COURSE HANDOUT

REMEDIAL MATHEMATICS (THEORY)

COURSE CODE: BP106RMT

VISION

Train the minds to think logically and become a success

MISSION

To Develop inventive, pioneering research & high-quality technical education

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1: To produce graduates with sound theoretical knowledge and technical skills required for career opportunities in various domains.

PEO 2: To incite the students towards research and to address the challenges with their innovative Contributions for the benefit of mankind.

PEO 3: To bring forth a quality professional equipped with technological advances to adapt easily to changes in the ever-evolving pharma and allied industry, hospital and clinical pharmacy setup, pharma retailing and distribution, and governmental and health agencies.

PEO 4: To engage graduates in professional ethical practices in a multidisciplinary environment, while contributing to organization through leadership and building team spirit.

PEO 5: Pharmacists can become lifelong learners, absorb new technologies, and then offer leadership roles in society.

Programme Name	Bachelor of Pharmacy (B. Pharmacy)
Course Name	Remedial Mathematics (Theory)
Course Code	BP106RMT
Session	
Semester	I
Lecture/Tutorial (Per Week)	2 (2-0-0)
Course Credit	2
Course Coordinator Name	

1. Scope of the Course:

This is an introductory course in mathematics. This subject deals with the introduction to partial fractions, logarithms, matrices and determinants, analytical geometry, calculus, differential equations and Laplace transform.

2. Course Outcomes (COs):

106 M.1. Apply partial fraction decomposition for chemical kinetics and pharmacokinetics problem-solving.
106 M.2. Utilize matrices for pharmacokinetic modeling.
106 M.3. Apply differentiation for pharmaceutical optimization.
106 M.4. Analyze geometry and integrate for pharmaceutical calculations.
106 M.5. Solve differential equations and apply Laplace Transforms in pharmaceutical kinetics.

3. Recommended Books:

RB.1 Narayan S, Mittal PK. Differential Calculus. S. Chand Publishers, New Delhi.
RB.2 Gowda DHP. Pharmaceutical Mathematics with Application to Pharmacy. Pharmamed Press.
RB.3 Narayan S, Mittal PK. Integral Calculus. S. Chand Publishers, New Delhi.
RB.4 Grewal BS. Higher Engineering Mathematics. Khanna Publishers, New Delhi.

4. Course Plan:

Subject: Remedial Mathematics (Theory)	**Subject Code:** BP106RMT	
Sr. No.	**Topics**	**No. of Lectures**
1	**Partial fraction:** Introduction, polynomial, rational fractions, proper and improper fractions, partial fraction, resolving into partial fraction, application of partial fraction in chemical kinetics and pharmacokinetics. **Logarithms:** Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems. **Function:** Real valued function, classification of real valued functions. **Limits and continuity**: Introduction, limit of a function, definition of limit of a function (- definition), $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$, $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$,	06
2	**Matrices and Determinant**: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations.	06
ST-I (Syllabus Covered from Lecture 01 to 12)		
3	**Calculus:** *Differentiation*: Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – Without Proof, Derivative of x^n, w.r.t. x, where n is any rational number, Derivative of e^x, Derivative of loge x, Derivative of a^x, Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application.	06
4	**Analytical Geometry:** *Introduction*: Signs of the coordinates, distance formula. *Straight Line*: Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line. **Integration:** Introduction, definition, standard formulae, rules of integration, method of substitution, method of partial fractions, integration by parts, definite integrals, application.	06
5	**Differential Equations**: Some basic definitions, order and degree, equations in separable form, homogeneous equations, linear differential equations, exact equations, application in solving pharmacokinetic equations. **Laplace Transform**: Introduction, definition, properties of Laplace transform, Laplace transforms of elementary functions, inverse Laplace transforms, Laplace transform of derivatives, application to solve linear differential equations, application in solving chemical kinetics and pharmacokinetics equations.	06
ST- II (Syllabus Covered from Lecture 13 to 30)		

5. Lecture Plan:

Lect No.	**Topics**	**Tentative Date**	**CO**
01	Partial fraction: Introduction, polynomial, rational fractions, proper and improper fractions, partial fraction, resolving into partial fraction	12.09.23	106M.1
02	Application of partial fraction in chemical kinetics and pharmacokinetics.	13.09.23	106M.1
03	Logarithm: Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristics and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems	18.09.23	106M.1

