RAMAIAH UNIVERSITY OF APPLIED SCIENCES

M.S. Ramaiah University of Applied Sciences

Programme Structure and Course Details

of

M. Pharm. Pharmaceutics

2022-2024

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

Programme Code: 058

Faculty of Pharmacy

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M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean - Academics
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University's Vision, Mission and Objectives

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

Vision

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

Mission

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

Objectives

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

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Faculty	Pharmacy
Department	Pharmaceutics
Programme Code	058
Programme Name	M. Pharm. Pharmaceutics
Dean of the Faculty	Dr. S. Bharath
Head of the Department	Dr. B.V Basavaraj

1. **Title of the Award:** M. Pharm. in Pharmaceutics
2. **Mode of Study:** Full-Time
3. **Awarding Institution /Body:** M. S. Ramaiah University of Applied Sciences, Bengaluru
4. **Joint Award:** Not Applicable
5. **Teaching Institution:** Faculty of Pharmacy, M. S. Ramaiah University of Applied Sciences, Bengaluru
6. **Date of Programme Specifications:** July 2022
7. **Date of Programme Approval by the Academic Council of MSRUAS:** 06 April 2017
8. **Next Review Date:** June 2024
9. **Programme Approving Regulating Body and Date of Approval:** Pharmacy Council of India
10. **Programme Accredited Body and Date of Accreditation:** Not Applicable
11. **Grade Awarded by the Accreditation Body:** Not Applicable
12. **Programme Accreditation Validity:** Not Applicable
13. **Programme Benchmark:** Not Applicable
14. **Rationale for the Programme**

There are many drug moieties with pharmacological properties, but needs special measures to achieve desired therapeutic activity at the site of action. Pharmaceutics is the science of dosage form design that converts drugs from natural or synthetic origin into medication to be used safely and effectively by patients. The Indian pharmaceutical industry currently tops the chart amongst India's science-based industries with wide ranging capabilities in the complex field of drug research and manufacture. The new drug launches, new drug filings, and increasing Phase II clinical trials create the thrust for competitive and qualified Postgraduates in Pharmaceutics. Taking into consideration high demand for skill-based pharmacists in the pharmaceutical field and the excellent opportunities available in the field of Pharmaceutics, Post Graduate Programme M. Pharm. in Pharmaceutics is being offered

The M. S. Ramaiah College of Pharmacy, now a constituent of MSRUAS as Faculty of Pharmacy has been in existence for almost three decades. Over the years, Faculty of Pharmacy of MSRUAS has grown and evolved as one of the Premier Institution in the state of Karnataka. It has very good infrastructure, noteworthy laboratory facilities, experienced and competent faculty members. During almost three decades Faculty of Pharmacy has produced enormous, competitive highly qualified pharmacy Graduates and Post graduates. The presence of other Faculties of Applied

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Sciences in the University will facilitate the students to have a better multi-disciplinary research experience and exposure in comparison to the conventional training procedures.
Faculty of Pharmacy of MSRUAS offering M. Pharm degree programme in Pharmaceutics featured with semester pattern curriculum is aimed to emphasize critical thinking, analytical and problem-solving skills with outcome based curriculum. Importance will be given to research projects based on rational drug design and development. The curriculum is structured to develop the students for taking up independent professional responsibilities and acquire necessary skills to compete with their global counterparts.

15. Programme Mission

The aim of the programme is to produce proficient postgraduates with advanced knowledge both in theoretical and applied topics; high order skills in analysis, critical evaluation and professional application; think differently and independently to solve complex problems related to research and pharmaceutical processes.

16. Graduate Attributes(GAs)

GA-1. Pharmacy Knowledge: Ability to acquire knowledge and comprehend the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

GA-2. Planning Abilities: Ability to demonstrate effective planning including time management, resource management, delegation skills and organizational skills. Also to develop and implement plans and organize work to meet deadlines.

GA-3. Problem analysis: Ability to utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

GA-4. Modern tool usage: Ability to learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

GA-5. Leadership skills: Ability to understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Also to assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well- being.

GA-6. Professional Identity: Ability to understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

GA-7. Pharmaceutical Ethics: Ability to honor personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks;

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apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

GA-8. **Communication:** Ability to communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, give and receive clear instructions.

GA-9. **The Pharmacist and society:** Ability to apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

GA-10. **Environment and sustainability: Ability** to understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

GA-11. **Life-long learning:** Ability to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self- assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

17. Programme Outcomes (POs)

M.Pharm. graduates will be able to:

PO-1. **Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

PO-2. **Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

PO-3. **Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

PO-4. **Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

PO-5. **Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well- being.

PO-6. **Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

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PO-7. Pharmaceutical Ethics: Honor personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

PO-8. Communication: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

PO-9. The Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

PO-10. Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO-11. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self- assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

18. Programme Goal

The Programme goal is to produce proficient postgraduates with advanced knowledge and skills in designing and developing novel target-based pharmaceuticals for better safety and efficacy to needy patients.

19. Program Educational Objectives (PEOs)

The objectives of the M. Pharm program in Pharmaceutics are to:

PEO-1. Provide students with various advancements in Pharmaceutics enable them to devise and deliver efficient solutions to challenging problems in Pharmacy and allied disciplines

PEO-2. Impart analytical and cognitive skills required to develop innovative solutions for R&D, Industry, and societal requirements

PEO-3. Provide sound knowledge of pharmacy, managerial and entrepreneurial skills to enable students to contribute to the well-being and welfare of the society

PEO-4. Inculcate strong human values and social, interpersonal and leadership skills required for professional success in evolving global professional environments

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20. Programme Specific Outcomes (PSOs)

At the end of the M. Pharm program in Pharmaceutics, the graduate will be able to:

PSO-1. Apply the knowledge of preformulation in drug development and interpret the fate of a drug in the biological system

PSO-2. Design stable and effective drug delivery systems using appropriate equipment, methodology with optimization techniques and carry out validation

PSO-3. Enable the leadership qualities and strive for the betterment of organization, environment and society

PSO-4. Demonstrate an understanding of the importance of life-long learning through professional development, practical training and specialized certifications

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21. Programme Structure:

Table 1 Programme Structure

SEMESTER – I			
Course Code	**Course**	**Credits**	**Hours/Week**
DEPARTMENT COMMON COURSE			
PSF501	1.Modern Pharmaceutical Analytical Techniques	4	4
PROGRAMME SPECIALIZATION COURSES			
PSC502	1.Drug Delivery Systems	4	4
PSC503	2.Modern Pharmaceutics	4	4
PSC504	3.Regulatory Affairs	4	4
PSL505	4. Pharmaceutics Practical - I	6	12
PSS506	5.Seminar / Assignment	4	7
SEMESTER - II			
PROGRAMME SPECIALIZATION COURSES			
PSC507	1.Molecular Pharmaceutics (Nano Technology and Targeted DDS)	4	4
PSC508	2Advanced Biopharmaceutics & Pharmacokinetics	4	4
PSC509	3.Computer Aided Drug Delivery System	4	4
PSC510	4. Cosmetic and Cosmeceuticals	6	12
PSL511	5. Pharmaceutics Practical -II	6	12
PSS512	6.Seminar / Assignment	4	7
SEMESTER - III			
FACULTY COMMON SPECIALIZATION COURSES			
PSF613	1.Research Methodology and Biostatistics	4	4
PSF614	2.Journal Club	1	1
PSF615	3.Group Project	4	-
PSF616	4.Discussion / Presentation (Proposal Presentation)	2	2
PSF617	5.Research Work	14	28
SEMESTER - IV			
PROGRAMME SPECIALIZATION COURSES			
PSF618	1.Journal Club	1	1
PSF619	2. Discussion / Presentation	3	3
PSF620	3. Research Work	16	31
	MANDATORY COURSE/S		
PSF621	1.Participation/Presentation in research forum: National / International Seminar, Conferences, Workshops	1-3	-
PSF622	2.Publication: National / International Journals		-
PSF623	3.Academic/Research award: State/National/International Agencies		-

22. Course Delivery: As per the Timetable

23. Teaching and Learning Methods

1. Face to Face Lectures using Audio-Visuals
2. Workshops, Group Discussions, Debates, Presentations
3. Demonstrations
4. Guest Lectures

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5. Laboratory work/Fieldwork/Workshop
6. Industry Visit
7. Seminars
8. Group Exercises
9. Project Work
10. Project
11. Exhibitions
12. Technical Festivals

24. Assessment and Grading

Table 2 Assessment and Grading

Semester I

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
PSF501	1.Modern Pharmaceutical Analytical Techniques	10	15	1 h	25	75	3 h	100
PSC502	2.Drug Delivery Systems	10	15	1 h	25	75	3 h	100
PSC503	3.Modern Pharmaceutics	10	15	1 h	25	75	3 h	100
PSC504	4.Regulatory Affairs	10	15	1 h	25	75	3 h	100
PSL505	5. Pharmaceutics Practical - I	20	30	6 h	50	100	6 h	150
PSS506	6.Seminar / Assignment	-	-	-	-	-	-	100

Semester II

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
PSC507	1. Molecular Pharmaceutics (Nano Technology and Targeted DDS)	10	15	1 h	25	75	3 h	100
PSC508	2. Advanced Biopharmaceutics & Pharmacokinetics	10	15	1 h	25	75	3 h	100
PSC509	3.Computer Aided Drug Delivery System	10	15	1 h	25	75	3 h	100
PSC510	4. Cosmetic and Cosmeceuticals	10	15	1 h	25	75	3 h	100
PSL511	5. Pharmaceutics Practical - II	20	30	6 h	50	100	6 h	150
PSS512	6.Seminar / Assignment	-	-	-	-	-	-	100

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Semester III

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
PSF613	1.Research Methodology and Biostatistics	10	15	1 h	25	75	3h	100
PSF614	2.Journal Club	-	-	-	25	-	-	25
PSF615	3.Group Project	-	-	-	-	-	-	-
PSF616	4.Discussion / Presentation (Proposal Presentation)	-	-	-	50	-	-	50
PSF617	5.Research Work	-	-	-	-	350	1 h	350

Semester IV

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
PSF618	1.Journal Club	-	-	-	25	-	-	25
PSF619	2. Discussion /Presentation	-	-	-	-	400	1 h	400
PSF620	3. Research Work	-	-	-	75	-	-	75

24.1 Components of Grading

There shall be **two components** of grading in the assessment of each course:

Component 1, Continuous Evaluation (CE): This component involves multiple subcomponents (SC1, SC2, etc.) of learning assessment. The assessment of the subcomponents of CE is conducted during the semester at regular intervals. This subcomponent represents the formative assessment of students' learning.

Component 2, Semester-end Examination (SEE): This component represents the summative assessment carried out in the form an examination conducted at the end of semester.

Marks obtained CE and SEE components have a weightage of 25:75 (CE:25% and SEE: 75%) in determining the final marks obtained by a student in a Course.

The complete details of Grading are given in the Academic Regulations.

24.2 Continuous Evaluation Policies

Continuous evaluation depends on the type of the course as discussed below:

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24.2.1 Theory Courses

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks ▶	8	2	15	
CO-1				
CO-2				
CO-3				
CO-4				
CO-5				
CO-6				
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

24.2.2 Laboratory Courses

Focus of Cos on each Component or Subcomponent of Evaluation				
	Component1: CE(25%Weightage)			Component2: SEE (75%Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 100 Marks
Maximum Marks ▶	10	10	30	
CO-1				
CO-2				
CO-3				
CO-4				
CO-5				
The details of SC1,SC2,SC3 are presented in the Programme Specifications Document.				

Table 3:- Scheme for awarding Continuous Evaluation-Theory

Criteria	Maximum Marks
Attendance*	8
Student-Teacher Interaction**	2
Total	10

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Table 4:- Guidelines for the allotment of marks for attendance*

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

Theory
(Component -1: 25 Marks + Component-2: 75Marks)
Component - 1: - 25 Marks
It has two sub-components (Part A & B)

Part – A: Continuous Evaluation: 10 Marks
The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Part – B: Sessional Examination: 15 Marks

Two sessional examinations (each for 15 Marks with one hour duration) will be conducted. Average marks of the two sessionals will be computed for sessional examination marks.

Component -2 Semester End Theory Examination: 75 Marks
Theory Examination: A theory exam shall be conducted for maximum marks 75 Marks with three hours of duration

Practical – 150 Marks

(Component -1: 50 Marks + Component-2: 100Marks)
Component - 1: - 50 Marks
It has two sub-components (Part A & B)
Part – A: Continuous Evaluation: 20 Marks
The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Scheme for awarding Continuous Evaluation -Practical

Criteria	Maximum Marks
Attendance*	10
Practical Records, Regular viva-voce**	10
Total	20

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Guidelines for allotment of marks for attendance*

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

Part – B: Sessional Examination: 30 Marks

Two sessional examinations (each for 30 Marks with six hour duration) will be conducted. Average marks of the two sessional will be computed for sessional examination marks.

Component -2 Semester End Practical Examination: 100 Marks

Practical Examination: 100 Marks with six hours of duration. Practical examination shall also consist of a viva –voce (Oral) examination.

The assessment questions are set to test the learning outcomes. In each component a certain learning outcome is assessed.

Note: For more details on the break-ups, please refer to the Course Specifications

A student is required to score an overall 50% for successful completion of a course and earn the credits.

Note: Final marks awarded in each of the courses will be confirmed only after SAB/PAB as explained in Academic Regulations of M. Pharm. Programme.

Assignment & Seminar

The detailed procedure and evaluation procedure is available in the Operation Manual / Student Handbook/Academic Regulations.

Journal Club

The detailed procedure and evaluation procedure is available in the Operation Manual / Student Handbook/Academic Regulations.

Group Project

The detailed procedure and evaluation procedure is available in the Operation Manual / Student Handbook/Academic Regulations

Mandatory Courses

The credit points assigned for extracurricular and or co-curricular activities shall be given by the Dean of the Faculty and the same shall be submitted to the University.

Name of the Activity	Maximum credit points Eligible/Activity
Participation in National level Seminar/ Conference / Workshop/Symposium/Training Programs	01
Participation in International level outside India Seminar/ Conference / Workshop/Symposium/Training Programs (Related to the specialization of the Student)	02
Academic Award/Research Award from State Level/National Agencies	01
Academic Award/Research Award from International Agencies	02

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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

Dissertation/Research Work

1. Every candidate shall carry out work on an assigned research project under the guidance of a recognized Postgraduate Teacher, the result of which shall be written up and submitted in the form of a dissertation.
2. Work for writing the Dissertation is aimed at contributing to the development of spirit of enquiry, besides exposing the candidate to the techniques of research, critical analysis, acquaintance with the latest advances in pharmaceutical/medical sciences and the manner of identifying and consulting available literature. Dissertation shall be submitted as per the notified time schedule mentioned in the Academic calendar / student hand book.
3. The Dissertation and viva-voce shall be evaluated by two examiners, one Internal and one External examiner appointed by the University.

Scheme of Evaluation of Dissertation book:

Objective(s) of the work done: 50 Marks
Methodology adopted: 150 Marks
Results and Discussions: 250 Marks
Conclusions and Outcomes: 50 Marks

Total: 500 Marks

Scheme of Evaluation of Presentation:

Presentation of work: 100 Marks
Communication skills: 50 Marks
Question and answer skills: 100 Marks

Total: 250 Marks

A student is required to score a minimum of 50% overall for successful completion of Dissertation and earn the corresponding credits.

Supplementary/re-registration examination and improvement of sessional marks

The eligibility criteria and procedures for supplementary examination and improvement of sessional marks are as per the Pharmacy Council of India (PCI) norms and as indicated in the Academic Regulations governing this programme.

