G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY

Nandikotkur Road, Kurnool– 518002

DEPARTMENT OF HUMANITIES AND SCIENCE

B.TECH I YEAR

COURSE DESCRIPTION

Course Code	**:**	**15A54101**	
Course Title	**:**	ENGINEERING MATHEMATICS-I	
Regulation	**:**	**R15-JNTUA**	
Course Structure	**:**	Lectures Tutorials Practical	Credits
		3 1 -	3
Course Coordinator	**:**	Mr. G.SIDDESH BABU	
Team of Instructors	**:**	Mrs.SHAHINA NIKHATH ,Mr.A.SRI HARI, Miss R.MAHA RANI	

I. COURSE OVERVIEW:

The course matter is divided into 5 chapters covering duly-recognized areas of theory and study. This course deals with more advanced Engineering Mathematics topics which provide students with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The topics covered include ordinary differential equations, mean value theorems, Jacobians, multiple integrals, Laplace transforms and vector calculus. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program.

II. PREREQUISITE(S):

Level	Credits	Periods / Week	Prerequisites
UG	3	4	Basic mathematics, Diff and Integration

III. Marks Distribution:

Sessional Marks	University End Exam Marks	Total Marks
There shall be2 midterm examinations. Each midterm examination consists of subjective test. The subjective test is for 20 marks, with duration of 1:30 hours. Subjective test of each Academic year contains 5 questions, the student has to answer 3 questions, each carrying 10 marks. First midterm examination shall be conducted for the first two units of syllabus and second midterm examination shall be conducted for the 3 units and final mid term shall be conducted remaining 3 units. Marks shall be awarded considering the 80% of Best Mid Term and 20% of Least Mid Term	70	100

IV. Evaluation Scheme:

S.No	Component	Duration (hours)	Marks
I	I MID EXAMINATION	1hr 50 min	30
2	II MID EXAMINATION	1hr 50 min	30
3	EXTERNAL EXAMINATION	3hrs	70

V. Course Educational Objectives:

The course matter is divided into 5 chapters covering duly-recognized areas of theory and study. This course deals with more advanced Engineering Mathematics topics which provide students with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The topics covered include ordinary differential equations, Electric circuits, Deflection of beams, Simple harmonic motion Jacobians, multiple integrals, and vector calculus. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program

VI. Course Outcomes:

1. Apply the mathematical principles to solve first and second order differential equations, analyze the non-homogenous linear differential equations of second and higher order and Apply in various streams –like Electrical Circuits ,Simple Harmonic Motion, Deflection of beams
2. Estimate the Taylors and Maclaurin series and Apply Partial differential equations to study Maxima and minima of functions involving 2 variables along with radius of curvature.
3. Evaluate double integral by changing variables, changing order and triple integration to find the area & volume of given region.
4. Analyze scalar and vector fields and compute the Gradient, Divergence and Curl. Apply Green's theorem to evaluate the line integrals along simple closed contours on the plane, Stokes and Gauss Divergence theorems to give physical interpretation of the curl and divergence of a vector field .
5. Develop alternative ways to solve a problem and systematic approach of a solution for real time applications

VII. How Course Outcomes are assessed:

Outcome		Level	Proficiency assessed by
A	An ability to apply knowledge of computing, mathematical foundations, algorithmic principles, and computer science and engineering theory in the modeling and design of computer – based systems to real-world problems.	H	--
B	An ability to design and conduct experiments, as well as to analyze and interpret data.	H	--
C	An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability, and sustainability.	H	Tests and assignments
D	An ability to function effectively on multi-disciplinary teams.	N	--
E	An ability to analyze a problem, and identify, formulate and use the appropriate computing and engineering requirements for obtaining its solution.	H	Tests and assignments
F	An understanding of professional, ethical, legal, security and social issues and responsibilities.	N	--
G	An ability to communicate effectively, both in writing and orally.		
H	The broad education necessary to analyze the local and global impact of computing and engineering solutions on individuals, organizations, and society.	N	--
I	Recognition of the need for, and an ability to engage in continuing professional development and life-long learning.	H	--
J	Knowledge of contemporary issues.	N	--
K	An ability to use current techniques, skills and tools necessary for computing and engineering practice.	H	Tests and assignments
L	An ability to apply design and development principles in the construction of software and hardware systems of varying complexity.	N	--
M	An ability to recognize the importance of professional development by pursuing postgraduate studies or face competitive examinations that offer challenging and rewarding careers in computing.	H	--

N = None **S = Supportive** **H = Highly Related**

VIII. Syllabus:

ENGINEERING MATHEMATICS-1

UNIT I :

DIFFERENTIAL EQUATIONS OF FIRST ORDER AND THEIR APPLICATIONS

Overview of differential equations- exact, linear and Bernoulli. Applications to Newton's law of cooling, law of natural growth and decay and orthogonal trajectories. Linear differential equations of second and higher order with constant coefficients, RHS term of the type $Q(x)= e^{ax}$, sinax, cosax, and x^n, $e^{ax}V(x)$, $xV(x)$

UNIT II:

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS

Method of variation of parameters.Linear equations with variable coefficients;Euler –cauchys equations.Legendre's linear euqation Applications to electrical circuits, simple harmonic motion.

