Semester: IV List of open elective –II

Sr. No.	List of Open Elective
1	OE-02A Entrepreneurship and Innovation
2	OE-02B Environmental Sustainability
3	OE-02C Renewable Energy
4	OE-02 D Measurement, Instrumentation and Sensors
5	OE-02E Operation Research
6	OE-02F Computational Mathematics
7	OE-02 G Professional Business Communication
8	OE-02 H Applied Mathematics

Teaching Scheme	**Examination Scheme**
Theory: - 2 Hrs/Week, 2 Credits	**ESE –** 70 Marks
Practical- 2Hrs/Week, 1 Credit	**ISE-** 30 Marks
	ICA- 25 Marks

- **Course Objectives:**

➢ To introduce the students to solution higher order differential equation.
➢ To introduce the students to Laplace Transforms and Z-transforms.
➢ To introduce the student to various numerical methods.
➢ To introduce the student to probability distributions.
➢ To introduce the student to Fourier series.

- **Course Outcomes:**

At the end of this course, students will be able to

➢ Compute higher order linear differential equations.
➢ Solve Laplace transforms of given functions.
➢ Compute Z- transforms of given functions.
➢ Determine the numerical solutions of transcendental equations, ordinary differential equations and numerical integrations.
➢ Solve problems by binomial, Poisson and normal distribution.
➢ Compute Fourier series and Half range Fourier series.

Section-I

Unit 1– Linear Differential Equations with Constant Coefficients   **7 Hrs**

Basic definition, differential operator, complimentary functions,
Particular integral shortcut method for standard functions like , e^{ax} sinax, cosax, x^m ,e^{ax} V, XV ,
Particular integral general method (without method of variation of parameters) for other functions,
Applications to Electrical Engineering Problems.

Unit 2–Laplace Transform   **7 Hrs**

Definition, Laplace Transform of standard functions, Properties First shifting, change of scale, multiplication of powers of t and division by t, Laplace Transform of derivative and integral, Unit step functions and unit Impulse functions, Methods of finding Inverse Laplace transforms by Convolution Theorem only.

Unit 3- First Order Partial Differential equations and applications   6 Hrs

Non – Linear partial differential Equations of Type I $f(p, q) = 0$, Type II $f(p,q,z)=0$, Type III $f_2 (p, x)= f_2 (q,y)$, Linear partial differential equation by Lagranges method. Solution of partial differential equation by method of separation of variables.

Section-II

Unit 4- Numerical Methods   7 Hrs

Newton-Rapshon Method, Multiple roots, Newton's iterative formula for obtaining square root onlyFirst order differential equation by Runge – Kutta method (Fourth order)
Numerical Integration using -Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule.

Unit 5 - Probability Distributions   7 Hrs

Random variables, Discrete and Continuous Probability distributions., Binomial distribution, Poisson distribution, Fitting of Binomial or Poisson distributions, Normal distribution

Unit 6 - Fourier Series   6 Hrs

Definition, Dirichlet's Conditions, Euler's formula, Fourier series in the interval $(0,2\pi)$, $(-\pi, \pi)$, $(0,2l)$ and in the interval $(-l, l)$, Half Range Series: Half range cosine series and Half range sine series.

- In Semester Evaluation(ISE): ISE shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

- Internal Continuous Assessment (ICA): ICA shall be based on student's performance during the laboratory sessions, minimum 6 assignments and on completion of minimum 8 exercises out of the following exercises:
  1. Solve any 5 examples on shortcut method of higher order linear differential equations.
  2. Solve any 5 examples on general method of higher order linear differential equations.
  3. Solve any 5 examples on application of LDE to Electrical Problems
  4. Solve any 5 examples on properties of Laplace transform.
  5. Solve any 5 examples on laplace transform of derivative.
  6. Solve any 5 examples on laplace transform of integral.
  7. Solve any 5 examples on standard forms of PDE.
  8. Solve any 5 examples on linear PDE by Lagrange method
  9. Solve any 5 examples on numerical methods for ODE.
  10. Solve any 5 examples on Numerical integration.
  11. Solve any 5 examples on Binomial distributions.
  12. Solve any 5 examples on Poisson distributions.
  13. Solve any 5 examples on on Normal distributions.
  14. Solve any 5 examples on on fourier series for the interval $(0,2\pi)$ and $(-\pi, \pi)$,
  15. Solve any 5 examples on fourier series for the interval $(0,2l)$ and $(-l, l)$
  16. Solve any 5 examples on half range Sine/Cosine series.

✓ Note – Students shall be encouraged to use Scilab, R-programming and other software's forsolving examples

- **Text Books:**
  1) "A textbook of Applied Mathematics Vol II", Vidyarthi Grah Prakashan, Pune, JN and PN Wartikar
  2) "Higher Engineering Mathematics" , Khanna Publications, Delhi, B S Grewal
  3) "Advanced Engineering Mathematics", Wiley & SMS, Newyork, Kreyzig-John
  4) "Numerical Methods", Khanna publications-New Delhi, BSGrewal
  5) "Introductory methods of Numerical Analysis"-PHI Learning Publication ,SSShastry

- **Reference Books:**
1) "Advanced Engineering Mathematics", Cengage Learning, Peter O'Neil
2) "Higher Engineering Mathematics" , Tata McGraw-Hill Education, BV Ramana
3) "Numerical Methods" SChand Publication, DrPKandasamy
4) "Numerical methods for scientific and engineering computations"-New age International Ltd MKJain,SRKIyengar,RKJain
5) V. Krishnamurthy, V.P. Mainra and J.L. Arora, "An introduction to Linear Algebra" Affiliated East–West press, Reprint 2005.