25. Student Support for Learning

1. Course Notes
2. Reference Books in the Library
3. Magazines and Journals
4. Internet Facility
5. Computing Facility
6. Laboratory Facility
7. Workshop Facility

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8. Staff Support
9. Lounges for Discussions
10. Any other support that enhances their learning

26. Quality Control Measures

1. Review of Course Notes
2. Review of Question Papers and Assignment Questions
3. Student Feedback
4. Moderation of Assessed Work
5. Opportunities for students to see their assessed work
6. Review by external examiners and external examiners reports
7. Staff Student Consultative Committee meetings
8. Student exit feed back
9. Subject Assessment Board (SAB)
10. Programme Assessment Board (PAB)

27. Programme Map (Course-PO-PSO Map)

Sem.	Course Title	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
1	Modern Pharmaceutical Analytical Techniques	3		2	2		1	1	1			1	3	3		2
1	Drug Delivery Systems	3	3	3	3	2	2	2	1	2	1	2	3	3	2	2
1	Modern Pharmaceutics	3	2	3	2	1		3	2				2	2		2
1	Regulatory Affairs	3	1		1		2			2		2			2	2
1	Pharmaceutics Practical- I	3	2	3	3	1	2	2	1	2	3	3	3	3		3
1	Seminar / Assignment	3	3	2	3	2	2	2	3	1	2	3	1	1	2	3
2	Molecular Pharmaceutics (Nano Technology and Targeted DDS)	3	2	3	3	2	3	2	1	3	3	3	3	3	2	2
2	Advanced Biopharmaceutics & Pharmacokinetics	3	3	3	3	2	3	3	3	3	2	3	3	3	3	3
2	Computer Aided Drug Delivery System	3	2	3	3			1	1				3	2	1	3
2	Cosmetic and Cosmeceuticals	3	3	3	3	2	2	3	3	3	3	3	3	3	3	3
2	Pharmaceutics Practical- II	3		3	3		2	2	2	2	2	3	3	3		3
2	Seminar / Assignment	3	3	2	3	2	2	2	3	1	2	3	1	1	2	3
3	Research Methodology and Biostatistics	2	3	3	3		3	3	2	2	2	2	2	3	3	3
3	Journal Club	3	3	3	3	3		2	3			3	3		3	3
3	Group Project	3	3	3	3	3	2	1	2	3	1	2	3	3	2	1
3	Discussion / Presentation (Proposal Presentation)	3	3	3	2	3	3	2	3	3	2	3	3	3	3	2
3	Research Work	3	2	2	2	1	1	2	2	2	1	3	1	2	1	2
4	Journal Club	3	3	3	3	3		2	3			3	3		3	3

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4	Discussion / Presentation	2	3	3	3	2	2	1	3	1	1	2	3	3	3	3
4	Research Work	3	2	2	2	1	1	2	2	2	1	3	1	2	1	2
4	Participation/Presentation in research forum: National / International Seminar, Conferences, Workshops	3	3	2	1	3	3	3	3	2	1	3	1	1	3	3
4	Publication: National / International Journals	3	2	1	2		1		3	1	2	2	2	2	1	2
4	Academic/Research award: State/National/International Agencies	3	3	3	1	1	1	1	3		1	1	3	1	3	3

28. Co-curricular Activities

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposia, paper writing, attending industry exhibitions, project competitions and related activities for enhancing their knowledge and networking.

29. Cultural and Literary Activities

Annual cultural festivals are held to showcase the creative talents in students. They are involved in planning and organizing the activities.

30. Sports and Athletics

Students are encouraged to take part in sports and athletic events regularly. Annual sports meet will be held to demonstrate sportsmanship and competitive spirit.

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RAMAIAH UNIVERSITY OF APPLIED SCIENCES

M.S. Ramaiah University of Applied Sciences

Course Specifications

M. Pharm. in Pharmaceutics

Programme Code: 058

Faculty of Pharmacy
Batch 2022-2024

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SEMESTER I

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Course Specifications: Modern Pharmaceutical Analytical Techniques (Theory)

Course Title	Modern Pharmaceutical Analytical Techniques (Theory)
Course Code	PSF501
Course Type	Core Theory Course
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

This course is to provide in-depth knowledge of advances in organic chemistry, different techniques of organic synthesis and their applications to process chemistry as well as drug discovery. This course also emphasizes on the strategies as synth on approach and retro-synthesis.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	100 **Component 1: 25 Marks** 1A: Attendance: 8 Marks 1B: Student-Teacher interaction: 2 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Summarize the fundamental principles, theory, and applications of UV-visible and IR spectroscopy, flourimetric analysis, flame emission and atomic absorption spectroscopy

CO-2. Theory, instrumentation and applications of NMR and Mass spectroscopy,

CO-3. Explain the principles and applications of chromatographic, and electrophoretic separation techniques

CO-4. Elaborate the principle and applications of potentiometric methods, X-ray crystallographic methods and thermo-analytical methods

CO-5. Discuss the instrumentation of the various modern analytical techniques

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4. Course Contents

Unit 1 **10 hours**

a. UV-Visible spectroscopy:
Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy.

b. IR spectroscopy:
Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier -Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.

c. Spectroflourimetry:
Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analyzed by fluorimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

d. Flame emission spectroscopy and atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

nit 2 **10 hours**

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

Unit 3 **10 hours**

Mass Spectroscopy:
Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and applications of Mass spectroscopy.

Unit 4 **10 hours**

Chromatography:
Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following:

a) Thin Layer chromatography
b) High Performance Thin Layer Chromatography
c) Ion exchange chromatography
d) Column chromatography
e) Gas chromatography
f) High Performance Liquid chromatography
g) Ultra High-Performance Liquid chromatography
h) Affinity chromatography
i) Gel Chromatography

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Unit 5 **10 hours**

a. Electrophoresis:

Principle, Instrumentation, working conditions, factors affecting separation and applications of the following:

a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing

b. X ray Crystallography:

Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.

Unit 6 **10 hours**

a. Potentiometry:

Principle, working, Ion selective Electrodes and Application of potentiometry.

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.

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	-	2	2	-	1	-	1	-	-	1	3	1	-	-
CO-2	3	-	-	2	-	1	-	1	-	-	1	3	2	-	-
CO-3	3	-	2	2	-	1	-	1	-	-	1	3	2	-	1
CO-4	3	-	1	2	-	1	-	1	-	-	1	3	2	-	1
CO-5	3	-	1	2	-	-	-	1	-	-	1	3	2	-	1
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		55
Demonstrations		02
1.Demonstration using Videos	2	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		03
1. Case Study Presentation	00	
2. Guest Lecture	01	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	01	
5. Group Discussions	01	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

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7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment is presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	8	2	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
CO-5		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Criteria		Maximum Marks
Attendance*		8
Student-Teacher Interaction		2
	Total	10

1A. Guidelines for the allotment of marks for attendance*

Percentage of Attendance Theory	Marks
95 – 100	8
90 – 94	6
85 – 89	4
80 – 84	2
Less than 80	0

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1B. Student-Teacher interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by a second examiner.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities is limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Class room lectures, Student-Teacher interaction, Assignments
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Class room lectures, Examination and Assignments
6.	Practical Skills	--
7.	Group Work	Assignments
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination, Student-Teacher Interaction
10.	Verbal Communication Skills	Presentations, Student-Teacher Interaction
11.	Presentation Skills	Class room activity, Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Group discussions and presentations, preparation for examination and presentations
14.	Personal Management	Course work
15.	Leadership Skills	Handling questions during presentations, classroom behavior with peers, Student-Teacher interaction

9. Course Resources

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a. Class Notes

b. Essential Reading

1. Silverstein, RM. Webster, FX (2004) Spectrometric identification of organic compounds, 6th Edition, New York: John Wiley and Sons.
2. Mendham, J. Denny, RC. Barnes, JD. Thomas, M. (2008). Vogel's Textbook of quantitative chemical analysis. 6th Edition, New Delhi: Dorling Kindersley (India) Pvt. Ltd., Licensees of Pearson Education in South Asia.
3. Willard, HH. Merritt, LL. Dean, JA. Settle, FA. Instrumental methods of analysis.7thEdition, New Delhi: CBS Publishers and Distributors.
4. Beckett, AH. Stenlake, JB. (2004) Practical Pharmaceutical Chemistry. Vol. I & II. London: The Athlon Press of the University of London.
5. Kemp, W. (2008) Organic spectroscopy. 3rdEdition. New York: Palgrave.
6. Skoog, DA. West, DM. Hollen, FG. Fundamentals of Analytical chemistry, 6thEdition, USA:
7. Saunders College Publishing.
8. Munson, JW. (2001) Pharmaceutical Analysis-Modern methods-Part B. Vol II Marcel Dekker series. Mumbai, India: International Medical Book Distributors.
9. Sethi, PD. (1997) Quantitative Analysis of Drugs in Pharmaceutical formulation 3rd Edition, NewDelhi: CBS Publishers.
10. Connors, KA. (1982) A textbook of pharmaceutical analysis. 3rd Edition, New York: John Wiley and Sons.

c. Recommended Reading

1. Hoffmann, ED. Stroobant, V. (2001) Mass spectrometry: Principles and Applications. 2nd Ed. England: John Wiley and Sons Ltd.
2. Troy, D.B & Beringer, P. (2006) Remington's: The Science and Practice of Pharmacy. 22nd edition. New York: Lipincott Williams and Wilkins.
3. United State of Pharmacopeial Convention, (2004). The United States Pharmacopoeia-27(NF-22).Rockville: MD
4. Government of India, (2014) Indian Pharmacopoeia. New Delhi: Government of India.

d. Magazines and Journals

1. Indian Journal of Chemistry Section – B: Published by National Institute of Science Communication and Information Resources, Dr K S Krishnan Marg, New Delhi 110 012
2. Indian Journal of Pharmaceutical Sciences: Published on behalf of Indian Pharmaceutical Association by OMICS International, Hyderabad, India

e. Websites

3. www.sciencedirect.com
4. www.elsevier.com
5. www.pubmed.com

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Course Specifications: Drug Delivery Systems (Theory)

Course Title	Drug Delivery Systems (Theory)
Course Code	PSC502
Course Type	Core Theory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Size and Credits Course Summary

This course is designed to impart knowledge in the area of advances in novel drug delivery systems. The students are exposed to the design models for oral, transdermal and parenteral controlled drug delivery systems. This course also emphasizes the development and evaluation of several novel drug delivery systems

2. Course Size and Credits

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1: 25 Marks** 1A: Attendance: 8 Marks 1B: Student-Teacher interaction: 2 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Discuss the physiology of the Gastrointestinal Tract (G.I.T.) and the strategies for gastro-retentive and buccal drug delivery
CO-2. Identify suitable polymers for specific controlled drug delivery systems
CO-3. Select specific delivery systems for protein and peptide drugs
CO-4. Outline the approaches for transdermal and ocular drug delivery systems
CO-5. Develop various delivery systems for controlled/sustained release formulations
CO-6. Discuss recent trends and advances in parenteral drug delivery and vaccine delivery systems

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4. Course Contents

Unit 1 **10 hours**

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, Bio-electronic Medicines, 3D printing of pharmaceuticals, Tele pharmacy.

Unit 2 **10 hours**

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.

Unit 3 **10 hours**

Gastro-Retentive Drug Delivery Systems: Principle, concepts advantages and disadvantages, Modulation of GI transit time approaches to extend GI transit. Buccal Drug Delivery Systems: Principle of muco -adhesion, advantages and disadvantages, Mechanism of drug permeation, Methods of formulation and its evaluations.

Unit 4 **6 hours**

Ocular Drug Delivery Systems: Barriers of drug permeation, Methods to overcome barriers.

Unit 5 **10 hours**

Transdermal Drug Delivery Systems: Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation and evaluation.

Unit 6 **8 hours**

Proteins and Peptide Delivery: Barriers for protein delivery. Formulation and Evaluation of delivery systems of proteins and other macromolecules.

Unit 7 **6 hours**

Vaccine delivery systems: Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.

(Practical/Laboratory content (please mention if Lab content doesn't exist for this course): Selected Experiments pertaining to this course were dealt in the course "Pharmaceutics-I Practical, MPH105P")

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	1	3	2	1	2	2		2	3	1	3	3		2
CO-2	3	2	3	3	1	2	1	1	2		1	3	2	2	2
CO-3	3	3	2	3	2		2		2	1	2	3	3		2
CO-4	3	3	3	3		2	1		1	1	1	3	3		2
CO-5	3	3	2	3	1	2	1		2	1	2	3	3		2
CO-6	3	3	3	3	2	2	1	1	1	1	2	3	3		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		50
Demonstrations		05
1.Demonstration using Videos	2	
2. Demonstration using Physical Models / Systems	3	
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory	00	
Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
2. 5. Hospital	00	
6. Model Studio	00	
Others		05
1. Case Study Presentation	00	
2. Guest Lecture	01	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	01	
5. Group Discussions	02	
6. Discussing Possible Innovations	01	
Written Examination		5
	Total Duration in Hours	**65**

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7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks ▶	8	2	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
CO-5		×	×	×
CO-6		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Criteria	Maximum Marks
Attendance*	8
Student-Teacher Interaction	2
Total	10

1A. Guidelines for the allotment of marks for attendance*

Percentage of Attendance Theory	Marks
95 – 100	8
90 – 94	6
85 – 89	4
80 – 84	2
Less than 80	0

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1B. Student-Teacher interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by a second examiner.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Class room lectures, Student-Teacher interaction, Assignments
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Class room lectures, Examination and Assignments
6.	Practical Skills	--
7.	Group Work	Assignments
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination, Student-Teacher Interaction
10.	Verbal Communication Skills	Presentations, Student-Teacher Interaction
11.	Presentation Skills	Class room activity, Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Group discussions and presentations, preparation for examination and presentations
14.	Personal Management	Course work
15.	Leadership Skills	Handling questions during presentations, class room behavior with peers, Student-Teacher interaction

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9. Course Resources

a. Class Notes

b. Essential Reading

1. Robinson, J. R., Lee Vincent. (1987) *Controlled Drug Delivery: Fundamentals and Applications.*2nd d. New York: Marcel Dekker Inc.
2. Swarbrick, J. (2007) *Encyclopedia of Pharmaceutical Technology*.3rd Edition. New York: Marcel Dekker Inc.
3. Lachmann, L., Liebermann, H. A. (2009) *The Theory and Practice of Industrial Pharmacy*. New Delhi: CBS publishers.
4. Tyle, P. (1988) *Drug Delivery Devices: Fundamentals and Applications*. Volume 32, New York: Marcel Dekker.
5. Robinson, J.R., Lee, V.H.L. (1987) *Controlled Drug Delivery: Fundamentals and Applications*. 2nded.New York: Marcel Dekker.
6. Chien, Y.W. (1991) *Novel Drug Delivery Devices: Fundamentals, Developmental Concepts, Biomedical Assessments.* New York: Marcel Dekker.
7. Vyas, S.P, Khar, R.K. (2012) *Controlled Drug delivery: Concepts and Advances*. 2nded. Delhi: Vallabh Prakashan
8. Swarbrick, J.& Boylan, C. (2002) *Encyclopedia of Pharmaceutical Technology*. 3rd ed. New York: Marcel Dekker Inc.
9. Wise, D.L. (2000) *Handbook of Pharmaceutical Controlled Release Technology*. New York: Marcel Dekker Inc.
10. Li, X. & Jasti, B.R. (2006) *Design of Controlled Release Drug Delivery Systems*. New York: McGraw Hill.
11. Jain, N.K. (2010) *Advances in Novel Drug Delivery Systems*. 3rded. India: CBS Publishers.

