hrs	25	75	3 Hrs	100	4
MPG105P	Pharmacognosy Practical-I	20	30	6 Hrs	50	100	6 Hrs	150	6
MPG106	Seminar/Assignment	-	-	-	-	-	-	100	4
Total								650	26
Semester II									
MPG201T	Medicinal Plant Biotechnology	10	15	1 Hr	25	75	3 Hrs	100	4
MPG202T	Advanced Pharmacognosy-II	10	15	1 Hr	25	75	3 Hrs	100	4
MPG203T	Indian Systems of Medicine	10	15	1 Hr	25	75	3 Hrs	100	4
MPG204T	Herbal Cosmetics	10	15	1 Hr	25	75	3 Hrs	100	4
MPG205P	Herbal Cosmetics Practical	20	30	6 Hrs	50	100	6 Hrs	150	6
MPG206	Seminar /Assignment	-	-	-	-	-	-	100	4
Total								650	26

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Schemes for Internal Assessments and End Semester Examinations (Semester III & IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks	Credit Points
		Continuous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
Semester III									
MRM301T	Research Methodology and Biostatistics	40	60	2 Hr	100	-	-	100	4
MRM302T	Journal Club	-	-	-	25	-	-	25	1
MRM303P	Discussion /Presentation (Proposal Presentation)	-	-	-	50	-	-	50	2
MRM304P	Research Work	350	-	-	-	-	-	350	14
Total								525	21
Semester IV									
MRM401T	Journal Club	-	-	-	25	-	-	25	1
MRM402P	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75	3
MRM403P	Research Work and Colloquium	-	-	-	-	400	1 Hr	400	16
Total								500	20

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FIRST SEMESTER

PHARMACOGNOSY (MPG)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPG 101T)

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 Hrs

- a. UV-Visible spectroscopy:** Introduction, theory, laws, instrumentation associated with UV-Visible spectroscopy. Choice of solvents and solvent effect. Applications of UV- visible spectroscopy. **11 Hrs**
- b. IR Spectroscopy:** Theory, modes of molecular vibrations, sample handling. Instrumentation of dispersive and Fourier-Transform IR spectrometer. Factors affecting vibrational frequencies. Applications of IR spectroscopy.
- c. Spectrofluorimetry:** Theory of fluorescence, factors affecting fluorescence, quenchers. Instrumentation and applications of fluorescence spectrophotometer.
- d. Flame Emission spectroscopy and Atomic Absorption Spectroscopy:** Principle, instrumentation, interferences and applications.
- 2. NMR Spectroscopy:** Quantum numbers and their role in NMR. Principle, instrumentation, solvent requirement in NMR, relaxation process, NMR signals 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. Different types of ionization like electron impact, chemical, field, FAB and MALDI, APPI analyzers of quadrupole and time of flight. Mass Fragmentation and its rules, meta stable ions, isotopic peaks. Applications of mass spectroscopy. **11 Hrs**
- 4. Chromatography:** Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and application of the following: **11 Hrs**
 - 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

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5. **a. Electrophoresis:** Principle, instrumentation, working conditions, factors affecting separation and applications of the following: 11 Hrs
- Paper electrophoresis
 - Gel electrophoresis
 - Capillary electrophoresis
 - Zone electrophoresis
 - Moving boundary electrophoresis
 - Isoelectric focusing.
- b. X-ray Crystallography:** Production of X-rays, different X-ray diffraction methods, Bragg's law, rotating crystal technique, X-ray powder technique, types of crystals and applications of X-ray diffraction.
6. **a. Potentiometry:** Principle, working, Ion selective electrodes and application of potentiometry. 5 Hrs
- b. Thermal Techniques:** Principle, thermal transitions and instrumentation (Heat flux and power-compensation and designs), modulated DSC, hyper DSC, experimental parameters (Sample preparation, experimental 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, advantage and disadvantages, pharmaceutical applications.
- c. Immunological Assays:** RIA (Radio immune assay), ELISA, bioluminescence assays.

