SCHEME OF COURSE WORK

Course Details:

Course Title	**Mathematics-I**		
Course Code	**13BM1101**	**L T P C**	**3 0 0 3**
Program:	**B.Tech.**		
Specialization:	**Electrical and Electronics Engineering**		
Semester	**I Semester**		
Prerequisites	• Basic formulae of differentiation, product rule, and quotient rule. • Basic Integration formulae, integration by parts, definite integrals and properties • Basic concept of partial differentiation		
Courses to which it is a prerequisite	**: For all Engineering Courses**		

PROGRAM OUTCOMES:

The student of Electrical and Electronics Engineering at the end of the program will be able to:

1. PO-1: Apply the knowledge of basic sciences and electrical and electronics engineering fundamentals to solve the problems of power systems and drives.
2. PO-2: Analyze power systems that efficiently generate, transmit and distribute electrical power in the context of present Information and Communications Technology.
3. PO-3: Design and develop electrical machines and associated controls with due considerations to societal and environmental issues.
4. PO-4: Design and conduct experiments, analyze and interpret experimental data for performance analysis.
5. PO-5: Apply appropriate simulation tools for modeling and evaluation of electrical systems.
6. PO-6: Apply the electrical engineering knowledge to assess the health and safety issues and their consequences.
7. PO-7: Demonstrate electrical engineering principles for creating solutions for sustainable development.
8. PO-8: Develop a techno ethical personality that help to serve the people in general and Electrical and Electronics Engineering in particular.
9. PO-9: Develop leadership skills and work effectively in a team to achieve project objectives.
10. PO-10: Communicate effectively in both verbal and written form.
11. PO-11: Understand the principles of management and finance to manage project in multi disciplinary environments.
12. PO-12: Pursue life-long learning as a means of enhancing the knowledge and skills.

Course Outcomes (COs):

1	Develop the ability to solve linear differential equations of first and higher order and use the knowledge gain to certain engineering problems.
2	Appraise the Laplace transform technique and use it to solve various engineering problems.
3	Apply the techniques of multivariable differential calculus to determine extrema and series expansions etc. of functions of several variables.
4	Extend the concept of integration to two and three dimensions and support it through applications in engineering mechanics.
5	Generalize calculus to vector functions and interpret vector integral theorems.

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 Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Linear differential equations of second higher order with constant coefficients.	**CO-1**	1. solve $(D^2 + a^2)y = tanax$ 2. Solve $(D^3 - D)y = e^x + 1 + 2x$	Lecture / Problem solving	Assignment (Week 2 - 4) / Quiz-I (Week -8)/ Mid-Test 1 (Week 9)
2	Method of Variation of parameters Cauchy's Linear Differential Equations	**CO-1**	Solve $(D^2 + 1)y = \sec x$ by method of parameters	Lecture / Problem solving	Assignment (Week 2 - 4)/ Quiz -I (Week -8)/ Mid-Test 1 (Week 9)
3	Orthogonal trajectories, Newton's law of cooling, Models on R-L-C circuits.	**CO-1**	Show that the family of confocal and coaxial parabolas $y^2 = 4a(x + a)$ where a is an arbitrary constant are self orthogonal.	Lecture / Problem solving	Mid-Test 1 (Week 9)/ Assignment (Week 2 - 4)/ Quiz -I (Week -8)
4	Laplace transform of elementary functions,	**CO-2**	Find the Laplace transform of	Lecture /	Mid-Test 1

	Properties of Laplace transform, Transforms of Periodic function, Transforms of derivatives and integrals, Multiplication by t^n, division by t		$f(t) = \frac{e^{-t}\sin t}{t}$	Problem solving	(Week 9)/ Quiz -I (Week -8)
5	Evaluation of integrals by Laplace transforms, Elementary Inverse transforms, Inverse transform of Derivatives and Integrals.	**CO-2**	Find the inverse Laplace transform of the following function $\frac{s+2}{s^2(s^2-s-2)}$	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz -I (Week -8)
6	Convolution theorem, Unit step function, second shifting theorem	**CO-2**	Using convolution theorem, evaluate $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$	Lecture / Problem solving	Mid-Test 1 (Week 9)/ Quiz -I (Week -8)
7	Unit impulse function, Application of Laplace transforms to ordinary differential equations (initial and boundary value problems)	**CO-2**	Solve $(D^2+4D+3)y = e^{-t}$ given that $y(0) = y'(0) = 1\ at\ t = 0$ by using Laplace transform.	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz -I (Week -8)
8	Total derivative, change of variables Jocobians	**CO-3**	If $x = u(1-v),\ \ y = uv$, then find $\frac{\partial(u,v)}{\partial(x,y)}$	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz -I (Week -8)
9	**Mid-Test 1**	-----	----------	-------	----------
10	Taylor's theorem for functions of two variables	**CO-3**	Find the Taylor's series expansion of $e^x \sin y$ in powers of x and y	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (12-14)
11	Maxima and minima of functions of two variables, Lagrange method of undetermined multipliers	**CO-3**	In the plane triangle ABC, find the maximum value of $\cos A \cos B \cos C$	Lecture / Problem solving	Assignment (Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (12-14)
12	Non Cartesian Coordinates, Double integrals, Change of order of integration.	**CO-3**	Evaluate $\int_{-1}^{2}\int_{x^2}^{x+2} dy\,dx$.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (12-14)
13	Double integral in polar co-ordinates Triple integrals, Change of variables in double integral.	**CO-3**	Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\,dxdy$ by changing to polar coordinates.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
14	Change of variables in triple integral, Simple Applications of multiple integrals : Area	**CO-3**	Evaluate	Lecture /	Mid-Test 2 (Week 18) /

	enclosed by a plane curves.		$\int_{x=0}^{1}\int_{y=0}^{x}\int_{z=0}^{x+y} x\, dzdydx.$	Problem solving	Quiz -II (Week -17)
15	Differentiation of vectors, Scalar and vector point functions Gradient of a scalar function, properties, Directional derivative, Divergence of a vector point function and it's physical interpretation, Curl of a vector point function, properties, Physical interpretation of Divergence and Curl of a vector point function, Del applied twice to point functions	**CO-4**	Find angle between the surfaces $x^2+y^2+z^2=9$ and $x^2+y^2-z=3$ at $(2,-1,2)$.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
16	Line integral, circulation, work done, surface and volume integrals	**CO-5**	Evaluate $\iint_R e^{2x-3y}dxdy$ over the triangle bounded by $x=0, y=0$ $and\ x+y=1$	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
17	Green's theorem in the plane, Stoke's theorem, Gauss Divergence theorem and related problems	**CO-5**	Verify Divergence theorem for $\bar{F}=4x\boldsymbol{i}-2y^2\boldsymbol{j}+z^2\boldsymbol{k}$ taken over the region bounded by the cylinder $x^2+y^2=4, z=0\ and\ z=3.$	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
18	**Mid-Test 2**				
19/20	**END EXAM**				