c. Recommended Reading

1. Troy, D.B & Beringer, P. (2006) *Remington's: The Science and Practice of Pharmacy*. 22nd ed. New York: Lipincott Williams and Wilkins.\
2. Banker, G.S, Rhode, C. T. (2002) *Modern Pharmaceutics*. 4th ed. New York: Marcel Dekker Inc.
3. Bharath, S. (2012) *Pharmaceutical Technology- Concepts and Applications*. Asia: Pearson Publishers.
4. United State of Pharmacopeial Convention, (2004) The United States Pharmacopoeia-27 (NF-22), Rockville: Maryland
5. Government of India, (2014) *Indian Pharmacopoeia*. New Delhi: Government of India

d. Magazines and Journals

1. International Journal of Pharmaceutics, Elsevier, Science Direct, Amsterdam
2. European Journal of Pharmaceutical Sciences, Elsevier, Science Direct, Amsterdam
3. Advanced Drug Delivery Reviews, Elsevier, Science Direct, Amsterdam
4. Journal of Controlled Release, Elsevier, ScienceDirect, Amsterdam

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5. Drug Development and Industrial Pharmacy, Informa UK
6. Asian Journal of Pharmaceutical Sciences, Elsevier, Science Direct, Amsterdam
7. Indian Journal of Pharmaceutical Sciences, Indian Pharmaceutical Association, Mumbai

e. Websites

1.www. sciencedirect.com
2. www.pubmed.com

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Course Specifications: Modern Pharmaceutics (Theory)

Course Title	Modern Pharmaceutics (Theory)
Course Code	PSC503
Course Type	Core Theory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course is designed to impart knowledge in the area of advances in preformulation and dosage form development. The students are exposed to the preformulation concepts and their applications in the optimization and characterization of the formulation ingredients. This course also emphasizes the applications of validation and cGMP principles in dosage form development

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1: 25 Marks** 1A: Attendance: 8 Marks 1B: Student-Teacher interaction: 2 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Explain the process of compaction and compression in solid dosage form development
CO-2. Discuss various preformulation concepts in dosage form development
CO-3. Apply the cGMP and Industrial management principles in dosage form development
CO-4. Develop new dosage forms by applying the principles of optimization
CO-5. Design validation protocol for solid and liquid dosage forms
CO-6. Discuss recent advances in preformulation concepts, cGMP, validation, optimization, compression and compaction principles

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4. Course Contents

Preformulation Concepts – Drug Excipients interactions -different methods, kinetics of stability, Stability testing. Theories of dispersion and pharmaceutical Dispersion (Emulsion and Suspension, SMEDDS) preparation and stability Large and small volume parental – physiological and formulation consideration, Manufacturing, and evaluation. **10 hours**

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 **10 hours**

Validation: Introduction to Pharmaceutical Validation, Scope &merits of Validation, Validation and calibration of Master plan, ICH & WHO guidelines for calibration and validation of equipment, Validation of specific dosage form, Types of validation. Government regulation, Manufacturing Process Model, URS, DQ, IQ, OQ &P.Q. of facilities. **10 hours**

cGMP& Industrial Management: Objectives and policies of current good manufacturing practices, layout of buildings, services, equipment 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. **10 hours**

Compression and compaction: Physics of tablet compression, compression, consolidation, effect of friction, distribution of forces, compaction profiles. Solubility. **10 hours**

Study of consolidation parameters; Diffusion parameters, Dissolution parameters and Pharmacokinetic parameters, Heckel plots, Similarity factors – f2 and f1, Higuchi and Peppas plot, Linearity Concept of significance, Standard deviation, Chi square test, students T-test, ANOVA test. **10 hours**

(Practical/Laboratory content selected experiments pertaining to this course were dealt in the course "Pharmaceutics-I Practical, MPH105P")

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	2				1		2	3	3	2		2
CO-2	3	2	3	2		2		1		2	2	3	2		2
CO-3	3	2	3	2	2	1	2	1	3	3	3	3	2	2	2
CO-4	3	2	3	3		2	2	1	2	3	3	3	3		2
CO-5	3	2	2	3	2			1		2	3	3	3	2	2
CO-6	3	2	3	2	2	3		1	3	2	3	3	3		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		50
Demonstrations		05
1.Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		05
1. Case Study Presentation	02	
2. Guest Lecture	01	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	03	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

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Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks ▶	8	2	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
CO-5		×	×	×
CO-6		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Criteria	Maximum Marks
Attendance*	8
Student-Teacher Interaction	2
Total	10

1A. Guidelines for the allotment of marks for attendance*

Percentage of Attendance Theory	Marks
95 – 100	8
90 – 94	6
85 – 89	4
80 – 84	2
Less than 80	0

1B. Student-Teacher interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by a second examiner.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be

asked to register for Supplementary examination.

2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Class room lectures, Student-Teacher interaction, Assignments
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Class room lectures, Examination and Assignments
6.	Practical Skills	--
7.	Group Work	Assignments
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination, Student-Teacher Interaction
10.	Verbal Communication Skills	Presentations, Student-Teacher Interaction
11.	Presentation Skills	Class room activity, Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Group discussions and presentations, preparation for examination and presentations
14.	Personal Management	Course work
15.	Leadership Skills	Handling questions during presentations, class room behavior with peers, Student-Teacher interaction

9. Course Resources

a. Class Notes

b. Essential Reading

1. Robinson, J. R., Lee Vincent. (1987) *Controlled Drug Delivery: Fundamentals and Applications.*2nd d. New York: Marcel Dekker Inc.
2. Swarbrick, J. (2007) *Encyclopedia of Pharmaceutical Technology.*3rd Edition. New York: Marcel Dekker Inc.
3. Lachmann, L., Liebermann, H. A. (2009) *The Theory and Practice of Industrial Pharmacy.*

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New Delhi: CBS publishers.

4. Banker, GS, Rhode, C T. (2002) *Modern Pharmaceutics*, 4th Ed. New York: Marcel Dekker Inc. USA
5. Patrick J. Sinko. (2006) *Martin's Physical Pharmacy and Pharmaceutical Sciences.* 5th Ed. Lippincott Williams & Wilkins.
6. Rawlins. (1993) *Bentley's Textbook of Pharmaceutics*, 6th Ed., Williams & Wilkins, Baltimore
7. H.S. Bean, A.H. Beckett. (1964) *Advances in Pharmaceutical Sciences* Vol. 1-5, 2nd Ed. Academic Press, New York
8. Sidney H. Willig. (1993) *Good manufacturing practices for Pharmaceuticals: A plan for total quality control.* 2nd edition, CRC Press London.
9. D.P.S. Kohli, D.H. Shah, (2009), *Drug formulation manual*, Eastern publishers, New Delhi.
10. J.J. Wells. (2001) *Pharmaceutical Preformulation*, 2nd Ed. Taylor and Francis, UK
11. P.P.Sharma. *How to practice GMPs*, 7th Ed. Vandhana Publications, Agra.
12. Fra. R. Berry, Robert A. Nash. *Pharmaceutical Process Validation,* 2nd edition, Marcel Dekker Inc. USA

c. Recommended Reading

6. Troy, D.B & Beringer, P. (2006) *Remington's: The Science and Practice of Pharmacy*. 22nd ed. New York: Lippincott Williams and Wilkins.\
7. Banker, G.S, Rhode, C. T. (2002) *Modern Pharmaceutics*. 4th ed. New York: Marcel Dekker Inc.
8. Bharath, S. (2012) *Pharmaceutical Technology- Concepts and Applications*. Asia: Pearson Publishers.
9. Government of India, (2014) *Indian Pharmacopoeia*. New Delhi: Government of India
10. Robinson, J R, Lee Vincent. (1987) *Controlled Drug Delivery: Fundamentals and Applications,* 2nd Ed. New York: Marcel Dekker Inc.

d. Magazines and Journals

8. International Journal of Pharmaceutics, Elsevier, Science Direct, Amsterdam
9. European Journal of Pharmaceutical Sciences, Elsevier, Science Direct, Amsterdam
10. Advanced Drug Delivery Reviews, Elsevier, Science Direct, Amsterdam
11. Drug Development and Industrial Pharmacy, Informa UK
12. Asian Journal of Pharmaceutical Sciences, Elsevier, Science Direct, Amsterdam
13. Indian Journal of Pharmaceutical Sciences, Indian Pharmaceutical Association, Mumbai

e. Websites

1. www.sciencedirect.com
2. www.elsevier.com
3. www.pubmed.com

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Course Specifications: Regulatory Affairs (Theory)

Course Title	Regulatory Affairs (Theory)
Course Code	PSC504
Course Type	Core Theory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This Course is designed to provide comprehensive knowledge in the domain of Quality Compliance in the pharmaceutical industries including Pharmaceutical Regulatory Affairs. The course is structured to provide 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 for filing process of Investigational New Drug, New Drug Application and Abbreviated New Drug Application.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1: 25 Marks** 1A: Attendance: 8 Marks 1B: Student-Teacher interaction: 2 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Discuss the concepts of innovator and generic drugs in drug development process
CO-2. Organize the process involved in new drug application of pharmaceuticals
CO-3. Structure the guidelines for filing and approval process in different countries
CO-4. Analyze the post approval regulatory requirements for actives and drug products and submission of global documents in Common Technical Document / eCTD formats
CO-5. Identify regulatory procedures involved in non-clinical and clinical drug development
CO-6. Apply the principles of regulatory affairs in drug development process, filing and approval, non-clinical and clinical drug development in global scenario

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4. Course Contents

Unit 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 hours

Unit 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 hours**

Unit 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 hours**

Unit 4

Non clinical drug development: Global submission of IND, NDA, ANDA. Investigation of medicinal products dossier, dossier (IMPD) and investigator brochure (IB). **12 hours**

Unit 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 hours

(Practical/Laboratory content (please mention if Lab content doesn't exist for this course): Selected experiments pertaining to this course were dealt in the course "Pharmaceutics-I Practical, MPH205P")

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3					2		2				2			2
CO-2	3	2		1	3	2		3	2		2			2	2
CO-3	3	2				2			2		2			2	2
CO-4	3		3	2		2			2	2	2			2	2
CO-5	3	1				2	3		2	2	2			2	2
CO-6	3	2	3	2	2	2	3		2	2	2			2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		50
Demonstrations		05
1.Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		05
1. Case Study Presentation	02	
2. Guest Lecture	01	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	02	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

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7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks ▶	8	2	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
CO-5		×	×	×
CO-6				×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Criteria	Maximum Marks
Attendance*	8
Student-Teacher Interaction	2
Total	10

1A. Guidelines for the allotment of marks for attendance*

Percentage of Attendance Theory	Marks
95 – 100	8
90 – 94	6
85 – 89	4
80 – 84	2
Less than 80	0

1B. Student-Teacher interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

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Component - 2: 75 marks
A 3 hour duration Semester End Examination will be conducted for maximum marks of 75.

Both components will be evaluated by the concerned course leader/s.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.
Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Class room lectures, Student-Teacher interaction, Assignments
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Class room lectures, Examination and Assignments
6.	Practical Skills	--
7.	Group Work	Assignments
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination, Student-Teacher Interaction
10.	Verbal Communication Skills	Presentations, Student-Teacher Interaction
11.	Presentation Skills	Class room activity, Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Group discussions and presentations, preparation for examination and presentations
14.	Personal Management	Course work
15.	Leadership Skills	Handling questions during presentations, class room behavior with peers, Student-Teacher interaction

9. Course Resources

c. **Class Notes**

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d. Essential Reading

1. Berry, I.R., Martin, R.P. (2008) The Pharmaceutical Regulatory Process,. 2nd Ed. Informa Healthcare. New York
2. Richard A. Guarino, Richard Guarino, New drug approval process (2004) 5th Ed. CRC Press, Informa Healthcare. New York
3. Weinberg, S. (2009) Guidebook for Drug Regulatory Submissions. 3rd Ed. Wiley-Blackwell Inc, USA
4. Pisano, D.J, Mantus, D.S. (2008) FDA Regulatory Affairs: A guide for prescription drugs, medical devices, and Biologics, 2 nd Ed.. Informa Healthcare, New York
5. Rozovsky, F.A., Adams, R.K., Rozovsky, R.K., Adams, F.A. /, K, R. and Fay A. / Adams Rozovsky (2003) Clinical trials and Human Research: A practical guide to regulatory compliance. 1st Ed. John Wiley & Sons Inc., USA.

c. **Recommended Reading**

1. Shargel, L. and Kanfer, I. (eds.) (2013) Generic drug product development: Solid oral dosage forms. 2nd edn. Boca Raton, FL: CRC Press/Taylor & Francis Group. Quality Assurance Guide by Organization of Pharmaceutical Procedures of India, (1996), 3rd revised Edition. Vol I & II, Mumbai.
2. Weinberg, Y. (1995) Good laboratory practice regulations. Edited by Sandy Weinberg. 2nd edn. New York: Marcel Dekker
3. W.H.O (2007) Quality assurance of pharmaceuticals: A compendium of guidelines and related materials: Volume 2: Good manufacturing practices and inspection. 2nd edn. Geneva: World Health Organization.
4. Sharma PP. (2015) How to Practice GMP's, 6th Edition. Agra: Vandana Publications, New Delhi.
5. United State of Pharmacopeial Convention, (2004) The United States Pharmacopoeia-27 (NF-22), Rockville: Maryland
6. Government of India, (2014) *Indian Pharmacopoeia*. New Delhi: Government of India

d. Magazines and Journals

14. Clinical research and Regulatory Affairs; Published by Taylor and Francis Online.
15. International Journal of Drug Regulatory Affairs; Published by the Society of Pharmaceutical Technocrats (SoPh Tech).
16. Pharmaceutical Regulatory Affairs: Open Access; Published by OMICS International.

e. Websites

1. www.science direct.com
2. www.elsevier.com

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Course Specifications: Pharmaceutics Practical-I (Practical)

Course Title	**Pharmaceutics Practical-I**
Course Code	PSL505
Course Type	Core Practical Course
Department	Pharmaceutics & Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart training in the instrumental analysis of various pharmaceutical dosage forms. This course also emphasizes on the formulation and evaluation of novel drug delivery systems for wide variety of therapeutic agents.

2. Course Size and Credits:

Number of Credits	06
Credit Structure (Lecture: Tutorial: Practical)	0:0:12
Total Hours of Interaction	180
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics & Pharmaceutical Chemistry
Total Course Marks	150 **Component1:50Marks** 1A:Attendance:10Marks 1B:Student-Teacherinteraction:10Marks1C:Sessional Exam:30 Marks **Component2(SEE):** Semester End Examination: 100Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Examine efficacy of therapeutic agents by various instrumental analytical techniques
CO-2. Demonstrate preformulation studies for development of various dosage forms
CO-3. Formulate types of controlled oral, transdermal and mucosal drug delivery systems
CO-4. Evaluate various developed drug delivery systems using suitable methods
CO-5. Compose pharmaceutical factors affecting drug release kinetics

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4. Course Contents

1. Analysis of pharmacopoeial compounds and their formulations by UV Visible spectrophotometer
2. Simultaneous Estimation of multicomponent containing formulations by UV-Spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame 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-hydrodynamically balanced DDS.
11. Formulation and evaluation of Mucoadhesive tablets
12. Formulation and evaluation of transdermal patches
13. To carry out preformulation studies of tablets
14. To study the effect of compressional force on tablets disintegration time
15. To study the 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 factor

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes(POs)											Programme Specific Outcomes(PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3		2	2				1		2	2	3			3
CO-2	3	2	3	2			1	1		2	2	3	2		3
CO-3	3		3	2			1	1	2	3	3	3	3		3
CO-4	3		3	3	1	2	2	1	2	3	3	3	3		3
CO-5	3		3	3				1	2		3				3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		10
Demonstrations		10
1.Demonstration using Videos	10	
2.Demonstration using Physical Models/Systems		
3.Demonstration on a Computer		
Tutorials		10
Practical Work		140
1.Course Laboratory	100	
2.Computer Laboratory	00	
3.EngineeringWorkshop/Course/Workshop/ Kitchen	40	
4.ClinicalLaboratory	00	
5.Hospital	00	
6.Model Studio	00	
Others		10
1.Case Study Presentation	00	
2.Guest Lecture	00	
3.Industry/Field Visit	00	
4.Brain Storming Sessions	05	
5.Group Discussions	00	
6.Discussing Possible Innovations	05	
Written Examination		20
Total Duration in Hours		**200**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

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Focus of Cos on each Component or Subcomponent of Evaluation				
	Component1: CE(25%Weightage)			Component2: SEE (75%Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 100 Marks
Maximum Marks ▶	10	10	30	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
CO-5		X	X	X
The details of SC1,SC2,SC3 are presented in the Programme Specifications Document.				