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- Principles of Instrumental Analysis by Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
- Instrumental Methods of Analysis by Willards, 7th edition, CBS publishers.
- Practical Pharmaceutical Chemistry by Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
- Organic Spectroscopy by William Kemp, 3rd Edition, ELBS, 1991.
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- Pharmaceutical Analysis Modern Methods- Part B by J. W. Munson, Volume 11, Marcel Dekker Series.
- Pharmacopoeia of India, Ministry of Health, Govt. of India.
- Introduction to Spectroscopy by Pavia D.L., Lampman G.M., and Kriz G.S., 3rd Edition, Harcourt College Publishers, Philadelphia.
- Analytical Profile of Drug Substance (All volume) by Florey K., Academic Press, Elsevier, Massachusetts.
- Spectroscopy of Organic Compounds by Kalsi P.S., New Age International Publishers, New Delhi.

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12. Undergraduate Instrumental Analysis by Obonson J.W.R., Marcel Dekker Inc, New York.
13. Absorption Spectroscopy of Organic Molecules by Parikh V.H., Addison-Wesley Publishing Co., London.
14. Thin Layer Chromatography: A Laboratory Handbook by Stahl E., Springer, Berlin.
15. A Text Book of Pharmaceutical Chemistry by Chatten L.G., Vol. I & II, Marcel Dekker, New York.

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ADVANCED PHARMACOGNOSY (MPG 102T)

Scope

To learn and understand the advances in the field of cultivation and isolation of drugs of natural origin, various phytopharmaceuticals, nutraceuticals and their medicinal use and health benefits.

Objectives

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

- Advances in the cultivation and production of drugs.
- Various phyto-pharmaceuticals and their source, its utilization and medicinal value.
- Various nutraceuticals/herbs and their health benefits.
- Drugs of marine origin.
- Pharmacovigilance of drugs of natural origin.

THEORY

60 Hrs

1. **Plant drug cultivation:** General introduction to the importance of Pharmacognosy in herbal drug industry, Indian Council of Agricultural Research, Current Good Agricultural Practices, Current Good Cultivation Practices, Current Good Collection Practices, Conservation of medicinal plants- Ex-situ and In- situ conservation of medicinal plants. **12 Hrs**
2. **Marine natural products:** General methods of isolation and purification, Study of Marine toxins, Recent advances in research in marine drugs, Problems faced in research on marine drugs such as taxonomical identification, chemical screening and their solution.
3. **Nutraceuticals:** Current trends and future scope, Inorganic mineral supplements, Vitamin supplements, Digestive enzymes, Dietary fibres, Cereals and grains, Health drinks of natural origin, Antioxidants, Polyunsaturated fatty acids, Herbs as functional foods, Formulation and standardization of nutraceuticals, Regulatory aspects, FSSAI guidelines, Sources, name of marker compounds and their chemical nature, medicinal uses and health benefits of following:- **12 Hrs**
 - i) Spirulina ii) Soya bean iii) Ginseng iv) Garlic v) Broccoli vi) Green and Herbal Tea vii) Flax seeds viii) Black cohosh ix) Turmeric.
4. **Phytopharmaceuticals:** Occurrence, isolation and characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of following. **12 Hrs**
 - a) Carotenoids – i) α and β - Carotene ii) Xanthophyll (Lutein)
 - b) Limonoids – i) d-Limonene ii) α - Terpineol
 - c) Saponins – i) Shatavarins
 - d) Flavonoids – i) Resveratrol ii) Rutin iii) Hesperidin iv) Naringin v) Quercetin
 - e) Phenolic acids- Ellagic acid
 - f) Vitamins
 - g) Tocotrienols and Tocopherols
 - h) Andrographolide, Glycolipids, Gugulipids, Withanolides, Vascine, Taxol
 - i) Miscellaneous of drug permeation, methods to overcome barriers.

