SHARNBASVA UNIVERSITY, KALABURAGI
ENGINEERING MATHEMATICS – IV
4th SEMESTER SYLLABUS

Course Code	21MAT41	CIE Marks	50
Contact Hours/Week	03	SEE Marks	50
Total Hours	40	Exam Hours	03
Semester	IV	Credits	03

Course Learning Objectives:

This course will enable students to:

- Learn Fourier series and Fourier transforms.
- Conversant with numerical methods to solve ordinary differential equations.
- Know then complex combers, Analytic function and associated results and problems.
- Understand Joint probability distribution and stochastic processes arising in science and engineering.
- Understand the definition of sequence, series and its importance.
- Discuss the elementary concepts of graph theory.
- Know the finite difference method and use in solving partial differential equation.

Course Outcomes(COs):

After completion of course, the student will able to

CO#	Course Outcomes	POs	PSOs
CO1	Define the Periodic function and Find the Fourier series and half range series expansion of different functions in different intervals and studying Practical Harmonic functions, Know the use of periodic signals and Fourier series to analyze circuits.	1, 2, 3	
CO2	Learn to solve the problems on Joint probability distribution fortwo discrete random variables. Knowing the concept of stochastic processes, probability vector, Probability matrix and studying the examples on Markov's chains in discrete time.	1, 2, 3	
CO3	Solving the first order first degree ordinary differential equations arising in flow problems using single step and multistep numerical methods.	1, 2, 3	
CO4	Use to solve second order ordinary and partial differential equations arising in heat and wave equations by numerical methods.	1, 2, 3	
CO5	Apply the knowledge of Fourier transform to solve engineering problems. Understand the analyticity, potential fields, residues and poles of complex potentials in field theory, electromagnetic theory and studying Bilinear transformation./ Obtain the series solution of ordinary differential equations and studying special functions./ Develop the model using advanced concept of graph for real world applications.	1, 2, 3	

Bloom's level of the course outcomes:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√	√			
CO2	√	√	√			

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CO3	√	√	√
CO4	√	√	√
CO5	√	√	√

Course Articulation Matrix / Course mapping :

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		1				1			1			
CO2	3	3			1				1			1			
CO3	3	2	2		1				1			1			
CO4	3	2	2		1				1			1			
CO5	3	2	2		1				1			1			

Note: 1-Low, 2-Medium, 3-High

MODULE-1: FOURIER SERIES

Fourier Series: Periodic functions, Dirichlet's condition, Fourier Series of periodicfunctions with period 2π and with arbitrary period 2c. Fourier series of even and odd functions
Half range Fourier Series, practical harmonic analysis(5 Assignment Problem).
Self-Study: Sequence and series of a function, convergent series.

(RBT Levels: L1, L2 and L3) 8 Hours

Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-2: PROBABILITY DISTRIBUTIONS-2

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient.
Stochastic process: Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability-simple problems.
(5 Assignment Problem).
Self Study : Joint probability distribution for continuous random variable

(RBT Levels: L1, L2 and L3)

8 Hours

Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-3: NUMERICAL METHODS-1

Numerical Methods: Numerical solution of ordinary differential equations of first order andfirst degree, Taylor's series method, modified Euler's-method Runge Kutta method of fourth order. Milne's and Adams- Bashforth predictor and corrector methods (No derivations of formulae). (5 Assignment Problem).
Self Study :Picardsmathod

(RBT Levels: L1, L2 and L3)

8 Hours

Teaching – Learning Process	Chalk and talk method / Power Point Presentation

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MODULE-4: NUMERICAL METHODS-2

Numerical Methods: Numerical solution of second order ordinary differential equations, Runge- Kutta Method and Milne's Method, Numerical solution of P.D.E: Numerical solution of Heat equation, Wave equation, problems. (5 Assignment Problem).
Self Study :Picard's method, Numerical solution of Laplace's equation

(RBT Levels: L1, L2 and L3)	**8 Hours**
Teaching – Learning Process	Chalk and talk method / Power Point Presentation

MODULE-5

Department of ECE and EEE : Fourier Transforms and complex variable

Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier-transform (5 Assignment Problem).
Complex line Integrals: Cauchy's Integration theorem, Cauchy integral formula, Laurent's Series, types of singularities. Residue, Poles, Cauchy's Residue theorem (without proof) and Problems.
Transformations: Bilinear transformations and problems.
Self Study : Initial value and boundary value problems

(RBT Levels: L1, L2 and L3)	**8 Hours**
Teaching – Learning Process	Chalk and talk method / Power Point Presentation

Department of Civil , Mechanical and Energy Engg : Special Functions

Special Functions: Series solution of Bessel's differential equation leading to $J_n(x)$ —Bessel's function of first kind. Basic properties and orthogonality. Series solution of Legendre's differential equation leading to $P_n(x)$ —Legendre polynomials. Rodrigue's formula, problems
Self Study : Frobenius method

(RBT Levels: L1, L2 and L3)   **8 Hours**

Department of CSE : Graph Theory

Graph Theory: introduction to graph theory, definitions of finite and null graphs, loops, multigraphs, pseudo graph, simple graph, degree of a vertex, isolated vertices, connectedness and complete graph, minimum and maximum degree, regular graphs, subgraphs, walk, trial, paths, Euler and Hamilton graphs.

Self Study : line graphs , Bridge, Block and tree

(RBT Levels: L1, L2 and L3) 8 Hours

Assessment Details (both CIE and SEE)

    The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing marks for the CIE is 45% of the maximum marks (22.5 marks out of 50). The minimum passing marks for the SEE is 35% of the maximum marks (18 marks out of 50).

    A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

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The CIE shall be conducted by the course teacher throughout the semester. The CIE marks for the theory component of the IC shall be 30 marks and for the laboratory component 20 Marks.

The CIE marks for the theory component shall be 50 marks and scored will be reduced to 30.As below

- Three Tests each of 15 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90- 100% respectively. Average of Best Two performances of the Internal Tests shall be considered for 15 Marks.
- Session wise assignments for 25 marks
- For Seminar and library work 05 marks
- Attendance 5 marks (95% to 100%), 04 marks (85% to 94%)

CIE for the practical component of the IC:

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The 35 marks are for conducting the experiment and preparation of the laboratory record, the other 15 marks shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 50 marks. Marks of all experiments' write-ups are added and scaled down to 20 marks.

Semester End Examination(SEE)

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question carries 20 marks.
4. There will be two full questions (with a maximum of three sub questions) from each module
5. Each full question will have sub questions covering all the topics under a module.
6. The students will have to answer five full questions, selecting one full question from each module.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)Text Books
1. **B.S.Grewal**:"Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

Reference Books

1. **V. Ramana**:"Higher Engineering Mathematics" McGraw-Hill Education,11th Ed.,2017
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press, 3rdEd., 2016.
3. **N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications,10th Ed.,2022.
4. **C. Ray Wylie, Louis C. Barrett**: "Advanced Engineering Mathematics" McGraw–Hill Book Co., New York, 6thEd., 2017.
5. **C.B Gupta, S. R Singh and Mukesh Kumar**: "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India)Pvt.Ltd 2015.
6. **H.K. Dass and Er. Rajnish Verma**: "Higher Engineering Mathematics" S.Chand Publication, 3rdEd., 2014.
7. **James Stewart**: "Calculus" Cengage Publications, 7thEd., 2019.
8. **David CLay**: "Linear Algebra and its Applications", Pearson Publishers, 4th Ed.,2018.
9. **Gareth Williams**: "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6thEd., 2017.

Web links and Video Lectures:
1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math

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3. http://academicearth.org.