SCHEME OF COURSE WORK

Course Details:

Course Title	**ODE and Vector Calculus**		
Course Code	**22BM1103**	**L T P C**	**3 0 0 3**
Program:	**B.Tech.**		
Specialization:	**Electrical and Electronics Engineering**		
Semester	**II Semester**		
Prerequisites	• Basic formulae of differentiation and integrations. • Vectors, differentiation and integrations.		
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): *At the end of the Course, Student will be able to:*

1	Solve first order differential equations arising in various engineering fields
2	Evaluate linear differential equations of higher order and use the knowledge to study certain problems that arise in engineering
3	Illustrate the techniques of Laplace transform to solve problems that arise engineering.
4	Summarize various concepts of vector differentiation
5	Use 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	3	3										
CO-2	3	2										
CO-3	3	3										
CO-4	3	3										
CO-5	3	3										

3 - Strongly correlated, *2 - Moderately correlated, 1-Weakly correlated, Blank - No correlation*

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

Teaching-Learning and Evaluation

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Linear and Bernoulli differential equations.	CO-I	Solve $\frac{dy}{dt}\sin t+2y\cos t=\cos^2 t$ Solve $\frac{dy}{dx}+8x^6y=e^xy^3$	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
2	Orthogonal trajectories exact differential equations.	CO-I	Determine the orthogonal trajectories of $y=cx^3+2$	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
3	Equations reducible to exact equations.	CO-I	Solve $\left(\frac{y}{x}+6x\right)dx+\left(\ln x-2\right)dy=0$	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
4	simple electric circuits, Newton's law of cooling.	CO-I	A body originally at 80^0C cools down to 60^0C in 20 minutes, the temperature of the air being 40^0C. Determine the temperature of the body after 40 minutes from the original?	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
5	Linear differential equations of higher order with constant coefficients,	CO-II	Solve $2y'''+19y''+39y'+9y=0$	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz
6	Complete solution, operator D, rules	CO-II	Solve $2y'''+19y''+39y'+9y=0$.	Lecture / Problem	Mid-Test 1 (Week 9)/

	for finding the complementary function,			solving	Quiz
7	Inverse operator, rules for finding the particular integral, method of variation of parameters Cauchy's linear equation, L-C-R circuit problems.	CO-II	Solve $2x^3y'''+19x^2y''+39xy'+9y=0$	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz
8	**Mid Exam-I**				
9	Definition of Laplace transform, existence conditions, properties of Laplace transform, periodic functions,	CO-III	Determine Laplace transform of $g(t)=\begin{cases} 1, & 0\le t\le a, \\ \dfrac{(b-t)}{(b-a)}, & a<t\le b, \\ 0, & \text{if } t>b \end{cases}$	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
10	Transforms of derivatives, transforms of integrals, multiplication by t, division by t, evaluation of integrals by Laplace transforms,	CO-III	Solve $y''(t)+y(t)=g(t)$, $y(0)=0, y'(0)=0$, $g(t)=\begin{cases} t & \text{if } 0\le t<5 \\ 0 & \text{if } 5\le t<\infty. \end{cases}$	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
11	Inverse Laplace transforms, convolution theorem (without proof), unit step function, unit impulse function, applications to ordinary differential equations.	CO-III	Show that $L^{-1}\left[\dfrac{(s-a)}{(s-a)^2+b^2}\right]=e^{at}\cos bt$	Lecture / Problem solving	Mid-Test 2 (Week 18)/ Quiz
12	Scalar and vector point functions, gradient, directional derivative, divergence and curl.	CO-IV	Determine the gradient of the following function at the given point $h(x,y)=5500-0.001x^2-0.004y^2$ and p=$(200,800,900)$	Lecture / Problem solving	Mid-Test 2 (Week 18)/ Quiz
13	vector identities: del applied twice to point functions, del applied to products of point functions	CO-IV	Show that $Curl(gra\ f)=0$	Lecture / Problem solving	Mid-Test 2 (Week 18)/ Quiz
14	Line integral - circulation, work done, surface integral-flux, volume integral.	CO-V	Determine work done if $F=\langle 5xy, 2y^2\rangle = 5xyi+2y^2j$ and given path $y=6x^2$ from $(0,0)$ to $(1,6)$.	Lecture / Problem solving	Mid-Test 2 (Week 18)/ Quiz
15	Green's theorem in the plane, Stoke's theorem and the Divergence theorem (without proof).	CO-V	Using Green'theorem evaluate $\int_C (ax+2y)dx+(bx+3y)dy$ where C is the unit circle $x^2+y^2=1$	Lecture / Problem solving	Mid-Test 2 (Week 18)
16	**Mid Exam-II**				
17/18	**END EXAM**				