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5. **Pharmacovigilance of drugs of natural origin:** WHO and AYUSH guidelines for safety monitoring of natural medicine, Spontaneous reporting schemes for bio drug adverse reactions, bio drug-drug and bio drug-food interactions with suitable examples.

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2. Pharmacognosy-Tyler, Brady, Robbers
3. Modern Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II
4. Text Book of Pharmacognosy by T.E. Wallis
5. Marine Natural Products-Vol.I to IV.
6. Natural products: A lab guide by Raphael Ikan , Academic Press 1991.
7. Glimpses of Indian Ethano Pharmacology, P. Pushpangadam. Ulf Nyman. V.George Tropical Botanic Garden & Research Institute, 1995.
8. Medicinal natural products (a biosynthetic approach), Paul M. Dewick, John Wiley & Sons Ltd., England. 1998.
9. Chemistry of Marine Natural Products- Paul J. Schewer 1973.
10. Herbal Drug Industry by RD. Choudhary, Eastern Publisher, New Delhi, 1996.
11. Cultivation of Medicinal Plants by C.K. Atal & B.M. Kapoor.
12. Cultivation and Utilization of Aromatic Plants, C.K. Atal & B.M. Kapoor
13. Cultivation of medicinal and aromatic crops, AA Farooqui and B.S. Sreeramu. University Press, 2001.
14. Natural Products from Plants, 1st edition, by Peter B. Kaufman, CRC Press, New York, 1998
15. Recent Advances in Phytochemistry- Vol. 1&4: Scikel Runeckles- Appleton Century crofts.
16. Text book of Pharmacognosy, C.K.Kokate, Purohit, Ghokhale, Nirali Prakashan, 1996.
17. Pharmacognosy and Pharmaco-biotechnology, Ashutosh kar, New Age Publications, New Delhi.

JOURNALS

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

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PHYTOCHEMISTRY (MPG 103T)

Scope

Students shall be equipped with the knowledge of natural product drug discovery and will be able to isolate, identify and extract and the phyto- constituents

Objectives

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

- The different classes of phytoconstituents, their biosynthetic pathways, their properties, extraction and general process of natural product drug discovery
- phytochemical fingerprinting and structure elucidation of phytoconstituents.

THEORY

60 Hrs

1. **Biosynthetic pathways and Radio tracing techniques: Constituents & their Biosynthesis, Isolation, Characterization and purification with a special reference to their importance in herbal industries of following phyto-pharmaceuticals containing drugs:** 12 Hrs
 - a) Alkaloids: Ephedrine, Quinine, Strychnine, Piperine, Berberine, Taxol, Vinca alkaloids.
 - b) Glycosides: Digitoxin, Glycyrrhizin, Sennosides, Bacosides, Quercetin.
 - c) Steroids: Hecogenin, guggulosterone and withanolides
 - d) Coumarin: Umbelliferone.
 - e) Terpenoids: Cucurbitacins
2. **Drug discovery and development:** History of herbs as source of drugs and drug discovery, the lead structure selection process, structure development, product discovery process and drug registration, Selection and optimization of lead compounds with suitable examples from the following source: artemesin, andrographolides. Clinical studies emphasising on phases of clinical trials, protocol design for lead molecules. 12 Hrs
3. **Extraction and Phytochemical studies:** Recent advances in extractions with emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extraction and other methods of extraction commonly used like microwave assisted extraction, Methods of fractionation. Separation of phytoconstituents by latest CCCET, SCFE techniques including preparative HPLC and Flash column chromatography. 12 Hrs
4. **Compression and Compaction:** Physics Phytochemical finger printing: HPTLC and LCMS/GCMS applications in the characterization of herbal extracts. Structure elucidation of phytoconstituents. 12 Hrs
5. **Structure elucidation** of the following compounds by spectroscopic techniques like UV, IR, MS, NMR (^1H , ^{13}C) 12 Hrs
 - a) Carvone, Citral, Menthol
 - b) Luteolin, Kaempferol
 - c) Nicotine, Caffeine iv) Glycyrrhizin.