Component-1:25marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Criteria	Maximum Marks
Attendance*	10
Student-Teacher Interaction	10
Total	20

1A. Guidelines for the allotment of marks for attendance*

Percentage of Attendance Theory	Marks
95– 100	10
90– 94	7.5
85– 89	5
80– 84	2.5
Lessthan80	0

1B. Student-Teacher interaction

1C. Sessional exam: Two Sessional exams (each for 30marks) of 1hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component-2: 100 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by a second examiner.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.

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2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory interactions and self-study
2.	Understanding	Experiments conducted in laboratory
3.	Critical Skills	Experiments conducted in laboratory
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Lab work and Examination
6.	Practical Skills	Face to face interactions and lab work
7.	Group Work	Laboratory Tasks
8.	Self-Learning	Practical Record writing and Examination
9.	Written Communication Skills	Viva voce and presentation of results
10.	Verbal Communication Skills	Presentation of results
11.	Presentation Skills	Laboratory Tasks
12.	Behavioral Skills	Practical Record writing and presentation Of results
13.	Information Management	Group discussions and planning of Laboratory Tasks
14.	Leadership Skills	Handling questions during presentations, class room behavior with peers, Student-Teacher interaction

9. Course Resources

a. Essential Reading

1. Lab manual
2. Swarbrick J. (2007) Encyclopedia of Pharmaceutical Technology. 3rd Edition. New York: Marcel Dekker Inc.
3. Lachmann, L., Liebermann, H.A. (2009).The Theory and Practice of Industrial Pharmacy. New Delhi CBS publishers.
4. Chien, Y.W. (1991) Novel Drug Delivery Devices: Fundamentals, Developmental Concepts, Biomedical Assessments. New York: Marcel Dekker.
5. Vyas, S.P, Khar,R.K. (2012) Controlled Drug delivery: Concepts and Advances. 2nd ed. Delhi: Vallabh Prakashan
6. Wise, D.L. (2000) Handbook of Pharmaceutical Controlled Release Technology. New York: Marcel Dekker Inc.

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7. Robert M Silverstein, (2004), Spectrometric Identification of Organic compounds 6th Ed, John Wiley & Sons, USA.
8. Doglas A Skoog, F. James Holler, Timothy A. Nieman, (1998), Principles of Instrumental Analysis, 5th ed., Cengage Learning, Inc, USA
9. Willards,(1988),Instrumental methods of analysis 7th edition, Wads worth Publishing Company; Florence, KY (USA) Willards,(1988),Instrumental methods of analysis 7th edition, Wads worth Publishing Company; Florence, KY (USA)

b. Recommended Reading

1. The United States Pharmacopoeia-27(NF-22).(2004)Rockville: MD,USA
2. Government of India, (2014) Indian Pharmacopoeia. Ministry of Health and Family Welfare, Government of India. New Delhi
3. Government of India, (2010) Indian Pharmacopoeia. Ministry of Health and Family Welfare, Government of India. New Delhi
4. Government of India, (1996) Indian Pharmacopoeia. Ministry of Health and Family Welfare, Government of India. New Delhi
5. Beckett and Stenlake, (1997) Practical Pharmaceutical Chemistry, Vol II, 4thEd, The Athlone. Press, University of London, London

Magazines and Journals

1. International Journal of Pharmaceutics, Elsevier, ScienceDirect, Amsterdam
2. Journal of Controlled Release, Elsevier, Science Direct, Amsterdam
3. Drug Development and Industrial Pharmacy, Informa UK
4. Asian Journal of Pharmaceutical Sciences, Elsevier, Science Direct, Amsterdam
5. Indian Journal of Pharmaceutical Sciences, Indian Pharmaceutical Association, Mumbai
6. Journal of Pharmaceutical and Biomedical Analysis, Science Direct, Amsterdam

Websites

1. www.sciencedirect.com
2. www.pubmed.com

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Course Specifications: Seminar/Assignment

Course Title	Seminar/Assignment
Course Code	PSS506
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The course aims to instill critical thinking, analytical thinking and problem-solving skills amongst students. Students are trained to refer to literature and present their thought process, justification either in the form of an essay or debate as a concise report. Students are trained for collaborative learning while analyzing and also solving problems. They are exposed to citation, referencing and paraphrasing. Students are also exposed in communicating the collected information/literature to present and defend their accomplishment.

2. Course Size and Credits:

Number of credits	04
Total hours of classroom and laboratory interaction during the course	105 hours in a semester
Total Course Marks	**100** **Component -1: Assignment = 60 Marks** Report evaluated individually for 15 marks for 4 theory Courses in the semester. **Component-2: Seminar = 40 Marks** Assignment presentation evaluated individually for 10marks for 4 theory Courses in the semester.
Pass Criteria	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Develop critical thinking, analytical thinking and problem-solving skills
CO-2. Demonstrate the ability to synthesize the report
CO-3. Develop academic report with appropriate citation and referencing style
CO-4. Communicate the contents of the report to the panel
CO-5. Defend the contents of the report in the panel

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4. Course Contents

Critical review of the literature on the given assignment
Writing and Communication skills
Citation and referencing styles-Harvard referencing style
Plagiarism review
Analytical and problem-solving skills
Practical/Laboratory content: NA

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	3	3	1	1	2		1		2	2	1	1	2	2
CO-2	2	3	2	2		1		3		2	1	1	1	2	3
CO-3	3	1	1	3	1	2		3	1		3	1	1		2
CO-4	1	2	2	3	2	2	2	3	1		3	1	1	2	2
CO-5	3		2	3		1	2	3		1	3	1	1	2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		10
Demonstrations		10
1. Demonstration using Videos		
2. Demonstration using Physical Models/Systems	5	
3. Demonstration on a Computer	5	
Numeracy		00
1. Solving Numerical Problems	00	
Practical Work		15
1. Course Laboratory	05	
2. Computer Laboratory	00	
3. Engineering Workshop/Course Workshop/Kitchen	10	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	10	

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2. Guest Lecture	00	50
3. Industry/Field Visit	00	
4. Brain Storming Sessions	10	
5. Group Discussions		
6. Discussing Possible Innovations	30	
Term Tests, Laboratory Examination/Written Examination, Presentations		20
Total Duration in Hours		105

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

	Component 1: Assignment (60% Weightage)	Component 2: Seminar (40% Weightage)
Subcomponent ▶	SC1	SC2
Subcomponent Type ▶	Assignment	Seminar
Maximum Marks ▶	60	40
CO-1	X	×
CO-2	X	
CO-3	X	
CO-4	X	×
CO-5		×

Component-1: Assignment=60 Marks [4 courses of 15 marks each]
One word processed assignment submitted for 4 theory courses in a semester will be evaluated by Course Leaders for a maximum of 15 marks each.

Component-2: Seminar=40 Marks [4 courses of 15 marks each]
Presentation on submitted assignments will be evaluated by Course Leaders for a maximum of 10 marks each.

Marks awarded for four individual Courses (Assignment -15 marks & Seminar – 10 marks) will be summed and calculated for the total marks obtained for a maximummarksof100.

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The assessment questions are set to test the learning outcomes. In each component a certain learning outcomes are assessed. The following table illustrates the focus of learning outcome in each component assessed:

Both components will be moderated by a second examiner.

Reassessment

1. If a student fails in the course, it is considered fail and he or she has to earn the credits in the make-up opportunity and re-registration to the Course is required.

2. The maximum number of such opportunities is limited as per the academic regulations governing this programme.

8. Achieving COs

S.No	Curriculum and Capabilities Skills	How imparted during thec ourse
1.	Knowledge	Reading and findings
2.	Understanding	Reading and findings
3.	Critical Skills	Literature Review
4.	Analytical Skills	Data collection
5.	Problem Solving Skills	Data analysis
6.	Practical Skills	Writing & Presentation
7.	Group Work	Data analysis
8.	Self-Learning	Reading and findings
9.	Written Communication Skills	Assignment processing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Interactions
13.	Information Management	Paper writing
14.	Personal Management	Course work
14.	Leadership Skills	Effective management of learning, time management, achieving the learning objectives

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9. Course Resources

a. **Essential Reading**
   1. Research articles
   2. Relevant textbooks
   3. Visits to websites relevant to assignment problem

b. **Recommended Reading**

   NA

c. **Magazines and Journals**

   Relevant Magazines and Journals pertaining to assignment

d. **Websites**

   Specific web information pertaining to assignment

e. Other Electronic Resources

   NA

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SEMESTER II

Course Specifications: Molecular Pharmaceutics (Nano technology &Targeted DDS) (Theory)

Course Title	Molecular Pharmaceutics (Nano technology &Targeted DDS) (Theory)
Course Code	PSC507
Course Type	Core Theory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course is designed to impart knowledge on the area of advances in targeted drug delivery systems. The coursed also focuses on molecular mechanistic approaches to the development of bio-available drugs and delivery systems.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1: 25 Marks** 1A: Attendance: 8 Marks 1B: Student-Teacher interaction: 2 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Discuss the various approaches for development of novel drug delivery systems
CO-2. Explain the need for drug targeting in terms of site and target specificity
CO-3. Identify suitable polymers/excipients for formulation design
CO-4. Design and develop various delivery systems for a specific drug target
CO-5. Evaluate targeted drug delivery systems
CO-6. Recommend formulation approaches for site specific drug delivery

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4. Course Contents

Unit 1

Targeted Drug Delivery Systems: Concepts, Events and biological process involved in drug targeting. Tumor targeting and Brain specific delivery **12 hours**

Unit 2

Targeting Methods: introduction preparation and evaluation. Nano Particles & Liposomes: Types, preparation and evaluation **12 hours**

Unit 3

Micro Capsules / Micro Spheres: Types, preparation and evaluation, Monoclonal Antibodies; preparation and application, preparation and application of Niosomes, Aquasomes, Phytosomes, Electrosomes

12 hours

Unit 4

Pulmonary Drug Delivery Systems: Aerosols, propellants, Container Types, preparation and evaluation, Intra Nasal Route Delivery systems; Types, preparation and evaluation

12 hours

Unit 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 hours

(Practical/Laboratory content (please mention if Lab content doesn't exist for this course): Selected experiments pertaining to this course were dealt in the course "Pharmaceutics-II Practical, PSL511")

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3		2	2				1		2	3	3	2		2
CO-2	3		3	2		2		1		2	2	3	2		2
CO-3	3		3	2			2	1	3	3	3	3	2		2
CO-4	3	2	3	3	2	2	2	1	2	3	3	3	3	2	2
CO-5	3		2	3				1		2	3	3	3		2
CO-6	3	2	3	2		3		1	3	2	3	3	3		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		50
Demonstrations		05
1.Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		05
1. Case Study Presentation	00	
2. Guest Lecture	01	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	01	
5. Group Discussions	02	
6. Discussing Possible Innovations	01	
Written Examination		5
Total Duration in Hours		**65**

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7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Sub component ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks ▶	8	2	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
CO-5		×	×	×
CO-6				×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

1A. Guidelines for the allotment of marks for attendance*

Criteria	Maximum Marks
Attendance*	8
Student-Teacher Interaction	2
Total	10

Percentage of Attendance Theory	Marks
95 – 100	8
90 – 94	6
85 – 89	4
80 – 84	2
Less than 80	0

1B. Student-Teacher interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks
A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by a second examiner.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.
Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Class room lectures, Student-Teacher interaction, Assignments
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Class room lectures, Examination and Assignments
6.	Practical Skills	--
7.	Group Work	Assignments
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination, Student-Teacher Interaction
10.	Verbal Communication Skills	Presentations, Student-Teacher Interaction
11.	Presentation Skills	Class room activity, Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Group discussions and presentations, preparation for examination and presentations

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14.	Personal Management	Course work
15.	Leadership Skills	Handling questions during presentations, class room behavior with peers, Student-Teacher interaction

9. Course Resources

a. Class Notes

b. Essential Reading

1. Robinson, J. R., Lee Vincent. (1987) *Controlled Drug Delivery: Fundamentals and Applications.* 2nd d. New York: Marcel Dekker Inc.

2. Swarbrick,J. (2007) *Encyclopedia of Pharmaceutical Technology*.3rd Edition. New York: Marcel Dekker Inc.

3. Lachmann, L., Liebermann, H. A. (2009) *The Theory and Practice of Industrial Pharmacy*.New Delhi: CBS publishers.

4. Tyle, P. (1988) *Drug Delivery Devices: Fundamentals and Applications*. Volume 32, New York:Marcel Dekker.

5. Robinson,J.R., Lee, V.H.L. (1987) *Controlled Drug Delivery: Fundamentals and Applications*. 2nded.New York: Marcel Dekker.

6. Chien, Y.W. (1991) *Novel Drug Delivery Devices: Fundamentals, Developmental Concepts, Biomedical Assessments.* New York: Marcel Dekker.

7. Vyas, S.P, Khar, R.K. (2012) *Controlled Drug delivery: Concepts and Advances*. 2nded. Delhi: Vallabh Prakashan

8. Swarbrick,J.& Boylan, C. (2002) *Encyclopedia of Pharmaceutical Technology*. 3rd ed. New York: Marcel Dekker Inc.

9. Wise, D.L. (2000) *Handbook of Pharmaceutical Controlled Release Technology*. New York: MarcelDekker Inc.

`10. Li, X. &Jasti, B.R. (2006) *Design of Controlled Release Drug Delivery Systems*. New York: McGrawHill.