04	Function: Real valued function, classification of real valued functions	19.09.23	106M.1
05	Limits and continuity: Introduction	25.09.23	106M.1
06	Definition of limit of a function (- definition)	26.09.23	106M.1
07	Matrices and Determinant: Introduction matrices, Types of matrices	03.10.23	106M.2
08	Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants,	04.10.23	106M.2
09	Properties of determinants, Product of determinants, Minors and co-factors	10.10.23	106M.2
10	Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method	11.10.23	106M.2
11	Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem	17.10.23	106M.2
12	Application of matrices in solving pharmacokinetic equations	18.10.23	106M.2
13	Calculus: Differentiation: Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function	25.10.23	106M.3
14	Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula)	31.10.23	106M.3
15	Derivative of the quotient of two functions (Quotient formula) – Without Proof, Derivative of xn, w.r.t. x, where n is any rational number, Derivative of ex, Derivative of loge x, Derivative of ax	07.11.23	106M.3
16	Derivative of trigonometric functions from first principles (without Proof)	08.11.23	106M.3
17	Successive Differentiation	05.12.23	106M.3
18	Conditions for a function to be a maximum or a minimum at a point. Application.	06.12.23	106M.3
19	Analytical Geometry: Introduction: Signs of the coordinates, distance formula.	12.12.23	106M.4
20	Straight Line: Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines	13.12.23	106M.4
21	Slope of a line joining two points, Slope – intercept form of a straight line	19.12.23	106M.4
22	Integration: Introduction, definition, standard formulae	20.12.23	106M.4
23	Rules of integration, method of substitution, method of partial fractions	09.01.24	106M.4
24	Integration by parts, definite integrals, application.	10.01.24	106M.5
25	Differential Equations: Some basic definitions, order and degree, equations in separable form	16.01.24	106M.5
26	Homogeneous equations, linear differential equations, exact equations	17.01.24	106M.5
27	Application in solving pharmacokinetic equations.	23.01.24	106M.5
28	Laplace Transform: Introduction, definition, properties of Laplace transform, Laplace transforms of elementary functions, inverse Laplace transforms	24.01.24	106M.5
29	Laplace transform of derivatives, application to solve linear differential equations	30.01.24	106M.5
30	Application in solving chemical kinetics and pharmacokinetics equations.	31.01.24	106M.5

6. Assignments Plan:

Sr. No.	Type of Assignment	Assignment	Marks	CO	PO (Annexure I)	Tentative Date
1	Problem-solving	Practice solving basic rational expressions using partial fraction decomposition.	10	106M.1	PO3	26.09.23
2	Problem-solving	Perform simple matrix operations and apply them to basic pharmacokinetic scenarios.	10	106M.2	PO4	18.10.23
3	Problem-solving	Identify peaks and valleys in simple pharmaceutical data and explain their significance.	10	106M.3	PO8	06.12.23

4	Problem-solving	Calculate the area of basic pharmaceutical shapes and find simple integrals related to pharmaceutical processes.	10	106M.4	PO10	10.01.24
5	Problem-solving	Solve straightforward differential equations for basic pharmacokinetic situations and describe their implications.	10	106M.5	PO11	31.01.24

7. Class Tests Schedule:

Sr. No.	Test Type	Topics	Marks	CO	PO (Annexure I)	Tentative Date
1	Problem-solving	Partial Fraction; Logarithms; Function; and Limits and Continuity	20	106M.1	PO3	26.09.23
2	Problem-solving	Matrices and Determinant	20	106M.2	PO4	18.10.23
3	Problem-solving	Calculus	20	106M.3	PO8	06.12.23
4	Problem-solving	Analytical Geometry; and Integration	20	106M.4	PO10	10.01.24
5	Problem-solving	Differential Equations; and Laplace Transform	20	106M.5	PO11	31.01.24

8. Content Beyond Syllabus (CBS):

Sr. No.	Topics	PO to be Achieved (Annexure I)
1	Pharmacokinetics of Targeted Drug Delivery Systems	PO1, PO3, PO9

9. Proposed Activity:

Sr. No.	Type of Activity	Topics	Tentative Date
1	Workshop	Advanced Techniques in Pharmacokinetics and Drug Formulation	23.12.23

10. Evaluation Scheme:

The marks allocated for continuous mode of internal assessment shall be awarded for attendance, academic activities and student-teacher interaction. Two sessional exams shall be conducted during mid of the semester. The average marks of two sessional exams shall be computed for internal assessment. Sessional exam shall be conducted for 30 marks and shall be computed for 10 marks. Weightage for various evaluation components is as below:

Sr. No.	Evaluation Component	Weightage
1	Internal Assessment 1. Continuous Mode 2. Sessional Exams	 05 10
2	End Semester Exam	35
	Total	**50**

As per PCI and University guidelines minimum 75% attendance is required to become eligible for appearing in the End Semester Examination.

This document is approved by:

Designation	Name	Signature
Course Coordinator		
HOD		
Principal		

ANNEXURE I: PROGRAM OUTCOMES

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.
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.
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.
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.
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 wellbeing.
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).
7. **Pharmaceutical ethics:** Honour 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.
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.
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.
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.
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.