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2. Pharmacognosy by Trease and Evans, ELBS.
3. Pharmacognosy by Tylor and Brady.
4. Text book of Pharmacognosy by Wallis.
5. Clark's isolation and Identification of drugs by A.C. Mottal.
6. Plant Drug Analysis by Wagner & Bladt.
7. Wilson and Gisvolds text book of Organic Medicinnal and Pharmaceutical Chemistry by Deorge. R.
8. The Chemistry of Natural Products, Edited by R.H. Thomson, Springer International Edn. 1994.
9. Natural Products Chemistry Practical Manual by Anees A Siddiqui and Seemi Siddiqui
10. Organic Chemistry of Natural Products, Vol. 1&2. Gurdeep R Chatwal.
11. Chemistry of Natural Products- Vol. 1 onwards IWPAC.
12. Modem Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II
13. Medicinal Natural products – a biosynthetic approach, Dewick PM, John Wiley & Sons, Toronto, 1998.
14. Chemistry of Natural Products, Bhat SV, Nagasampagi BA, Meenakshi S, Narosa Publishing House New Delhi.
15. Pharmacognosy & Phytochemistry of Medicinal Plants, 2nd edition, Bruneton J, Interceptt Ltd., New York, 1999.

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INDUSTRIAL PHARMCOGNOSTICAL TECHNOLOGY (MPG104T)

Scope

Course designed to understand the Industrial and commercial potential of drugs of natural origin, integrate traditional Indian systems of medicine with modern medicine and also to know regulatory and quality policy for the trade of herbals and drugs of natural origin.

Objectives:

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

- The requirements for setting up the herbal/natural drug industry.
- The guidelines for quality of herbal/natural medicines and regulatory issues
- The patenting/IPR of herbals/natural drugs and trade of raw and finished materials.

THEORY

60Hrs

1. **Herbal drug industry:** Infrastructure of herbal drug industry involved in production of standardized extracts and various dosage forms. Current challenges in upgrading and modernization of herbal formulations. Entrepreneurship Development, Project selection, project report, technical knowledge, Capital venture, plant design, layout and construction. Pilot plant scale –up techniques, case studies of herbal extracts. Formulation and production management of herbals.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. 12 Hrs
2. **Regulatory requirements for setting herbal drug industry:** Global marketing management. Indian and international patent law as applicable herbal drugs and natural products. Export - Import (EXIM) policy, TRIPS.Quality assurance in herbal/natural drug products. Concepts of TQM, GMP, GLP, ISO-9000. 12 Hrs
3. **Monographs of herbal drugs:** General parameters of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic Pharmacopoeia, Siddha and Unani Pharmacopoeia, American herbal pharmacopoeia, British herbal pharmacopoeia, WHO guidelines in quality assessment of herbal drugs. 12 Hrs
4. **Testing of natural products and drugs:** Herbal medicines - clinical laboratory testing. Stability testing of natural products, protocols. 12 Hrs
5. **Patents:** Indian and international patent laws, proposed amendments as applicable to herbal/natural products and process. Geographical indication, Copyright, Patentable subject matters, novelty, non-obviousness, utility, enablement and best mode, procedure for Indian patent filing, patent processing, grant of patents, rights of patents, cases of patents, opposition and revocation of patents, patent search and literature, Controllers of patents. 12 Hrs

