SCHEME OF COURSE WORK

Course Details:

Course Title	**Mathematics II**		
Course Code	**15BM1102**	**L T P C**	**3 0 0 3**
Program:	**B.Tech.**		
Specialization:	**Chemical Engineering**		
Semester	**II Semester**		
Prerequisites	• Basic formulae of differentiation and integrations. • Basic terminology and elementary operations on Matrices and properties. • Basic concept of Partial Differentiation.		
Courses to which it is a prerequisite	**: For all Engineering Courses**		

PROGRAM OUTCOMES:

1. Able to apply the knowledge of mathematics, science, engineering fundamentals to solve complex chemical engineering problems.
2. Attain the capability to identify, formulate and analyse problems related to chemical engineering and substantiate the conclusions
3. In a position to design solutions for chemical engineering problems and design system components and processes that meet the specified needs with appropriate consideration to public health and safety.
4. Able to perform analysis and interpretation of data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions.
5. Able to select and apply appropriate techniques from the available resources and modern chemical engineering and software tools, and will be able to predict and model complex engineering activities with an understanding of the practical limitations.
6. Able to carry out their professional practice in chemical engineering by appropriately considering and weighing the issues related to society and culture and the consequent responsibilities.
7. Able to understand the impact of the professional engineering solutions on environmental safety.
8. Transform into responsible citizens by resorting to professional ethics and norms of the engineering practice.
9. Able to function effectively in individual capacity as well as a member in diverse teams and in multidisciplinary streams.
10. Able to communicate fluently on complex engineering activities with the engineering community and society, and will be able to prepare reports and make presentations effectively.
11. Able to apply knowledge of engineering and management principles while managing projects in multidisciplinary environments.

Engage in independent and life-long learning in their specialized areas of chemical engineering.

Course Outcomes (COs):

1	Solve the linear system of equations analytically and compute Eigen values and eigenvectors of a square matrix.
2	Numerically solve linear system of equations and compute eigen values and eigenvectors of a square matrix.
3	Discuss and demonstrate difference equations to discrete systems.
4	Calculate Fourier series and Fourier transforms for certain functions.
5	Classify and solve partial differential equations and apply it to heat flow and wave propagation problems.

Course Outcome versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	S	S										
CO-2	S	M										
CO-3	S	S										
CO-4	S	S										
CO-5	S	S										

S - Strongly correlated, *M - Moderately* correlated, *Blank - No correlation*

Assessment	Assignment / Quiz / Seminar / Case Study / Mid-Test / End

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Solve the linear system of equations analytically and compute Eigen values and eigenvectors of a square matrix.	**CO-1**	1) If $A=\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$, find A^{-1} by Cayley Hamilton Theorem. 2) Find the value of λ for which the system of equations $3x - y + 4z = 3$, $x + 2y - 3z = -2$, $6x$ will have infinite number of solutions and solve them with that λ value. 3) Verify Cayley Hamilton Theorem for the Matrix $A=\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$.	Lecture / Problem solving	Assignment (Week 2 - 4) / Quiz-I (Week -8)/ Mid-Test 1 (Week 9)
2	Numerically solve linear system of equations and compute eigen values and eigenvectors of a square matrix.	**CO-2**	1) Using factorization method to solve the equations $x + y + z = 4$, $2x + 3y + 2z = 5$, $3x + 4y + z = 7$ the 2) Gauss-Seidel method to solve the	Lecture / Problem solving	Assignment (Week 2 - 4)/ Quiz -I (Week -8)/ Mid-Test 1 (Week 9)

			equations $2x+y+6z=9, 8+3x+y-2z=13, x+5y+z=7$ 3) Using Rayleigh's power method, find the largest eigen value and corresponding eigen vector of $A=\begin{bmatrix}2 & -1 & 0\\ -1 & 2 & -1\\ 0 & -1 & 2\end{bmatrix}$		
3	Difference operators (forward, backward and shift operators)	**CO-3**	1) Find $\Delta^2\left(\frac{5x+1}{x^2+5x+6}\right)$	Lecture / Problem solving	Mid-Test 1 (Week 9)/ Assignment (Week 2 - 4)/ Quiz -I (Week -8)
4	**Mid-Test 1**	-----	----------	-------	----------
5	Linear difference equations and it's complete solution. Rules for finding the complementary function and complete integral, Deflection of a loaded string.	**CO-3**	1) Solve the difference equation $y_{x+2}-2y_{x+1}+y_x=2^x$	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (12-14)
6	Calculate Fourier series and Fourier transforms for certain functions.	**CO-4**	1) Find the Fourier Series for $f(x)=e^{-x}$ in $0<x<2\pi$. 2) Find the Fourier Series for $f(x)=x^2$ in $0<x<2\pi$. 3) Find the Fourier Transform of $f(x)=\begin{cases}1, & if\ \|x\|<1\\ 0, & if\ \|x\|>1\end{cases}$	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (12-14)
7	Classify and solve PDE and apply it to heat flow and wave propagation problems.	**CO-5**	1) Find the partial DE for $z = f(x+c_1)+g(x-c_1)$ by eliminating f and g 2) Solve $\nabla^2 V = 0$ subject to	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (12-14)
8	**Mid-Test 2**				
9	**END EXAM**				