11. Jain, N.K. (2010) *Advances in Novel Drug Delivery Systems*. 3rded. India: CBS Publishers.

c. Recommended Reading

7. Troy, D.B &Beringer, P. (2006) *Remington's :The Science and Practice of Pharmacy*. 22nd ed.New York: Lipincott Williams and Wilkins.\
8. Banker, G.S, Rhode, C. T. (2002) *Modern Pharmaceutics*. 4th ed. New York: Marcel Dekker Inc.
9. Bharath, S. (2012) *Pharmaceutical Technology- Concepts and Applications*. Asia: Pearson Publishers.
10. United State of Pharmacopeial Convention, (2004) The United States Pharmacopoeia-27 (NF-22), Rockville: Maryland

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11. Government of India, (2014) *Indian Pharmacopoeia*. New Delhi: Government of India

d. Magazines and Journals

17.International Journal of Pharmaceutics, Elsevier, Science Direct, Amsterdam
18.European Journal of Pharmaceutical Sciences, Elsevier, Science Direct, Amsterdam
19.Advanced Drug Delivery Reviews, Elsevier, Science Direct, Amsterdam
20.Journal of Controlled Release, Elsevier, Science Direct, Amsterdam
21.Drug Development and Industrial Pharmacy, Informa UK
22.Asian Journal of Pharmaceutical Sciences, Elsevier, Science Direct, Amsterdam
23.Indian Journal of Pharmaceutical Sciences, Indian Pharmaceutical Association, Mumbai

e. Websites

1.www.sciencedirect.com
2. www.elsevier.com

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Course Specifications: Advanced Biopharmaceutics and Pharmacokinetics (Theory)

Course Title	Advanced Biopharmaceutics and Pharmacokinetics
Course Code	PSC508
Course Type	Core Theory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply biopharmaceutics theories in formulation design and evaluation. This course also emphasizes the students to apply pharmacokinetic and pharmacodynamic principles to predict modified release, targeted and biotechnological drug products.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1: 25 Marks** 1A: Attendance: 8 Marks 1B: Student-Teacher interaction: 2 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Analyze the factors affecting drug absorption from GI tract methods for determining drug permeability

CO-2. Apply knowledge of biopharmaceutic factors in drug product design and outline *in vitro* methods for determining drug product performance

CO-3. Determine pharmacokinetic parameters from raw data using pharmacokinetic models and predict the effect of nonlinearity on drug pharmacokinetics

CO-4. Measure bioavailability using suitable methods and summarize importance of bioequivalence studies

CO-5. Appraise the applications of biopharmaceutics and pharmacokinetics in the development of biopharmaceuticals and pharmaceuticals

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4. Course Contents

Unit 1

Drug Absorption From The Gastrointestinal Tract: Gastrointestinal tract, Mechanism of drug absorption, Factors affecting passive drug absorption, pH–partition theory of drug absorption. Factors affecting drug absorption: 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, Structure of Octanol, and Biopharmaceutics Classification System. Solubility: Experimental methods. Permeability: In-vitro, in-situ and In-vivo methods. **12 hours**

Unit 2

Biopharmaceutic Considerations in Drug Product Design and In-vitro Drug Product Performance: Introduction, Biopharmaceutic Factors Affecting Drug Bioavailability, Rate-Limiting Steps in Drug Absorption, Physicochemical Nature of the Drug Formulation Factors Affecting Drug Product Performance, 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, Drug Product Considerations. **12 hours**

Unit 3

Pharmacokinetics: Basic considerations, Pharmacokinetic models, Compartment modeling: One compartment model- IV bolus, IV infusion, Extravascular. Multi Compartment model: Two compartment - model in brief, Non-Linear Pharmacokinetics: Cause of non-linearity, Michaelis – Menten equation, Estimation Kmax and Vmax. Drug interactions: Introduction, The effect of protein-binding interactions, The effect of tissue-binding interactions, Cytochrome P450-based drug interactions, Drug interactions linked to transporters. **12 hours**

Unit 4

Drug Product Performance, In-vivo: Bioavailability and Bioequivalence: Drug Product Performance, Purpose of Bioavailability Studies, Relative and Absolute Availability. Methods for Assessing Bioavailability, Bioequivalence Studies, Design and Evaluation of Bioequivalence Studies, Study Designs, Crossover Study Designs, Evaluation of the Data, Bioequivalence Example, Study Submission and Drug Review Process. Biopharmaceutics Classification System, Generic Biologics (Biosimilar Drug Products), Clinical Significance of Bioequivalence Studies, Special Concerns in Bioavailability and Bioequivalence Studies, Generic Substitution **12 hours**

Unit 5

Application of Pharmacokinetics: Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. pharmacokinetic and pharmacodynamic, drug interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs. Introduction, Proteins and peptides, Monoclonal antibodies, Oligonucleotides, Vaccines (immunotherapy), Gene therapies. **12 hours**

(Practical/Laboratory content (please mention if Lab content doesn't exist for this course): Selected experiments pertaining to this course were dealt in the course "Pharmaceutics-II Practical, PSL511")

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5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	1	2	2		1		2			3	3	3		
CO-2	3	2	2	2		2		3	1		3	3	3	1	
CO-3	3	3	3	3		1		3	1		3	3	2		1
CO-4	3	2	3	2		1	1	3	1		3	3	3	1	1
CO-5	3	1	3	2	1	2	1	3	2		3	3	3		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		50
Demonstrations		05
1.Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop / Course/Workshop / Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		05
1. Case Study Presentation		
2. Guest Lecture	1	
3. Industry / Field Visit		
4. Brain Storming Sessions	1	
5. Group Discussions	2	
6. Discussing Possible Innovations	1	
Written Examination		05
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

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The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Sub component ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks ▶	8	2	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
CO-5		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Criteria	Maximum Marks
Attendance*	8
Student-Teacher Interaction	2
Total	10

1A. Guidelines for the allotment of marks for attendance*

Percentage of Attendance Theory	Marks
95 – 100	8
90 – 94	6
85 – 89	4
80 – 84	2
Less than 80	0

1B. Student-Teacher interaction

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1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks
A 3 hour duration Semester End Examination will be conducted for maximum marks of 75.

Both components will be evaluated by the concerned course leader/s

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Class room lectures, Student-Teacher interaction, Assignments
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Class room lectures, Examination and Assignments
6.	Practical Skills	--
7.	Group Work	Assignments
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination, Student-Teacher Interaction
10.	Verbal Communication Skills	Presentations, Student-Teacher Interaction
11.	Presentation Skills	Class room activity, Assignment, Examination
12.	Behavioral Skills	Course work

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13.	Information Management	Group discussions and presentations, preparation for examination and presentations
14.	Personal Management	Course work
15.	Leadership Skills	Handling questions during presentations, class room behavior with peers, Student-Teacher interaction

9. Course Resources

e. Essential Reading

1. Course notes
2. Milo Gibaldi .(1991) Biopharmaceutics and Clinical Pharmacokinetics , 4th Ed. Philadelphia:Lea and Febiger.
3. D.M. Brahmankar and Sunil B. Jaiswal. (2015) Biopharmaceutics and Pharmacokinetics- A Treatise. Pitampura, Delhi : Vallab Prakashan.
4. Shargel. Andrew B.C. and Yu. (2012) Applied Biopharmaceutics and Pharmacokinetics. 6th Ed. NewYork: McGraw-Hill Medical.
5. Shobha Rani R Hiremath.(2012) Textbook of Biopharmaceutics and Pharmacokinetics.2nd Ed. Mumbai: Prism Publication
6. Milo Gibaldi and D. Perrier.(1982) Pharmacokinetics .2nd edition, New York: Marcel Dekker Inc.,
7. Swarbrick. J. (1970) Current Concepts in Pharmaceutical Sciences: Biopharmaceutics. Philadelphia: Lea and Febiger.
8. Malcolm Rowland and Thom N. Tozer. (1995) Clinical Pharmacokinetics, Concepts and Applications. 3rd Ed. Philadelphia: Lea and Febiger.
9. Abdou. H.M.(1989) Dissolution, Bioavailability and Bioequivalence. Pennsylvania: Mack Publishing Company.
10. Robert. E. Notari/(1987) Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4thEd, New York and Basel: Marcel Dekker Inc.
11. John. G. Wagner and M. Pemarowsk. (1971) Biopharmaceutics and Relevant Pharmacokinetics. 1st Ed. Hamilton: Drug Intelligence Publications.
12. James Swarbrick, James and G. Boylan. (1996) Encyclopedia of Pharmaceutical Technology New York: Marcel Dekker Inc.
13. Sunil S Jambhekar and Philip J Breen.(2009) Basic Pharmacokinetics.1st Ed. London: RPS Publishing.
14. Alex Avdeef. (2012) Absorption and Drug Development- Solubility, Permeability and Charge State. New Jersey: John Wiley & Sons Inc.

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15. Banaker.U.V. (1991) Pharmaceutical dissolution testing. 1st Edition. New York: Marcel Dekker Inc

c. **Recommended Reading**

12. Welling , Tse. (2006) Pharmacokinetics.2ndEdition.UK: Taylor & Francis.
13. Sarfaraz, K.Niazi , (1979) Textbook of Biopharmaceutics and Clinical Pharmacokinetics. London: Appleton-Century-Crofts.
14. Naitee Ting. (2006) Dose finding in Drug Development, UK: Springer.
15. Javed Ali, Khar R. K., Alka Ahuja. (2011) Textbook of Biopharmaceutics and Pharmacokinetics. 3rd Edition. Delhi: Birla Publication Pvt Ltd.

d. Magazines and Journals

24. International Journal of Biopharmaceutics and Pharmacokinetics, Elsevier, Science Direct, Amsterdam
25. International Journal of Pharmaceutics, Elsevier, Science Direct, Amsterdam
26. European Journal of Pharmaceutical Sciences, Elsevier, Science Direct, Amsterdam

e. Websites

1.www.sciencedirect.com
2. www.elsevier.com
3. www.pubmed.com

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Course Specifications: Computer Aided Drug Delivery System (Theory)

Course Title	Computer Aided Drug Delivery System
Course Code	PSC509
Course Type	Core Theory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

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.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1: 25 Marks** 1A: Attendance: 8 Marks 1B: Student-Teacher interaction: 2 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Explain the history of software applications in pharmaceutical research and development
CO-2. Understand and interpret computational modeling of drug disposition
CO-3. Examine software applications in preclinical and formulation development
CO-4. Evaluate the role of software in biopharmaceutical analysis and clinical data management
CO-5. Discuss the applications of artificial intelligence and machine learning in pharmaceutical field

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4. **Course Contents**

Unit 1

Explain the history of software applications in pharmaceutical research and development History of Computers in Pharmaceutical Research and Development. Statistical modelling in Pharmaceutical research and development: Descriptive versus Mechanistic Modeling, Statistical Parameters, Estimation, Confidence Regions, Nonlinearity at the Optimum, Sensitivity Analysis, Optimal Design, Population Modeling. Quality-by-Design In Pharmaceutical Development: Introduction, ICH Q8 guideline, Regulatory and industry views on QbD, Scientifically based QbD - examples of application. **12 Hours**

Unit 2

Computational Modeling Of Drug Disposition: 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. **12 Hours**

Unit 3

Computer-aided formulation development: Concept of optimization, Optimization parameters, Factorial design, Optimization technology & Screening design. Computers in Pharmaceutical Formulation: Development of pharmaceutical emulsions, microemulsion drug carriers Legal Protection of Innovative Uses of Computers in R&D, The Ethics of Computing in Pharmaceutical Research, Computers in Market analysis. **12 Hours**

Unit 4

Computer-aided biopharmaceutical characterization: Gastrointestinal absorption simulation. Introduction, Theoretical background, Model construction, Parameter sensitivity analysis, Virtual trial, Fed vs. fasted state, In vitro dissolution and in vitro in vivo correlation, Bio waiver 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. **12 Hours**

Unit 5

Applications of artificial intelligence and machine learning in pharmaceutical field Artificial Intelligence (AI), Robotics and Computational fluid dynamics: General overview, Pharmaceutical Automation, Pharmaceutical applications, Advantages and Disadvantages. Current Challenges and Future Directions. **12 Hours**

Practical/Laboratory content: Selected experiments for this course will be conducted in the Course Pharmaceutics – II Practical Code: PSL511

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5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	3									2		
CO-2	3		2	2								3			
CO-3	3	3					1	1				1	1		
CO-4	3			2			1	1					2	1	2
CO-5	2		3												3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		50
Demonstrations		05
1.Demonstration usingVideos	2	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer	3	
Tutorials		00
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		05
1. Case Study Presentation	00	
2. Guest Lecture	01	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	01	
5. Group Discussions	02	
6. Discussing Possible Innovations	01	
Written Examination		5
Total Duration in Hours		**65**

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7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document. The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of Coson each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks ▶	8	2	15	
CO-1		×	×	×
CO-2		×		×
CO-3		×	×	×
CO-4		×	×	×
CO-5		×		
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Criteria	Maximum Marks
Attendance*	8
Student-Teacher Interaction	2
Total	10

1A. Guidelines for the allotment of marks for attendance*

Percentage of Attendance Theory	Marks
95 – 100	8
90 – 94	6
85 – 89	4
80 – 84	2
Less than 80	0

1B. Student-Teacher interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted,

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one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Class room lectures, Student-Teacher interaction, Assignments
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Class room lectures, Examination and Assignments
6.	Practical Skills	--
7.	Group Work	Assignments
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination, Student-Teacher Interaction
10.	Verbal Communication Skills	Presentations, Student-Teacher Interaction
11.	Presentation Skills	Class room activity, Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Group discussions and presentations, preparation for examination and presentations
14.	Personal Management	Course work
15.	Leadership Skills	Handling questions during presentations, class room behavior with peers, Student-Teacher interaction

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9. Course Resources

a. Essential Reading

1. Course notes
2. Ekins, Sean. Computer Applications in Pharmaceutical Research and Development. Wiley Series In Drug Discovery and Development. 1st ed. Wiley, 2006.

b. Recommended Reading

1. Djuris, Jelena. Computer-Aided Applications in Pharmaceutical Technology. 1st ed. Cambridge, UK: Woodhead Pub., 2013
2. Swarbrick, James. Encyclopedia of Pharmaceutical Technology.1st Ed. New York: Informa Healthcare, 2007.

c. Magazines and Journals

1. Current Computer-Aided drug Design
2. Journal of Computer-Aided Molecular Design

d. Websites

1. www.springer.com
2. www.benthamscience.com

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Course Specifications: Cosmetics and Cosmeceuticals (Theory)

Course Title	Cosmetics and Cosmeceuticals
Course Code	PSC510
Course Type	Core Theory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course is designed to impart knowledge in the area of advances cosmetics. The students are exposed to design and evaluate various cosmetic products. This course also emphasizes the regulatory requirements for cosmetics and cosmeceuticals.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component1:25Marks** 1A: Attendance:8Marks 1B: Student-Teacherinteraction:2Marks1C: Sessional Exam: 15 Marks **Component 2 (SEE):** SemesterEndExamination:75Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain regulatory requirements for cosmetics
- **CO-2.** Interpret biological aspects of human system with suitable cosmetic applications
- **CO-3.** Identify suitable excipients for cosmetical preparations
- **CO-4.** Discuss recent trends and advances in cosmetics and cosmeceuticals
- **CO-5.** Formulate and evaluate various cosmetic products
- **CO-6.** Recommend suitable cosmetic and cosmeceutical applications for herbal extracts

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4. Course Contents

Unit1

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 hours

Unit2

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 hours

Unit3

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 hours

Unit4

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.

12hours

Unit5

Herbal Cosmetics: Herbal ingredients used in Hair care, skin care and oral care. Review of guidelines for herbal cosmetics by private bodies like cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics. **12hours**

Practical/Laboratory content: Selected experiments for this course will be conducted in the Course Pharmaceutics –II Practical Code: PSL511

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5. Course Map (CO-PO-PSO Map)

	Programme Outcomes(POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3		2					2	3		3			3	3
CO-2	3		2			2	1	3	3	3	3		1		2
CO-3	3	3	3	3		1	3	2	3	2	3	3	3	2	3
CO-4	3		2	1		2	3	2	3	2	3		2	2	3
CO-5	3	3	3	3	2		3	2	3	1	3	3	3		3
CO-6	3	3	3	3	2	2	3	3	3	2	3	3	3		3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		50
Demonstrations		05
1.Demonstration using Videos	5	
2.Demonstration using Physical Models/Systems		
3.Demonstration on a Computer		
Tutorials		00
Practical Work		
1.Course Laboratory	00	
2.Computer Laboratory	00	
3.Engineering Workshop/Course/Workshop/ Kitchen	00	
4.Clinical Laboratory	00	
5.Hospital	00	
6.Model Studio	00	
Others		05
1.Case Study Presentation	01	
2.Guest Lecture	01	
3.Industry/Field Visit	00	
4.Brain Storming Sessions	00	
5.Group Discussions	02	
6.Discussing Possible Innovations	01	
Written Examination		5
Total Duration in Hours		**65**

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7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of Cos on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester EndExamination75Marks
Maximum Marks ▶	8	2	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
CO-5		×	×	×
CO-6		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component-1: 25marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Criteria	Maximum Marks
Attendance*	8
Student-Teacher Interaction	2
Total	10

1A. Guidelines for the allotment of marks for attendance*

Percentage of Attendance Theory	Marks
95– 100	8
90– 94	6
85– 89	4
80– 84	2
Less than 80	0

1B. Student-Teacher interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component-2: 75marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by a second examiner.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Student-Teacher interaction, Assignments
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Classroom lectures, Examination and Assignments
6.	Practical Skills	--
7.	Group Work	Assignments
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination, Student-Teacher Interaction
10.	Verbal Communication Skills	Presentations, Student-Teacher Interaction
11.	Presentation Skills	Classroom activity, Assignment, Examination
12.	Behavioral Skills	Coursework

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13.	Information Management	Group discussions and presentations, preparation for Examination and presentations
14.	Personal Management	Coursework
15.	Leadership Skills	Handling questions during presentations, classroom behavior with peers, Student-Teacher interaction

9. Course Resources

a. Class Notes

b. Essential Reading

1. Harry's Cosmeticology.(2011),8thedition,ChemicalPublishing,NewYork
2. Poucher's perfume cosmetics and Soaps, (1993), 10th edition, Kluwer Academic Publishers.
3. PP.Sharma.(2014)Cosmetics-Formulation,Manufactureandqualitycontrol, 4thedition.

c. Recommended Reading

1.A.O.Barel, M.Paye, H.I. (2014), Maibach. Handbook of cosmetic science andTechnology3rdedition, CRC Press, London

d. Magazines and Journals

1. International Journal of Cosmetic Science, John-Wiley &Sons, USA.
2. Journal of Cosmetics, Dermatological Sciences and Applications, Fluorotronics, Inc., USA.

e. Websites

1. International Journal of Cosmetic Science, John Wiley & Sons, USA.
2. Journal of Cosmetics, Dermatological Sciences and Applications, Fluorotronics, Inc., USA.