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2. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine by Pulok K Mukharjee (2003), Ist Edition, Business horizons Robert Verpoorte, New Delhi.
3. Quality control of herbal drugs by Pulok K Mukarjee (2002), Business Horizons Pharmaceutical Publish New Delhi.
4. PDR for Herbal Medicines (2000), Medicinal Economic Company, New Jersey.
5. Indian Herbal Pharmacopoeia (2002), IDMA, Mumbai.
6. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (1996), Nirali Prakashan, New Delhi.
7. Text book of Pharmacognosy and Phytochemistry by Vinod D. RangarI (2002), Part I & II, Career Publication, Nasik, India.
8. Plant drug analysis by H.Wagner and S.Bladt, Springer, Berlin.
9. Standardization of Botanicals. Testing and extraction methods of medicinalherbs by V. Rajpal (2004), Vol.I, Eastern Publisher, New Delhi.
10. Phytochemical Dictionary. Handbook of Bioactive Compounds from Plants by J.B.Harborne, (1999), Ist Edition, Taylor and Francis Ltd, UK.
11. Herbal Medicine. Expanded Commission E Monographs by M.Blumenthal, (2004), IST Edition,
12. Drug Formulation Manual by D.P.S.Kohli and D.H.Shah (1998), Eastern Publisher, New Delhi.

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PHARMACOGNOSY PRACTICALS – I
(MPG 105P)

1. Analysis of Pharmacopoeial compounds of natural origin and their formulations by UV Vis spectrophotometer
2. Analysis of recorded spectra of simple phytoconstituents
3. Experiments based on Gas Chromatography
4. Estimation of sodium/potassium by flame photometry
5. Development of fingerprint of selected medicinal plant extracts commonly used in herbal drug industry viz. Ashwagandha, Tulsi, Bael, Amla, Ginger, Aloe, Vidang, Senna, Lawsonia by TLC/HPTLC method
6. Methods of extraction
7. Phytochemical screening
8. Demonstration of HPLC- estimation of glycyrrhizin
9. Monograph analysis of clove oil
10. Monograph analysis of castor oil.
11. Identification of bioactive constituents from plant extracts
12. Formulation of different dosage forms and their standardisation.

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SECOND SEMESTER

MEDICINAL PLANT BIO-TECHNOLOGY (MPG 201T)

Scope

This course is designed to explore the knowledge of Biotechnology and its application in the improvement quality of medicinal plants

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

60Hrs

1. **Introduction to Plant biotechnology:** Historical perspectives, prospects for development of plant biotechnology as a source of medicinal agents. Applications in pharmacy and allied fields. Genetic and molecular biology as applied to pharmacognosy, study of DNA, RNA and protein replication, genetic code, regulation of gene expression, structure and complicity of genome, cell signaling, DNA recombinant technology. **12 Hrs**
2. **Different tissue culture techniques:** Organogenesis and embryogenesis, synthetic seed and monoclonal variation, Protoplast fusion, Hairy root multiple shoot cultures and their applications. Micro propagation of medicinal and aromatic plants. Sterilization methods involved in tissue culture, gene transfer in plants and their applications. **15 Hrs**
3. **Immobilization techniques & Secondary Metabolite Production:** Immobilization techniques of plant cell and its application on secondary metabolite Production. Cloning of plant cell: Different methods of cloning and its applications. Advantages and disadvantages of plant cell cloning. Secondary metabolism in tissue cultures with emphasis on production of medicinal agents. Precursors and elicitors on production of secondary metabolites. **15 Hrs**
4. **Biotransformation and Transgenesis:** Biotransformation, bioreactors for pilot and large scale cultures of plant cells and retention of biosynthetic potential in cell culture. Transgenic plants, methods used in gene identification, localization and sequencing of genes. Application of PCR in plant genome analysis. **13 Hrs**
5. **Fermentation technology:** Application of Fermentation technology, Production of ergot alkaloids, single cell proteins, enzymes of pharmaceutical interest. **05 Hrs**

