PSG INSTITUTE OF ADVANCED STUDIES - COIMBATORE – 641 004

Course : CALCULUS AND ITS APPLICATIONS
Course Code : 15IUHM101/15IGAM101/15IUFM101
Semester : 1
Faculty : Dr. C. VEERAMANI

Prerequisite :

- Basic concepts of functions and graphical representation.
- Basic concepts of algebra, trigonometry and two-dimensional geometry

Course objectives and course outcomes:

Course Objectives	Course Outcomes	
	Upon completion of the course the students will be able to	
1. To provide in depth knowledge of calculus, differential equations and vector calculus 2.To facilitate the students to use the knowledge of calculus in their respective field of study	CO1	analyze functions and their graphs and compute their limits and derivatives
	CO2	sketch the region of integration, set up the limits in appropriate order to evaluate integral and interpret double/multiple integrals as area/volume
	CO3	solve first order differential equations and demonstrate their understanding of how physical phenomena such as mixing problems, Newton's law of cooling and free oscillations are modeled by first order differential equations
	CO4	implement various solution methods for solving second order differential equations
	CO5	determine gradient of a scalar field, divergence and curl of vector fields and to interpret their physical meaning
	CO6	utilize line integral in vector fields to find work done and to apply Green's, Stoke's and Gauss divergence theorems to calculate flux and circulation

Text Books:

1. Thomas G B and Finney R L, "Calculus and Analytical Geometry", Pearson Education, New Delhi, 2012.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Pvt Ltd, New Delhi, 2012.

Reference Books:

1. Wylie C R and Barrett L C, "Advanced Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2013.
2. Peter V.O Neil, "Advanced Engineering Mathematics", Cengage, New Delhi, 2010.

Web Sites:

1. www.math.ucsd.edu/~wgarner/math20a/limcont.htm
2. tutorial.math.lamar.edu/Classes/CalcIII/MultipleIntegralsIntro.aspx\
3. www.math.oregonstate.edu/home/programs/undergrad/.../change.html
4. http://hyperphysics.phy-astr.gsu.edu/hbase/vecal.html

SESSION PLAN:

Week	Topics	Assignments / Tutorial / Tests
1	**BRIDGE COURSE ON BASIC MATHEMATICS:** Number system, partial fraction, fundamental theorem of algebra, relation between roots and coefficients, synthetic division, Trigonometry and hyperbolic functions–basic formulas, differentiation and integration –basic formulas, graphs of basic curves. (Motivation and simple problems only).	
2	**DIFFERENTIAL CALCULUS:** Basic concepts - Limits, continuity and problems based on limits, continuity, and discontinuity.	
3	Differentiation, functions of several variables, partial derivatives, total derivatives, concepts and practice problems.	
4	Taylor's formula for function of two variables.	
5	**INTEGRAL CALCULUS:** Double integrals - double integrals over rectangles.	
6	Double integrals as volumes, region of integration and graphical representation. Fubini's theorem (concept and statement only),	**Tutorial 1**
7	Double integrals in polar form. Changing the order of integration and practice problems.	**Assignment 1**
8	**ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER:** Basic concepts, separable differential equations.	
9	**TEST WEEK**	**CA Test 1**
10	Exact differential equations, integrating factors, linear differential equations, Bernoulli equations and practice problems. Modeling - mixing problems, Newton's law of cooling.	
11	**LINEAR DIFFERENTIAL EQUATIONS OF SECOND ORDER:** Homogeneous linear equations of second order, linearity principle, initial value problem, general solutions.	**Tutorial 2**
12	Second order homogeneous equations with constant co-efficient, simple problems related to their fields, Euler – Cauchy equation.	
13	Solution by variation of parameters, modeling free-oscillations. **VECTOR CALCULUS:** Gradient of a scalar field, directional derivatives.	**Assignment 2**
14	Divergence of a vector field, curl of a vector field and practice problems.	
15	**TEST WEEK**	**CA Test 2**
16	Integration in vector field. Line integrals, vector fields, work, circulation and flux.	
17	Path independence, Conservative fields, Surface integrals.	
18	Green's, and Gauss divergence theorem (concepts and statements only).	
19	Stoke's theorem (concept and statement only), evaluation of line, surface and volume integrals. Applications of these concepts related to their disciplines.	
20	**TEST WEEK**	**CA Test 3**

EVALUATION COMPONENTS:

Sl. No	COMPONENT	C A	MARKS
1	TESTS	25	50
2	ASSIGNMENT	15	
3	TUTORIALS/OPEN BOOK TEST	10	
4	FINAL SEMESTER EXAMINATION		50
TOTAL			**100**

Prepared by
Dr. V. Veermani