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Course Specifications: Pharmaceutics Practical – II (Practical)

Course Title	**Pharmaceutics Practical - II**
Course Code	PSL511
Course Type	Core Practical Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of the course is to impart training in the formulation and evaluation of cosmetics. This course also emphasizes the application of principles of QbD and DOE for effective optimization of process parameters and to assess the pharmacokinetic parameters using software.

2. Course Size and Credits:

Number of Credits	06
Credit Structure (Lecture: Tutorial: Practical)	0:0:12
Total Hours of Interaction	180
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics& Pharmaceutical Chemistry
Total Course Marks	150 **Component 1: 50 Marks** 1A: Attendance: 10 Marks 1B: Student-Teacher interaction: 10 Marks 1C: Sessional Exam: 30 Marks **Component 2 (SEE):** Semester End Examination: 100 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Compare the dissolution efficiency of various marketed pharmaceutical products
CO-2. Formulate and evaluate various cosmetic products
CO-3. Design experiments based on QbD for optimization of drug delivery
CO-4. Analyze and predict pharmacokinetic parameters using software
CO-5. Evaluate computational modeling of drug disposition
CO-6. Formulate and evaluate various targeted drug delivery systems

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4. Course Contents

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

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3		2	2				1		2	3	3	2		3
CO-2	3		3	3			1	1		2	3	3	3		3
CO-3	3		3	3			2	1	2	3	3	3	1		3
CO-4	3		3	3		2	2	1	2		3	2			3
CO-5	3		3	3		1		2	2		3	2			3
CO-6	3	3	3	3						2	2	3	3		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		10
Demonstrations		15
1.Demonstration usingVideos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer	15	
Tutorials		10
Practical Work		150
1. Course Laboratory	100	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	50	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		05
1. Case Study Presentation	05	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	05	
5. Group Discussions	00	
6. Discussing Possible Innovations	05	
Written Examination		20
Total Duration in Hours		**200**

1. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

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Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 100 Marks
Maximum Marks ▶	10	10	30	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
CO-5		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Criteria	Maximum Marks
Attendance*	10
Student-Teacher Interaction	10
Total	20

1A. Guidelines for the allotment of marks for attendance*

Percentage of Attendance Theory	Marks
95 – 100	10
90 – 94	7.5
85 – 89	5
80 – 84	2.5
Less than 80	0

1B. Student-Teacher interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 100 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by a second examiner.

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Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory interactions and self-study
2.	Understanding	Experiments conducted in laboratory
3.	Critical Skills	Experiments conducted in laboratory
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Lab work and Examination
6.	Practical Skills	Face to face interactions and lab work
7.	Group Work	Laboratory Tasks
8.	Self-Learning	Practical Record writing and Examination
9.	Written Communication Skills	Viva voce and presentation of results
10.	Verbal Communication Skills	Presentation of results
11.	Presentation Skills	Laboratory Tasks
12.	Behavioral Skills	Practical Record writing and presentation of results
13.	Information Management	Group discussions and planning of Laboratory Tasks
14.	Leadership Skills	Handling questions during presentations, class room behavior with peers, Student-Teacher interaction

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9. Course Resources

a. Essential Reading

- **Lab manual**

a. Essential reading

1. Swarbrick,J. (2007) Encyclopedia of Pharmaceutical Technology. 3rd Edition. New York: Marcel Dekker Inc. 2. Lachmann, L., Liebermann, H. A. (2009) The Theory and Practice of Industrial Pharmacy. New Delhi: CBS publishers.

3. Chien, Y.W. (1991) Novel Drug Delivery Devices: Fundamentals, Developmental Concepts, Biomedical Assessments. New York: Marcel Dekker.

4. Vyas, S.P, Khar, R.K. (2012) Controlled Drug delivery: Concepts and Advances. 2 nd ed. Delhi: Vallabh Prakashan

5.Wise, D.L. (2000) Handbook of Pharmaceutical Controlled Release Technology. New York: Marcel Dekker Inc.

b. Recommended Reading

1 United State of Pharmacopoeial Convention, (2004) The United States Pharmacopoeia-27 (NF-22). Rockville: MD

2. Government of India, (2010) Indian Pharmacopoeia. New Delhi: Government of India.

3. Government of India, (2014) Indian Pharmacopoeia. New Delhi: Government of India.

Magazines and Journals

a. International Journal of Pharmaceutics, Elsevier, ScienceDirect
b. European Journal of Pharmaceutical Sciences, Elsevier, ScienceDirect
c. Journal of Controlled Release, Elsevier, ScienceDirect
d. Drug Development and Industrial Pharmacy, Informa UK
e. Journal of Pharmaceutics, Hindawi

Websites

1. www.sciencedirect.com
2. www.pubmed.com

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Course Specifications: Seminar/Assignment

Course Title	Seminar/Assignment
Course Code	PSS512
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The course aims to instill critical thinking, analytical thinking and problem-solving skills amongst students. Students are trained to refer to literature and present their thought process, justification either in the form of an essay or debate as a concise report. Students are trained for collaborative learning while analyzing and also solving problems. They are exposed to citation, referencing and paraphrasing. Students are also exposed in communicating the collected information/literature to present and defend their accomplishment.

2. Course Size and Credits:

Number of credits	04
Total hours of class room and laboratoryinteraction during the course	105 hours in a semester
Total Course Marks	**100** **Component -1: Assignment = 60 Marks** Report evaluated individually for 15 marks for 4 theory Courses in the semester. **Component-2: Seminar = 40 Marks** Assignment presentation evaluated individually for 10 marks for 4 theory Courses in the semester.
Pass Criteria	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

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3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Develop critical thinking, analytical thinking and problem-solving skills
CO-2. Demonstrate the ability to synthesise the report
CO-3. Develop academic report with appropriate citation and referencing style
CO-4. Communicate the contents of the report to the panel
CO-5. Defend the contents of the report in the panel

4. Course Contents

Critical review of the literature on the given assignment
Writing and Communication skills
Citation and referencing styles- Harvard referencing style
Plagiarism review
Analytical and problem-solving skills
Practical/Laboratory content: NA

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	3	3	1	1	2		1		2	2	1	1	2	2
CO-2	2	3	2	2		1		3		2	1	1	1	2	3
CO-3	3	1	1	3	1	2		3	1		3	1	1		2
CO-4	1	2	2	3	2	2	2	3	1		3	1	1	2	2
CO-5	3		2	3		1	2	3		1	3	1	1	2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration inHours
Face to Face Lectures		10
Demonstrations		10
1. Demonstration using Videos		
2. Demonstration using Physical Models/Systems	5	
3. Demonstration on a Computer	5	
Numeracy		00
1. Solving Numerical Problems	00	
Practical Work		15
1. Course Laboratory	05	
2. Computer Laboratory	00	
3. Engineering Workshop/Course Workshop/Kitchen	10	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		50
1. Case Study Presentation	10	
2. Guest Lecture	00	
3. Industry/Field Visit	00	
4. Brain Storming Sessions	10	
5. Group Discussions		
6. Discussing Possible Innovations	30	
Term Tests, Laboratory Examination/Written Examination, Presentations		20
Total Duration in Hours		105

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7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

	Component 1: Assignment (60% Weightage)	Component 2: Seminar (40% Weightage)
Subcomponent ▶	SC1	SC2
Subcomponent Type ▶	Assignment	Seminar
Maximum Marks ▶	60	40
CO-1	X	X
CO-2	X	
CO-3	X	
CO-4	X	X
CO-5		X

Component - 1: Assignment = 60Marks [4 courses of 15 marks each]
One word processed assignment submitted for 4 theory courses in a semester will be evaluated by Course Leaders for a maximum of 15 marks each.

Component - 2: Seminar = 40Marks [4 courses of 10 marks each]
Presentation on submitted assignments will be evaluated by Course Leaders for a maximum of 10 marks each.

Marks awarded for four individual Courses (Assignment -15 marks & Seminar – 10 marks) will be summed and calculated for the total marks obtained for a maximum mark of 100.

The assessment questions are set to test the learning outcomes. In each component a certain learning outcome are assessed. The following table illustrates the focus of learning outcome in each componentassessed:

Both components will be moderated by a second examiner.

Reassessment

1.If a student fails in the course, it is considered fail and he or she has to earn the credits inthe makeup opportunity and re-registration to the Course is required.

2.The maximum number of such opportunities is limited as per the academic regulations governing this Programme.

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8. Achieving COs

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Reading and findings
2.	Understanding	Reading and findings
3.	Critical Skills	Literature Review
4.	Analytical Skills	Data collection
5.	Problem Solving Skills	Data analysis
6.	Practical Skills	Writing & Presentation
7.	Group Work	Data analysis
8.	Self-Learning	Reading and findings
9.	Written Communication Skills	Assignment processing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Interactions
13.	Information Management	Paper writing
14.	Personal Management	Course work
15.	Leadership Skills	Effective management of learning, time management, achieving the learning

9. Course Resources

a. Essential Reading
   1. Research articles
   2. Relevant text books
   3. Visits to websites relevant to assignment problem

b. Recommended Reading
   NA

c. Magazines and Journals

   Relevant Magazines and Journals pertaining to assignment

d. Websites
   Specific web information pertaining to assignment

e. Other Electronic Resources: NA

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SEMESTER III

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Course Specifications: Research Methodology and Biostatistics

Course Title	Research Methodology and Biostatistics
Course Code	PSF613
Course Type	Core Theory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course deals with the basic principles of research methodology and medical research. The students are trained on statistical tools and methodologies to solve problem arising in medical research. The course will also impart students the guidelines for quality maintenance of laboratory animals for conducting biomedical research.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy & Pharmacy Practice
Total Course Marks	100 **Component 1: 25 Marks** 1A: Attendance: 8 Marks 1B: Student-Teacher interaction: 2 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Recognize the value, scope, objective and requirements of research
CO-2. Discuss the basic concept and importance of statistical analysis
CO-3. Outline the basic principles of medical research
CO-4. Summarize the guidelines for the maintenance of laboratory animals
CO-5. Perform the profession of Pharmacy with code of conduct and ethics
CO-6. Apply the principles of medical research for the development of knowledge in the field of medicine

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4. Course Contents

Unit 1

General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques. **12 Hours**

Unit 2

Biostatistics: Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests (students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxan rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values. **12 Hours**

Unit 3

Medical Research: History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality. **12 Hours**

Unit 4

CPCSEA guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anaesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs personnel and training, transport of lab animals. **12 Hours**

Unit 5

Declaration of Helsinki: History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care. **12 hours**

Practical/Laboratory content: NA

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5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3										2	3	2		
CO-2	3		3	2							2	2			1
CO-3	3		2				2					2			1
CO-4	3						2					2			
CO-5	2						3				1	2	2		2
CO-6	2		2	1			2	2				3	2		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		55
Demonstrations		00
1.Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		05
1. Case Study Presentation	00	
2. Guest Lecture	02	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	03	
6. Discussing Possible Innovations	00	
Written Examination		05
Total Duration in Hours		**65**

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7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document. The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Student – Teacher Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks▶	8	2	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
CO-5		×	×	×
CO-6		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below:

Criteria	Maximum Marks
Attendance*	8
Student-Teacher Interaction	2
Total	10

1A. Guidelines for the allotment of marks for attendance*

Percentage of Attendance Theory	Marks
95 – 100	8
90 – 94	6
85 – 89	4
80 – 84	2
Less than 80	0

1B. Student-Teacher interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be

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conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by a second examiner.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Class room lectures, Student-Teacher interaction, Assignments
4.	Analytical Skills	Student-Teacher Interaction
5.	Problem Solving Skills	Class room lectures, Examination and Assignments
6.	Practical Skills	--
7.	Group Work	Assignments
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination, Student-Teacher Interaction
10.	Verbal Communication Skills	Presentations, Student-Teacher Interaction
11.	Presentation Skills	Class room activity, Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Group discussions and presentations, preparation for examination and presentations
14.	Personal Management	Course work
15.	Leadership Skills	Handling questions during presentations, class room behavior with peers, Student-Teacher interaction

9. Course Resources

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a. Essential Reading

1. Course notes
2. Booth W. C, Colomb and Williams, G.G (2005) The Craft of Research, Chicago University Press.
3. Willium M.K and Trochim. (2003) Research Methods, 2nd ed, Biztantra Publications
4. Jonathan Grix. (2004) The Foundation of Research, Palgrave Study Guides
5. Bolton S and Bon C (2009) Pharmaceutical Statistics - Practical & Clinical Applications. 5th ed.New York: Marcel Dekker.
6. Jagadeesh, G., Sreekant Murthy, Gupta Y.K., Amitabh Prakash (2010) Biomedical Research, Lippincott Williams and Wilkins, 1ST ed, New Delhi.
7. Gupta S.K. (2007) Basic principles of clinical Research and methodology, Institute of Clinical Research, India.
8. Ghosh M.N,(2008) Fundamentals of experimental Pharmacology, 4th ed, Hilton and company, Kolkata.

b. Recommended Reading

1. Muth, J.E.D.(2006) Basic Statistics and Pharmaceutical Statistical Applications, 2nd ed. New Delhi:CRC Press.
2. Jones, D.S. (2002) Pharmaceutical Statistics. UK: Pharmaceutical Press.
3. Himanshi Joshi, (2015) An alternative approach to experimental Pharmacology. India: Himdeep publication.

c. Magazines and Journals

1. Indian Journal of Medical Research- ICMR, India.
2. The International Journal of Biostatistics-Berkeley Electronic Press, United States.
3. Indian Journal of Pharmacology- Medknow Publication, India

d. Websites

1. www.sciencedirect.com
2. www.pubmed.com

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Course Specifications: Journal Club

Course Title	Journal Club
Course Code	PSF614
Course Type	Core Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to equip a student to critically appraise the research article published in reputed journals. Students are trained for inquiry based learning and critical thinking skills. Students will also be trained to access journals adopting search engines and made to choose a topic of interest, collect relevant data, analyze and assess the quality of scientific paper and comment on the internal and external validity of the findings. Student will be able to base their opinion on evidence-based literature

2. Course Size and Credits:

Number of Credits	01
Credit Structure (Lecture: Tutorial: Practical)	1:0:0
Total Hours of Interaction	15
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	**Total Marks: 25** **Component 1: 15 Marks** Report Evaluation: 15 marks **Component 2: 10 Marks** Presentation: 10 marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Select scientific articles from reputed journals
CO-2. Use search engines to select scientific articles
CO-3. Critically appraise scientific articles and assess the quality
CO-4. Develop a report on the critically appraised article
CO-5. Present the critically appraised article in appropriate forum

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4. Course Contents

Select scientific articles from reputed journals

- Use search engines to select scientific articles
- Critically appraise scientific articles and assess the quality
- Develop a report on the critically appraised article
- Present the critically appraised article in appropriate forum

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3														
CO-2	1			3							3				
CO-3	3		3								3	3			3
CO-4	3	3	3		3		2	3			3			3	3
CO-5	3	3	2	3	3		2	3			3			3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		00
1.Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		00
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop / Course/Workshop / Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		15
1. Case Study Presentation	05	
2. Guest Lecture		
3. Industry / Field Visit		
4. Brain Storming Sessions	10	
5. Group Discussions		
6. Discussing Possible Innovations		
Report preparation/ Report Evaluation & Presentation		05
Total Duration in Hours		**20**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

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Focus of COs on each Component or Subcomponent of Evaluation		
	Component 1: Report evaluation (15% Weightage)	Component 2: Presentation (10% Weightage)
Subcomponent Type ▶	Report Evaluation	Presentation
Maximum Marks ▶	15	10
CO-1	×	
CO-2	×	
CO-3	×	
CO-4	×	
CO-5		×

Component - 1: 15 marks
Report submitted will be evaluated by a committee of examiners consisting not less than 2 members within the Department appointed by the Head of the Department in consultation with the Academic Registrar of the Faculty

Component - 2: 10 marks
Evaluation of presentation by a committee of examiners consisting not less than 2 members within the Department appointed by the Head of the Department in consultation with the Academic Registrar of the Faculty.
Both components will be moderated by a second examiner.