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1. Novel Plant tissue culture, Bhagwani, vol 5, Elsevier Publishers.
2. Plant cell and Tissue Culture (Lab. Manual), JRMM. Yeoman
3. Elements in biotechnology by PK. Gupta, Rastogi Publications, New Delhi.
4. An introduction to plant tissue culture by MK. Razdan, Science Publishers.
5. Experiments in plant tissue culture by John HD and Lorin WR., Cambridge University Press.
6. Pharmaceutical biotechnology by SP. Vyas and VK. Dixit, CBS Publishers.
7. Plant cell and tissue culture by Jeffrey W. Pollard and John M Walker, Humana press.
8. Plant tissue culture by Dixon, Oxford Press, Washington DC, 1985
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10. Pharmacognosy by G. E. Trease and WC. Evans, Elsevier.
11. Biotechnology by Purohit and Mathur, Agro-Bio, 3rd revised edition.
12. Biotechnological applications to tissue culture by Shargool, Peter D, Shargoal, CKC Press.
13. Pharmacognosy by Varo E. Tyler, Lynn R. Brady and James E. Robberrt, That Tjen, NGO.
14. Plant Biotechnology, Ciddi Veerasham.

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ADVANCED PHARMACOGNOSY II (MPG 202T)

Scope

To know and understand the Adulteration and Deterioration that occurs in herbal/natural drugs and methods of detection of the same. Study of herbal remedies and their validations, including methods of screening

Objectives

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

- The validation of herbal remedies
- The methods of detection of adulteration and evaluation techniques for the herbal drugs
- The methods of screening of herbals for various biological properties

THEORY

60Hrs

1. **Herbal remedies – Toxicity and Regulations:** Herbals vs Conventional drugs, Efficacy of Herbal medicine products, Validation of herbal therapies, Pharmacodynamic and Pharmacokinetic issues. **12 Hrs**
2. **Adulteration and Deterioration:** Introduction, Types of Adulteration/ Substitution of Herbal drugs, Causes and Measures of Adulteration, Sampling Procedures, Determination of Foreign Matter, DNA Finger printing techniques in identification of drugs of natural origin, detection of heavy metals, pesticide residues, phytotoxin, microbial contamination in herbs and their formulations. **12 Hrs**
3. **Ethnobotany and Ethnopharmacology:** Ethnobotany in herbal drug evaluation, Impact of Ethnobotany in traditional medicine, New development in herbals, Bio-prospecting tools for drug discovery, Role of Ethnopharmacology in drug evaluation, Reverse Pharmacology. **12 Hrs**
4. **Analytical Profiles of herbal drugs:** Andrographis paniculata, Boswellia serata, Coleus forskholii, Curcuma longa, Embelica officinalis, Psoralea corylifolia. **12 Hrs**
5. **Biological screening of herbal drugs:** Introduction and Need for Phyto-Pharmacological Screening, New Strategies for evaluating **12 Hrs**

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1. Glimpses of Indian Ethano Pharmacology by P. Pushpangadam. Ulf Nyman. V.George Tropical Botanic Garden & Research Institute.
2. Natural products: A lab guide by Raphael Ikan, Academic Press.
3. Pharmacognosy - G. E. Trease and W.C. Evans. WB. SaundersEdinburgh, New York.
4. Pharmacognosy-Tyler, Brady, Robbers, Lee & Fetiger.
5. Modern Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I & II, Springer Publishers.
6. Herbal Drug Industry by RD. Choudhary, Eastern Publishers, New Delhi.
7. Text book of Pharmacognosy by C.K.Kokate, Purohit, Ghokhale, Nirali Prakashan.
8. Text Book of Pharmacognosy by T.E. Wallis, J & A Churchill Ltd., London.
9. Quality control of herbal drugs by Pulok K Mukherjee, Business Horizons Pharmaceutical Publishers, New Delhi.
10. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
11. Text book of Pharmacognosy and Phytochemistry by Vinod D. RangarI,Part I & II, Career Publication, Nasi India.
12. Plant drug analysis by H.Wagner and S.Bladt, 2nd edition, Springer, Berlin.
13. Standardization of Botanicals. Testing and extraction methods of medicinalherbs by V. Rajpal (2004), Vol.I. Eastern PublisherS, New Delhi.
14. Herbal Medicine. Expanded Commission E Monographs, M.Blumenthal.