UNIT III:

MEAN VALUE THEOREMS AND FUNCTIONS OF SEVERAL VARIABLES

Taylors Series and Maclaurins Series Functions of several variables – functional dependence -Jacobian - maxima and minima of functions of two variables with and without constraints and method of Lagrangian multipliers with three variables only. Radius of curvature

UNIT IV:

MULTIPLE INTEGRALS

Multiple integrals - double and triple integrals – change of order of integration- change of variables.Applications to areas and volumes in Cartesian and polar coordinates using double & triple integrals

UNIT V:

VECTOR CALCULUS

Gradient- divergence- curl and their related properties - potential function - laplacian and second order operators. Line integral – work done – surface integrals - flux of a vector valued function. Vector integral theorems: Green's -Stoke's and Gauss's divergence theorems (statement & their verification).

TEXT BOOKS :

1. Grewal B.S (2007), Higher Engineering Mathematics, 40th Edition, New Delhi, Khanna Publishers.
2. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), Engineering Mathematics Vol - I, 10th
3. Revised Edition, New Delhi, S. Chand & Company Limited.

REFERENCES :

1. Jain R. K., and Iyengar S. R. K (2008), Advanced Engineering Mathematics, 3rd Edition, NeW Delhi, Narosa Publication House.

2. Shahanaz Bathul (2007), Engineering Mathematics-I, 3rd Edition, Hyderabad, Right Publishers.

3. Ramana B.V (2010), Engineering Mathematics, New Delhi, Tata McGraw Hill Publishing Co. Limited

IX. Course Plan:

The course plan is meant as a guideline. There may probably be changes.

Lecture No.	Learning Objective	Topics to be covered	Reference
1-2	To understand the formation of differential equation	Definition, order, Degree and formation of Differential Equations	T1: pg 307-308
3-5	To know the methods of solving of first order and first degree differential Equations	Solution of first order and first degree differential Equations: Variable separable method, Homogeneous Differential Equations, Equations reducible to homogeneous form	T1: 9.6 – 9.8
6-10	Linear, Bernoulli and exact differential equations	Linear and Bernoulli Differential Equations of first order, Exact Differential Equations and equations reducible to exact form,	T1: 9.9 – 9.12
10-11	To apply differential equations to the applications	Newton's Law of cooling, Law of natural growth and decay.	T1:10.6, 10.8
12-14	To apply differential equations in orthogonal trajectories.	Orthogonal trajectories of families of curves in Cartesian and polar coordinates	T1: 10.2 - 10.3
5-17	Higher order linear differential equations	Definition of linear differential equations of second and higher order with constant coefficients, differential operator and Complementary functions and General solutions of f(D)y =Q(x)	T1: 11.1
18-21	To know the methods of finding particular integral	e^{ax}, sinax, cosax, x^n, $e^{ax}V(x)$, $x^n V(x)$	T1:pg 356-361
22	method of variation of parameters	To find the general solution of second order linear differential equations by using the method of variation of parameters.	T1:11.8
23-24	To apply differential equation for engineering problems	Electrical circuits (R-L-C), simple harmonic motion.	T1:12.2, 12.5
25-26	To Know the method of Linear equations with variable coefficients	Problems based on methods of Linear equations with variable coefficients	T2: 2.1-2.3
27-28	To know the method Euler-cauchy equation ,and Legendre's linear equations	Problems based on the Euler-cauchy equation ,and Legendre's linear equations	T2: 2.4-2.5
29-32	Functions of single variable	Problems based on Taylor series and Maclaurins series	T1: 4.8, 4.12-4.13
33-35	Functions of several variables	Functional dependence - Jacobin – Maxima and Minima of functions of two variables with and without constraints	T1:4.15-4.18
36-38	To know the method of Lagranges method of multipliers with three variables	Problems based on of Lagranges method of multipliers with three variables.	T1:4.19-4.25
39-44	Radius of Curvature	Radius, of Curvature of the given curves in Cartesian and polar coordinates	T2: 4.1-4.8
45-47	To know the importance of Multiple integrals in engineering problem solving	Double and triple integrals – change of order of integration- change of variables	T1: 5.1-5.3 5.5 & 5.7
48-52	To understand the difference between vector and scalar point functions	Definition scalar and vector point functions, Gradient- Divergence- Curl and their related properties – scalar potential function, directional derivative of a scalar point function	T1: 6.5-6.9

53-58	To know Vector Identities	Operators and Vector Identities	T2: 11.10-11.11
59-64	To find the work done by using line integral	Work done, Flux of a vector valued function	T1: 6.11-6.12
65-70	To verify Vector Integrals theorems for the given examples	Verification of Green's, Stoke's and Gauss's divergence Theorems	T1: 6.13-6.17

T1: Grewal B.S (2007), Higher Engineering Mathematics, 40th Edition, New Delhi, Khanna Publishers.
T2: Iyengar T.K.V., Krishna Gandhi B. & Others (2011), Engineering Mathematics Vol – I

Prepared By : G.SIDDESH BABU, Assistant professor HODH&S

Date :