Re-assessment
1. If a student fails in the course, it is considered fail and he /she has to re-register in the next opportunity. The marks awarded will be recapped to 50%.
2. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

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39. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Reading
2.	Understanding	Reading
3.	Critical Skills	Review on Seminar topic
4.	Analytical Skills	Comments on the reviewed topic
5.	Problem Solving Skills	---
6.	Practical Skills	---
7.	Group Work	---
8.	Self-Learning	Reading and Research
9.	Written Communication Skills	Paper writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Interactions
13.	Information Management	Paper writing
14.	Leadership Skills	Effective management of learning, time management, achieving the learning outcomes

9. Course Resources

a. Essential Reading

Jennifer Raff, 2013, How to read and understand a scientific paper: A guide for non- scientists.

b. Recommended Reading

Relevant articles pertaining to the programme domain

c. Magazines and Journals

Relevant magazines and journals pertaining to the programme domain

d. Websites

1.www.sciencedirect.com
2. www.elsevier.com

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Course Specifications: Group Project

Course Title	Group Project
Course Code	PSF615
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course will focus on the applications of appropriate methods and techniques involved in pharmaceutical Sciences using relevant University resources for definition and execution of the project. The group project will enable the students to apply the theoretical and practical aspects of pharmaceutical sciences as well as project management techniques taught during the programme. This course will enable the students to gain practical experience of working in a project mode, requiring interactions with the domain specialist to meet the technical challenges of the project undertaken.

2. Course Size and Credits:

Number of Credits	04
Total Hours of Interaction	NA
Number of Weeks in a Semester (Lecture: Tutorial: Practical)	NA
Department Responsible	Department of Pharmacognosy, Pharmaceutical Chemistry, Pharmacology, Pharmaceutics, Pharmacy Practice
Total Course Marks	NA
Pass Criterion	Report Submission, Presentation & Exhibition of the project
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Work in a team and undertake a project in the area of Pharmaceutical Sciences
CO-2. Apply concepts of pharmaceutical sciences for executing the project
CO-3. Apply appropriate research methodology while formulating a project
CO-4. Generate specifications, synthesize, analyse, develop and evaluate a project
CO-5. Defend the project, exhibit, make a presentation and document the work

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4. Course Contents

Unit 1
Need for undertaking a project, Project design, protocol / specifications design, methodology, analysis, product/design/model evaluation and presentation
Unit 2
Project Management, Time Management, Resource Management
Unit 3
Project Material indent, Project Development, Testing, Project Evaluation
Unit 4
Project Exhibition, Presentation
Unit 5
Team building, Team work, Leadership skills
Unit 6
Practical/Laboratory content: Interdepartmental laboratory work

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	3	2	2	1	1	1	2	1		1	3	3	2	1
CO-2	3	3	2	2	2	1	1	1	1		2	3	2	2	1
CO-3	3	3	3	3	2	1	1	1	1	1	1	3	3	2	1
CO-4	2	2	3	1	3	2	1	1	1	1	1	3	3	2	1
CO-5	3	3	3	3	2	1	1	3	3	1	1	3	3	2	1
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		00
1.Demonstration usingVideos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		00
Total Duration in Hours		**NA**

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7. Course Assessment and Reassessment

There are two components for assessment in this course

		Type of Assessment	
No.	**Intended Learning Outcome**	**Component-I** (Project Report and Viva-Voce)	**Component-II** (Exhibition and Presentation)
1	Work in a team and undertake a project in the area of Pharmaceutical Sciences	X	X
2	Apply concepts of pharmaceutical sciences for executing the project	X	X
3	Apply appropriate research methodology while formulating a project	X	X
4	Generate specifications, synthesize, analyse, develop and evaluate a project	X	X
5	Defend the project, exhibit, make a presentation and document the work	X	X

Component - 1: 50% weight
Project Report and Viva-Voce
Component - 2: 50% weight
Exhibition and Presentation
Both components will be moderated by a second examiner and the credits will be awarded after satisfying completion of the project work.
Reassessment
If a student fails in any one of the components, it is considered fail and the student should resubmit the project report or re-register to the course as applicable.
The maximum number of such opportunities is limited as per the academic regulations governing this course.

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8. Meeting Programme Objectives through Course Objectives

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Group Project Work
2.	Understanding	Group Project Work
3.	Critical Skills	Group Project Work
4.	Analytical Skills	Group Project Work
5.	Problem Solving Skills	Group Project Work
6.	Practical Skills	Group Project Work
7.	Group Work	Group Project Work
8.	Self-Learning	Group Project Work
9.	Written Communication Skills	Report writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Group Project Work
13.	Information Management	Group Project Work
14.	Personal Management	Group Project Work
15.	Leadership Skills	Effective management of learning, time management, achieving the learning outcomes

9. **Course Resources**

a. Essential Reading
Assigned reading relevant to the group project.
b. Recommended Reading
Assigned reading relevant to the group project.
c. Magazines and Journals
Specific Journals relevant to group project work
d. Websites
Specific Websites relevant to group project work

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Course Specifications: Discussion / Synopsis Presentation

Course Title	Discussion / Synopsis Presentation
Course Code	PSF616
Course Type	Core Theory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course is designed to impart knowledge on the area of advances in targeted drug delivery systems. The coursed also focuses on molecular mechanistic approaches to the development of bio-available drugs and delivery systems.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	2:0:0
Total Hours of Interaction	02
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	50
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Identify Research problem
CO-2. Discuss research problem with team and peers for solution
CO-3. Develop a protocol report on the critically appraised research problem
CO-4. Present the critically appraised research problem in appropriate forum

4. Course Contents

Unit 1

Collect and appraise the relevant data from the scientific article for the chosen research problem.
Record the findings/data for solving research problem.
Develop a report on the critical observations and discuss with mentor /peer.
Presentation of the reports/findings in appropriate forum.
Practical/Laboratory content: NA.

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5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	1	3						3	2		3	1	3	2
CO-2	3	1	1		2	2		3			2	2	1	2	
CO-3	3	3	3	2			2		2	2	3	3	3	3	2
CO-4	3	1			3	3		3			2	2	1	2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		20
Demonstrations		10
1.Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer	5	
Tutorials		00
Practical Work		00
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop / Course/Workshop / Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		00
1. Case Study Presentation		
2. Guest Lecture		
3. Industry / Field Visit		
4. Brain Storming Sessions	05	
5. Group Discussions		
6. Discussing Possible Innovations	20	
Synopsis preparation/ Presentation/ Discussion		05
Total Duration in Hours		**35**

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7. Course Assessment and Reassessment

Synopsis to be evaluated along with the supporting documents by the Head of the Department/ Nominated Examiner by the HoD/Academic Registrar/Dean. Panel to evaluate and endorse. Dean of the Faculty to approve and submit to the University.

Re-assessment

The remarks/queries/suggestions made by the examiner during scrutiny of the synopsis should be attended by the candidate in consultation with the Research Supervisor and must be re-submitted for evaluation process

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Reading
2.	Understanding	Reading
3.	Critical Skills	Review on research topic
4.	Analytical Skills	Comments on reviewed topic
5.	Problem Solving Skills	Research work, discussion
6.	Practical Skills	Research work, interactions
7.	Group Work	Discussion
8.	Self-Learning	Reading and Research
9.	Written Communication Skills	Report writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Interactions
13.	Information Management	Document writing and Presentation
14.	Personal Management	Presentation
15.	Leadership Skills	Effective management of learning, time management, achieving the learning outcomes

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9. Course Resources

a. Essential Reading

1. Jennifer Raff, 2013, *How to read and understand a scientific paper: A guide for non-scientists.*

b. Magazines and Journals

1. International Journal of Pharmaceutics, Elsevier, Science Direct, Amsterdam
2. European Journal of Pharmaceutical Sciences, Elsevier, Science Direct, Amsterdam
3. Advanced Drug Delivery Reviews, Elsevier, Science Direct, Amsterdam
4. Journal of Controlled Release, Elsevier, Science Direct, Amsterdam
5. Drug Development and Industrial Pharmacy, Informa UK
6. Asian Journal of Pharmaceutical Sciences, Elsevier, Science Direct, Amsterdam
7. Indian Journal of Pharmaceutical Sciences, Indian Pharmaceutical Association, Mumbai

c. Websites

1.www.sciencedirect.com
2. www.elsevier.com

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Course Specifications: Research Work

Course Title	Research Work
Course Code	PSF617
Course Type	Core Research Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to encourage students to develop skills in identification of a research problem in the chosen domain. This course also emphasizes the application of principles of research methodology, preparation of research project proposal, research project management, execution of research project with effective technical documentation and presentation.

2. Course Size and Credits:

Number of Credits	14
Credit Structure (Lecture: Tutorial: Practical)	0:0:14
Total Hours of Interaction	28
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	**Total Marks: 350** **Component -1: 250 Marks** Evaluation of Interim-Dissertation work Progress **Component-2:100Marks** Evaluation of Interim-Dissertation Presentation
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Review scholarly literature collected from various sources critically for the project and formulate a research problem
CO-2. Prepare and present a research proposal
CO-3. Conduct research to achieve research objectives
CO-4. Propose new ideas/methodologies or procedures for further improvement of the research problem
CO-5. Create research document of the findings
CO-6. Defend the research findings in front of scholarly audience

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4. **Course Contents**

- Information search, retrieval and review
- Research problem identification
- Project definition and project planning with objectives
- Use of conceptual models/methodologies and frameworks
- Problem solving and evaluation
- Interpretations and drawing conclusions
- Proposing ideas or methods for further work
- Dissertation writing
- Oral presentation

Practical/Laboratory content: Yes

5. **Course Map (CO-PO-PSO Map)**

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	2			3	2		1	3	3	2		2
CO-2	3	2	3	2	2	2	3	2		1	2	3	2	2	2
CO-3	3	2	3	2		2	3	2	3	1	3	3	2		2
CO-4	3	2	3	3	2	2	3	2	2	1	3	3	3	2	2
CO-5	3	2	2	3		2	3	2		1	3	3	3		2
CO-6	3	2	3	2	2	3	3	2	3	1	3	3	3	2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		
1.Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory	25	
2. Computer Laboratory	03	
3. Engineering Workshop / Course/Workshop / Kitchen	00	28
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	00
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Presentation Evaluation		02
Total Duration in Hours		30

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7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation		
	Component 1: CE (250 Marks)	Component 2: SEE (100 Marks)
CO-1	×	×
CO-2	×	×
CO-3	×	×
CO-4	×	×
CO-5	×	×
CO-6	×	×

Component-1: Evaluation of Dissertation Book

Objectives	25 Marks
Review of literature	25 Marks
Methodology – Preliminary and on-going, evaluation parameters	100 Marks
Results and Discussion	100 Marks
Total	**250 Marks**

Component-2: Evaluation of Dissertation Presentation

Presentation of work	50 Marks
Communication skills	25 Marks
Question and answer skills	25 Marks
Total	**100 Marks**

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The components will be evaluated by two examiners, one would be the Guide/ Supervisor (Internal Examiner) and the other External examiner would be the senior faculty member (within Department/Faculty for Component-1 & outside external to the University for Component-2.

However, the process of Dissertation evaluation in the IV semester should be carried out only after the student passes all the courses till III semester.

Re-assessment

1. If a student fails in the course, it is considered fail and re-registration to the course is required
2. The maximum number of such opportunities is limited as per the academic regulations governing this programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Dissertation
2.	Understanding	Dissertation
3.	Critical Skills	Dissertation
4.	Analytical Skills	Dissertation
5.	Problem Solving Skills	Dissertation
6.	Practical Skills	Dissertation
7.	Group Work	Dissertation
8.	Self-Learning	Dissertation
9.	Written Communication Skills	Report writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Presentation
13.	Information Management	Report writing and Presentation
14.	Personal Management	Report writing and Presentation
15.	Leadership Skills	Effective management of learning, time management, achieving the learning outcome

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9. Course Resources

a. Essential Reading

16. BarryWhite,2011, *Mapping Your Thesis: The Comprehensive Manual of Theory and Techniques for Masters and Doctoral Research*, ACER press, Australia.
17. Maximiano M. Rivera, Jr. and Roela Victoria Rivera, 2007, *Practical Guide to Thesis and Dissertation Writing*, KATHA Publishing, Philippines.
18. Lecture sessions on Dissertation, Thesis preparation delivered by the concerned Head of the Dept.

b. Recommended Reading

Relevant books pertaining to research problem

c. Magazines and Journals

Relevant magazines and journals pertaining to research problem

d. Websites

Relevant websites pertaining to research problem

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SEMESTER IV

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Course Specifications: Journal Club

Course Title	Journal Club
Course Code	PSF618
Course Type	Core Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to equip a student to critically appraise the research article published in reputed journals. Students are trained for inquiry based learning and critical thinking skills. Students will also be trained to access journals adopting search engines and made to choose a topic of interest, collect relevant data, analyze and assess the quality of scientific paper and comment on the internal and external validity of the findings. Student will be able to base their opinion on evidence-based literature

2. Course Size and Credits:

Number of Credits	01
Credit Structure (Lecture: Tutorial: Practical)	1:0:0
Total Hours of Interaction	15
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	**Total Marks: 25** **Component 1: 15 Marks** Report Evaluation: 15 marks **Component 2: 10 Marks** Presentation: 10 marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1.** Select scientific articles from reputed journals
- **CO-2.** Use search engines to select scientific articles
- **CO-3.** Critically appraise scientific articles and assess the quality
- **CO-4.** Develop a report on the critically appraised article
- **CO-5.** Present the critically appraised article in appropriate forum

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4. Course Contents

- Select scientific articles from reputed journals
- Use search engines to select scientific articles
- Critically appraise scientific articles and assess the quality
- Develop a report on the critically appraised article
- Present the critically appraised article in appropriate forum

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3														
CO-2	1			3							3				
CO-3	3		3								3	3			3
CO-4	3	3	3		3		2	3			3			3	3
CO-5	3	3	2	3	3		2	3			3			3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		00
1.Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		00
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop / Course/Workshop / Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		10
1. Case Study Presentation		
2. Guest Lecture		
3. Industry / Field Visit		
4. Brain Storming Sessions	10	
5. Group Discussions		
6. Discussing Possible Innovations		
Report preparation/ Report Evaluation & Presentations		05
Total Duration in Hours		**15**

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8. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

Focus of COson each Component or Subcomponent of Evaluation		
	Component 1: Report evaluation (15% Weightage)	Component 2: Presentation (10% Weightage)
Subcomponent Type ▶	Report Evaluation	Presentation
Maximum Marks ▶	15	10
CO-1	×	
CO-2	×	
CO-3	×	
CO-4	×	
CO-5		×

Component - 1: 15 marks
Report submitted will be evaluated by a committee of examiners consisting not less than 2members with in the Department appointed by the Head of the Department in consultation withthe Academic Registrar of the Faculty

Component - 2: 10 marks
Evaluation of presentation by a committee of examiners consisting not less than 2 members within the Department appointed by the Head of the Department in consultation with the Academic Registrar of the Faculty.
Both components will be moderated by a second examiner.