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INDIAN SYSTEMS OF MEDICINE (MPG 203T)

Scope

To make the students understand thoroughly the principles, preparations of medicines of various Indian systems of medicine like Ayurveda, Siddha, Homeopathy and Unani. Also focusing on clinical research of traditional medicines, quality assurance and challenges in monitoring the safety of herbal medicines.

Objectives

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

- the basic principles of various Indian systems of medicine.
- the clinical research of traditional medicines, Current Good Manufacturing Practice of Indian systems of medicine and their formulations.

THEORY

60 Hrs

- 1) Fundamental concepts of Ayurveda, Siddha, Unani and Homoeopathy systems of medicine. Different dosage forms of the ISM. Ayurveda: Ayurvedic Pharmacopoeia, Analysis of formulations and bio crude drugs with references to: Identity, purity and quality. Siddha: Gunapadam (Siddha Pharmacology), raw drugs/Dhatu/Jeevam in Siddha system of medicine, Purification process (Suddhi). 12 Hrs
- 2) Naturopathy, Yoga and Aromatherapy practices. 12 Hrs
 - (a) Naturopathy - Introduction, basic principles and treatment modalities.
 - (b) Yoga - Introduction and Streams of Yoga. Asanas, Pranayama, Meditations and Relaxation techniques.
 - (c) Aromatherapy – Introduction, aroma oils for common problems, carrier oils.
- 3) Formulation development of various systems of medicine Salient features of the techniques of preparation of some of the important class of Formulations as per Ayurveda, Siddha, Homeopathy and Unani Pharmacopoeia and texts. Standardization, Shelf life and Stability studies of ISM formulations. 12 Hrs
- 4) Schedule T – Good Manufacturing Practice of Indian systems of medicine Components of GMP (Schedule – T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records. Quality assurance in ISM formulation industry - GAP, GMP and GLP. Preparation of documents for new drug application and export registration. Challenges in monitoring the safety of herbal medicines: Regulation, quality assurance and control, National/Regional Pharmacopoeias. 12 Hrs
- 5) TKDL, Geographical indication Bill, Government bills in AYUSH, ISM, CCRAS, CCRS, CCRH, CCRU 12 Hrs

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REFERENCES

1. Ayurvedic Pharmacopoeia, The Controller of Publications, Civil Lines, Govt. of India, New Delhi.
2. Hand Book on Ayurvedic Medicines, H. Panda, National Institute of Industrial Research, New Delhi.
3. Ayurvedic System of Medicine, Kaviraj Nagendranath Sengupta, Sri Satguru Publications, New Delhi.
4. Ayurvedic Pharmacopoeia. Formulary of Ayurvedic Medicines, IMCOPS, Chennai.
5. Homeopathic Pharmacopoeia. Formulary of Homeopathic Medicines, IMCOPS, Chennai.
6. Homeopathic Pharmacy : An introduction & Hand book, Steven B. Kayne, Churchill Livingstone, New York.
7. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
8. British Herbal Pharmacopoeia, bRITISH Herbal Medicine Association, UK.
9. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine, Pulok K Mukharjee, Business Horizons, New Delhi.
10. Indian System of Medicine and Homeopathy in India, Planning and Evaluation Cell, Govt. of India, New Delhi.
11. Essential of Food and Nutrition, Swaminathan, Bappco, Bangalore.
12. Clinical Dietitics and Nutrition, F.P. Antia, Oxford University Press, Delhi.
13. Yoga - The Science of Holistic Living by V.K.Yoga, Vivekananda Yoga Prakashna Publishing, Bangalore.

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Ashish
S. K. Singh
Singh

HERBAL COSMETICS (MPH 204T)

Scope

This course deals with the study of preparation and standardization of herbal/natural cosmetics. This subject gives emphasis to various national and international standards prescribed regarding herbal cosmeceuticals.

Objectives

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

- the basic principles of various herbal/natural cosmetic preparations
- current Good Manufacturing Practices of herbal/natural cosmetics as per the regulatory authorities

THEORY

- | | 60 Hrs |
|--|--------|
| 1. Introduction: Herbal/natural cosmetics, Classification & Economic aspects. Regulatory Provisions relation to manufacture of cosmetics: - License, GMP, offences & Penalties, Import & Export of Herbal/natural cosmetics, Industries involved in the production of Herbal/natural cosmetics. | 12 Hrs |
| 2. Herbal preparations & excipients: Commonly used herbal cosmetics, raw materials, preservatives, surfactants, humectants, oils, colors, and some functional herbs, preformulation studies, compatibility studies, possible interactions between chemicals and herbs, design of herbal cosmetic formulation | 12 Hrs |
| 3. Herbal Cosmetics: Physiology and chemistry of skin and pigmentation, hairs, scalp, lips and nail, Cleansing cream, Lotions, Face powders, Face packs, Lipsticks, Bath products, soaps and baby product, Preparation and standardization of the following: Tonic, Bleaches, Dentifrices and Mouth washes & Tooth Pastes, Cosmetics for Nails. | 12 Hrs |
| 4. Cosmeceuticals of herbal and natural origin: Hair growth formulations, Shampoos, Conditioners, Colorants & hair oils, Fairness formulations, vanishing & foundation creams, anti-sun burn preparations, moisturizing creams, deodorants. | 12 Hrs |
| 5. Analysis of Cosmetics, Toxicity screening and test methods: Quality control and toxicity studies as per Drug and Cosmetics Act. | 12 Hrs |

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REFERENCES

1. Panda H. Herbal Cosmetics (Hand book), Asia Pacific Business Press Inc, New Delhi.
2. Thomson EG. Modern Cosmetics, Universal Publishing Corporation, Mumbai.
3. P.P.Sharma. Cosmetics - Formulation, Manufacturing & Quality Control, Vandana Publications, New Delhi.
4. Supriya K B. Handbook of Aromatic Plants, Pointer Publishers, Jaipur.
5. Skaria P. Aromatic Plants (Horticulture Science Series), New India Publishing Agency, New Delhi.
6. Kathi Keville and Mindy Green. Aromatherapy (A Complete Guide to the Healing Art), Sri Satguru Publications, New Delhi.
7. Chattopadhyay PK. Herbal Cosmetics & Ayurvedic Medicines (EOU), National Institute of Industrial Research, New Delhi.
8. Balsam MS & Edward Sagarin. Cosmetics Science and Technology, Wiley Interscience, New York.

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Anish
R. S. Singh

HERBAL COSMETICS PRACTICALS - II (MPH 205P)

1. Isolation of nucleic acid from cauliflower heads
2. Isolation of RNA from yeast
3. Quantitative estimation of DNA
4. Immobilization technique
5. Establishment of callus culture
6. Establishment of suspension culture
7. Estimation of aldehyde contents of volatile oils
8. Estimation of total phenolic content in herbal raw materials
9. Estimation of total alkaloid content in herbal raw materials
10. Estimation of total flavonoid content in herbal raw materials
11. Preparation and standardization of various simple dosage forms from Ayurvedic, Siddha, Homoeopathy and Unani formulary
12. Preparation of certain Aromatherapy formulations
13. Preparation of herbal cosmetic formulation such as lip balm, lipstick, facial cream, herbal hair and nail care products
14. Evaluation of herbal tablets and capsules
15. Preparation of sunscreen, UV protection cream, skin care formulations.
16. Formulation & standardization of herbal cough syrup.

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