Re-assessment
1. If a student fails in the course, it is considered fail and he /she has to re-register in the next opportunity. The marks awarded will be recapped to 50%.
2. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

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8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Reading
2.	Understanding	Reading
3.	Critical Skills	Review on Seminar topic
4.	Analytical Skills	Comments on the reviewed topic
5.	Problem Solving Skills	---
6.	Practical Skills	---
7.	Group Work	---
8.	Self-Learning	Reading and Research
9.	Written Communication Skills	Paper writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Interactions
13.	Information Management	Paper writing
14.	Leadership Skills	Effective management of learning, time management, achieving the learning outcomes

9. Course Resources

a. Essential Reading

1. Jennifer Raff, 2013, How to read and understand a scientific paper: A guide for non-scientists.

b. Recommended Reading

Relevant articles pertaining to the programme domain

c. Magazines and Journals

Relevant magazines and journals pertaining to the programme domain

d. Websites

1.www.sciencedirect.com
2. www.elsevier.com

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Course Specifications: Discussion / Presentation

Course Title	Discussion / Presentation
Course Code	PSF619
Course Type	Core Theory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to enrich a student to critically solve the research problem/project proposal. Students will be trained to plan and execute the solution for the research problem through discussion and presentation with their mentor and peers using acquired knowledge, skills, evidence-based literature and experience.

2. Course Size and Credits:

Number of Credits	03
Credit Structure (Lecture: Tutorial: Practical)	3:0:0
Total Hours of Class room and laboratory Interaction during the course	45
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Course Marks	75
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Identify the research problem
CO-2. Discuss research problem with team and peers for solution
CO-3. Develop a protocol report on the critically appraised research problem
CO-4. Present the critically appraised research problem in appropriate forum

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4. Course Contents

Unit 1
Conduct of research work /Group Project in the laboratories and collection of data/findings

Unit 2
Record the findings/data for solving research problem with scientific based results

Unit 3
Develop a report on the critical observations and discuss with mentor /peer.

Unit 4
Investigation of medicinal Presentation of the reports/findings in appropriate forum).

Unit 5
Practical/Laboratory content: Research work in the Post Graduate Laboratories

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3		3			3	2	3	2	2	2				3
CO-2	2	2	3	2	2	2	2	3	1	2	2			2	3
CO-3	3	3	3	3	2	2	2	3	2	2	3	3	3		3
CO-4	3	3	3	3	2	2	2	3	2	2	3	3	3	2	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		05
1.Demonstration using Videos	05	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		
1. Solving Numerical Problems	05	05
Practical Work		25
1. Course Laboratory	00	
2. Computer Laboratory	20	
3. Engineering Workshop / Course/Workshop / Kitchen	05	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		10
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	10	
5. Group Discussions	00	
6. Discussing Possible Innovations	05	
Written Examination / Presentation		05
Total Duration in Hours		**50**

7. Course Assessment and Reassessment

Process:

Log book of the research work/Group Project / Colloquium presentation to be evaluated along with the supporting documents by the Head of the Department/ Nominated Examiner by the HoD/Academic Registrar/Dean along with the Supervisor. Panel to evaluate and endorse. Dean of the Faculty to approve and submit to the University

Re-assessment

The remarks/queries/suggestions made by the examiner during discussion / colloquium should be attended by the candidate in consultation with the Research Supervisor and must be re-submitted for evaluation process.

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8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Reading
2.	Understanding	Reading
3.	Critical Skills	Review on Seminar topic
4.	Analytical Skills	Comments on the reviewed topic
5.	Problem Solving Skills	Research work, discussion
6.	Practical Skills	Research work, Interactions
7.	Group Work	Discussion
8.	Self-Learning	Reading and Research
9.	Written Communication Skills	Report writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Interactions
13.	Information Management	Document writing and Presentation
14.	Leadership Skills	Effective management of learning, time management, achieving the learning outcomes

9. Course Resources

Essential Reading

a. Research Papers

b. Visits to websites relevant to research

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Course Specifications: Research Work

Course Title	Research Work
Course Code	PSF620
Course Type	Core Research Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to encourage students to develop skills in identification of a research problem in the chosen domain. This course also emphasizes the application of principles of research methodology, preparation of research project proposal, research project management, execution of research project with effective technical documentation and presentation.

2. Course Size and Credits:

Number of Credits	16
Credit Structure (Lecture: Tutorial: Practical)	0:0:31
Total Hours of Interaction	31
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	**Total Marks :400** **Component -1: 250 Marks** Evaluation of Final Dissertation Book **Component-2:150Marks** Evaluation of Final Dissertation Presentation
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Review scholarly literature collected from various sources critically for the project and formulate a research problem
CO-2. Prepare and present a research proposal
CO-3. Conduct research to achieve research objectives
CO-4. Propose new ideas/methodologies or procedures for further improvement of the research problem
CO-5. Create research document of the findings
CO-6. Defend the research findings in front of scholarly audience

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4. Course Contents

- Information search, retrieval and review
- Research problem identification
- Project definition and project planning with objectives
- Use of conceptual models/methodologies and frameworks
- Problem solving and evaluation
- Interpretations and drawing conclusions
- Proposing ideas or methods for further work
- Dissertation writing
- Oral presentation

Practical/Laboratory content: Yes

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	2			3	2		1	3	3	2		2
CO-2	3	2	3	2	2	2	3	2		1	2	3	2	2	2
CO-3	3	2	3	2		2	3	2	3	1	3	3	2		2
CO-4	3	2	3	3	2	2	3	2	2	1	3	3	3	2	2
CO-5	3	2	2	3		2	3	2		1	3	3	3		2
CO-6	3	2	3	2	2	3	3	2	3	1	3	3	3	2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		
1.Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory	28	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	430
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	03	30
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Research Presentation		05
Total Duration in Hours		465

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7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the M.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of Coson each Component or Subcomponent of Evaluation		
	Component 1: CE (500 Marks)	Component 2: SEE (250 Marks)
CO-1	×	×
CO-2	×	×
CO-3	×	×
CO-4	×	×
CO-5	×	×
CO-6	×	×

Component-1: Evaluation of Dissertation Book

Methodology: Experimental work & Evaluation studies	50 Marks
Results & Discussion	150 Marks
Conclusion & final outcomes	50 Marks
Total	**250 Marks**

Component-2: Evaluation of Dissertation Presentation

Presentation of work	50 Marks
Communication skills	50Marks
Question and Answer skills	50 Marks
Total	**150 Marks**

The components will be evaluated by two examiners, one would be the Guide/Supervisor

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(Internal Examiner) and the other External examiner would be the senior faculty member (withinDepartment/FacultyforComponent-1&outsideexternaltotheUniversityforComponent-2.

However, the process of Dissertation evaluation in the IV semester should be carried out only after the student passes all the course still III semester.

Re-assessment

3. If a student fails in the course, it is considered fail and re-registration to the course is required
4. The maximum number of such opportunities is limited as per the academic regulations governing this programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Dissertation
2.	Understanding	Dissertation
3.	Critical Skills	Dissertation
4.	Analytical Skills	Dissertation
5.	Problem Solving Skills	Dissertation
6.	Practical Skills	Dissertation
7.	Group Work	Dissertation
8.	Self-Learning	Dissertation
9.	Written Communication Skills	Report writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Presentation
13.	Information Management	Report writing and Presentation
14.	Personal Management	Report writing and Presentation
15.	Leadership Skills	Effective management of learning, time management, achieving the learning outcome

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9. Course Resources

a. Essential Reading

1. Barry White, 2011, *Mapping Your Thesis: The Comprehensive Manual of Theory and Techniques for Masters and Doctoral Research*, ACER press, Australia.
2. Maximiano M. Rivera, Jr. and Roela Victoria Rivera, 2007, *Practical Guide to Thesis and Dissertation Writing*, KATHA Publishing, Philippines.
3. Lecture sessions on Dissertation, Thesis preparation delivered by the concerned Head of the Dept.

b. Recommended Reading

Relevant books pertaining to research problem

c. Magazines and Journals

Relevant magazines and journals pertaining to research problem

d. Websites

Relevant websites pertaining to research problem

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Course Specifications: Participation/ Presentation in Research Forum

Course Title	Participation/ Presentation in Research Forum
Course Code	PSF621
Course Type	Mandatory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to make a student participate / present a research paper in a conference /seminar/workshop/symposium based on his/her research work specialization during his/her programme. The student is required to carry out original research, author a conference paper and present it. The student is also required to submit the paper to a conference approved by the department

2. Course Size and Credits:

Number of Credits	03 **National level participation: 01** **International level participation: 02**
Credit Structure (Lecture: Tutorial: Practical)	NA
Total Hours of Interaction	NA
Number of Weeks in a Semester	NA
Department Responsible	Pharmaceutics, Pharmacognosy, Pharmaceutical Chemistry, Pharmacology, Pharmacy Practice
Total Course Marks	NA
Pass Criterion	As per the Academic Regulations
Attendance Requirement	NA

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Identify a suitable conference /research forum/workshop/symposium for participation/presentation

CO-2. Participation in a conference/research forum/workshop/symposium of the chosen research domain

CO-3. Present a research work in the conference/research forum of the chosen research domain

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4. Course Contents

Unit 1
Identification of suitable conference of research domain

Unit 2
Participation in a conference/symposium/workshop

Unit 3
Presentation of research work in a conference

Practical/Laboratory content: NA

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2		1	2	2								1	
CO-2	3	3			3	3	2	3	2		1			2	1
CO-3	3	3	2	1		3	3	3		1	3	1	1	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

6. Course Teaching and Learning Methods

Self-Learning

Description	Number of credits
Participation in National Level Seminar/Conference / Workshop / Symposium / Training Programs (related to the specialization of the student)	01
Participation in outside India International Level Seminar /Conference/Workshop / Symposium / Training Programs (related to the specialization of the student)	02

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7. Course Assessment and Reassessment

NA

Process: To be nominated by the Head of the department/Course Supervisor with the supporting documents. Panel to evaluate and endorse. Dean of the Faculty to approve the credit awarded and submit to the University.

Re-assessment

NA

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Reading and Research
2.	Understanding	Reading and Research
3.	Critical Skills	Literature Review
4.	Analytical Skills	Research
5.	Problem Solving Skills	Research
6.	Practical Skills	Research
7.	Group Work	Data analysis
8.	Self-Learning	Reading and Research
9.	Written Communication Skills	Paper writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Interactions
13.	Information Management	Paper writing
14.	Leadership Skills	Effective management of learning, time management, achieving the learning outcomes

9. Course Resources

a. Class Notes

b. Essential Reading

a. Research Papers

b. Visits to websites relevant to research

c. Websites

1.www.sciencedirect.com

2.www.elsevier.com

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Course Specifications: Publication: National/International Journals

Course Title	Publication: National/ International
Course Code	PSF622
Course Type	Core Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to make a student submit a research paper to a journal based on his/her research work during the programme. The student is required to carry out original research or explicit review of an article, author a journal paper for publication. The student isrequiredtosubmittheresearchpapertoajournalapprovedbythedepartment.

2. Course Size and Credits

Number of Credits	Scopus indexed National Journal : 01 Scopus indexed International Journal : 02
Credit Structure (Lecture:Tutorial:Practical)	NA
Total Hours of Interaction	NA
Number of Weeks in a Semester	NA
Department Responsible	Pharmacy Practice
Total Course Marks	NA
Pass Criterion	Acceptance of research work manuscript in a Scopus indexed journal
Attendance Requirement	NA

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Write a research paper based on research and journal requirements
CO-2. Publish the research work manuscript in a reputed journal

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Bangalore-560054

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4. Course Contents

Identify a suitable journal for research publication
Collection, presentation and analysis of relevant research data
Preparation of manuscript according to the Journal instructions
Submission of manuscript for publication and further review
Practical/Laboratory content: NA

5. Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	1	2		1		3			2	2	2	1	2
CO-2	3	2	1	2		1		3	1	2	2	2	2	1	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

6. Course Teaching and Learning Methods

Self-Directed

Description	Number of credits
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

7. Course Assessment and reassessment

NA

Process: To be nominated by the Head of the department/Course Supervisor with the supporting documents. Panel to evaluate and endorse. Dean of the Faculty to approve the credit awarded and submit to the University.

Reassessment

NA

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8. Achieving COs

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Reading and Research
2.	Understanding	Reading and Research
3.	Critical Skills	Literature Review
4.	Analytical Skills	Research
5.	Problem Solving Skills	Research
6.	Practical Skills	Research
7.	Group Work	Data analysis
8.	Self-Learning	Reading and Research
9.	Written Communication Skills	Paper writing
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation
12.	Behavioral Skills	Interactions
13.	Information Management	Paper writing
14.	Personal Management	Course work
14.	Leadership Skills	Effective management of learning, time management, achieving the learning outcomes

9. Course Resources

a. Essential Reading

1. Research Papers/Publications from reputed journals
2. Visits to websites relevant to research

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Course Specifications: Academic/Research Award

Course Title	Academic/Research Award
Course Code	PSF623
Course Type	Mandatory Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The students with extraordinary academic achievement/ research accomplishment are provided an opportunity to utilize in a State/National / International awarding agencies or platforms as a means to further encourage sound scholarship. The students are trained to develop required documents like statement of purpose and resume and also developing concept note / abstract of their accomplishment.

2. Course Size and Credits:

Number of Credits	State/National agency awarded : 01 International agency awarded : 02
Credit Structure (Lecture: Tutorial: Practical)	NA
Total Hours of Interaction	NA
Number of Weeks in a Semester	NA
Department Responsible	Pharmacognosy, Pharmaceutical Chemistry, Pharmaceutics, Pharmacology, Pharmacy Practice
Total Course Marks	NA
Pass Criterion	Certificate of Excellence Award from the appropriate agency
Attendance Requirement	NA

3. Course Outcomes (COs)

CO-1. Synthesize the academic accomplishments /research findings in the form of report
CO-2. Identify an appropriate award granting agency to submit the report
CO-3. Develop required documents applicable to submit the academic accomplishment / research report

4. Course Contents

Skill of developing report on the content of their domain for academic achievement/ research accomplishment.
Technical communication skills for submission of the documents /records for the award.
Practical/Laboratory content: NA

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5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
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CO-1	3	2	3	1			1	2			1	3	1		
CO-2		3	3		1			3			1			3	2
CO-3		2				1		1		1	1				3

6. Course Teaching and Learning Methods

Self-directed

Description	Number of credits
Academic /Research award from State/National level agencies	01
Academic/Research award from International level agencies	02

7. Course Assessment and Reassessment

Process: To be nominated by Head of the department/ Course Supervisor with supporting documents. Constitution panel will evaluate and endorse the application. Dean of faculty to approve nomination and submit to the University.

8. Achieving COs

NA

9. Course Resources

a. Essential Reading

i. Richard J Stelzer, 2002, How to write winning personal statement of purpose for graduate and professional school, 3rd edition, United States of America.
ii. Parker and Beth Brown, 2012, The Damn Good
iii. Leah M. Akins and Jefferson H. Akins, 2009, Technical Report Writing Guidelines, Dutchess Community College, Poughkeepsie, New York

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