LECTURE PLAN

Course Name: **Engineering Mathematics** **Course code: MA1201**
Academic Year: 2016 – 17 **Class:** BE
Academic Session: Monsoon 2017 **Semester:** I
Pre-requisite(s): Basics of Algebra, Calculus, Trigonometry, Coordinate Geometry
Credits: 4 (3 Lectures, 1 Tutorial)

Course Description: This course is intended as a basic course which enables the students to get the detailed idea about: infinite sequences and series, functions of two or more variables, their differentiation, properties and applications, integral calculus - multiple integrals and their applications, polar equations of conics and their properties, vector differential calculus, and vector integral calculus.

Course Outcomes: After completion of the course, the learners will be able to: decide the behaviour of sequences and series using appropriate tests, get an understanding of partial derivatives and their applications in finding maxima - minima problems, apply the principles of integral to solve a variety of practical problems in engineering and sciences, gain an understanding of polar equations of conics, their tangent, normal, chord of contact etc., solve problems involving derivatives (gradient, divergence, curl etc.) and integrals (surface, volume etc.) of vector functions, demonstrate a depth of understanding in advanced mathematical topics, and enhance and develop the ability of using the language of mathematics in engineering.

Course Coordinator: **Dr. (Mrs.) Anjana Pradhan Ghorai**
Team of Faculty members: Dr. (Ms.) Prabjot Kaur, Dr.AbhinavTandon, Dr.SatyabrataAdhikari, Dr.Randhir Singh, Dr.(Ms.) S. D. Jabeen.

Text Books:
TB 1: M.D. Weir, J. Hass and F. R. Giordano: Thomas' Calculus, 12th edition, Pearson Educations, 2008.
TB 2: Dennis G. Zill and Warren S. Wright: Advanced Engineering Mathematics, 4th edition, Jones andBartlertt Publishers, 2010

Reference Books:
RB 1: E. Kreyszig: Advanced Engineering Mathematics, 8th Edition John Wiley and sons 1999.
RB 2: T.M. Apostol: Calculus Vols 1 and 11.2ndEdition(reprint), John Wiley and sons, 2015.
RB 3: Robert Wrede& Murray R. Spiegel, Advanced Calculus, 3rd Ed., Schaum's outline series, McGraw-Hill Companies, Inc.,2010.

Serial No.	Learning objectives	Topic(s) to be covered	Lecture Hr.	Preferred Book(s)	Total no. of Lecture Hrs.
Module I	The aim of these lectures is to introduce the concept of a sequence which arises naturally in various fields.	Sequences, bounded sequences, upper and lower bounds, monotonic sequences	**1**	TB1 (10.1)	**3**
		limits of a sequence, convergence of sequence	**2**	TB1 (10.1)	
		Cauchy's general principle of convergence, Cauchy's theorems on limits (No proof).	**3**	RB3 (Ch.2)	
Module II	The aim of these lectures is to gain knowledge of how to	Convergence of series of real numbers of	**4-5**	TB1 (10.2-10.4)	**7**

	add infinitely many numbers together. which leads to the theory of infinite series. This theory is applicable to deal with general functions which are often solutions to important problems in science and engineering.	positive terms, p - series test			
		Cauchy's root test, D' Alembert's ratio test, Raabe's test. Gauss's Ratio Test, Logarithmic and Higher logarithmic Ratio	**6-8**	TB1 (10.5) & RB3 (Ch.11)	
		Leibnitz's Rule for alternating series Test.	**9**	TB1 (10.6)	
		Absolute and conditional convergence	**10**	TB1 (10.6)	
Module III	The aim of these lectures is to deal with the representation of the known differentiable function as an infinite sum of power of *x*. As most entities in the real world are dependent of several independent entities, the Functions of several variables, its limits, continuity and differentiability has been introduced.	Generalized Mean Value Theorem, Maclaurin's series, Taylor's series of functions	**11**	TB1 (10.8)	**9**
		Functions of several variables, level curves, limits, continuity, partial Derivatives.	**12-13**	TB1 (14.1-14.3)	
		Euler's theorem on Homogeneous functions	**14**		
		Chain Rule, transformation of independent variables, total differential, Jacobians.	**15-16**	TB1 (14.4)	
		Taylor's series in two or more variables.	**17**	TB1 (14.9)	
		Maximum, minimum and saddle points of functions of two variables. Several independent variables Lagrange's method of Undetermined Multipliers.	**18-19**	TB1 (14.7-14.8)	
Module IV	These lectures introduce the integrals of functions of several variables over a region in plane and space. The theory of multiple integrals has wide range of application specially in calculating volumes, areas in	Beta and Gamma functions.	**20**	RB1 (Ch.15)	**6**
		Double integrals, area, change of order of integration, evaluation of integrals by transforming into polar co-ordinates.	**21-22**	TB1 (15.1-15.4)	

	plane, moments and centers of mass etc.	Evaluation of Triple integrals.	**23**	TB1 (15.5)	
		Volume and surface area by double and triple integration by transforming in to cylindrical and spherical polar co-ordinates	**24-25**	TB1 (15.7-15.8)	
Module V	Polar coordinates are especially important in Astronomy and Astronautical engineering because the satellites, moons, planets all move with respect to a point(sun) and approximately move along the ellipses, parabolas, hyperbolas etc. All these curves can be described with a single relatively simple polar equation.	Sketching polar equations of conic section.	**26**	TB1 (11.7)	**4**
		Equation of chord, tangent and normal line to a conic section.	**27**		
		equation of chord of contact, director circle and asymptote to a conic section.	**28-29**		
Module VI		First order differential equations, linear and Bernoulli's equation, Reduction of order.	**30**	TB2 (2.3,3.2)	**7**
	In these lectures, the calculus of vector valued functions are introduced to describe the paths and motions of objects moving in a plane or space. The new quantities that describe how an object's path can turn and twist in space are also introduced.	Curvature, normal vector, torsion and TNB frame	**31**	TB1 (13.1,13.3,13.4) & TB2 (9.3)	
		Tangential and normal components of velocity and acceleration, radial and transverse acceleration, Motion in polar and cylindrical coordinates	**32**	TB1 (13.5-13.6) & TB2 (9.3)	
		Directional derivative, Gradient, Divergence and curl. Expansions, identities. Tangent plane and normal line.	**33-34**	TB1 (14.5) TB2 (9.5-9.7)	
		Gradient, divergence and curl in curvilinear coordinates.	**35**	RB3 (Ch.7)	
Module	In these lectures, the theory	Line integrals, Work,	**36-38**	TB1	**4**

VII	of integration is extended to curves and surfaces in a plane or space. The fundamental theorem of vector integral calculus and its mathematical consequence is discussed along with physical applications.	Circulation, Flux, Path independence, Potential function, Conservative field,		(16.1-16.3) TB2 (9.8-9.9)	
		Green's theorem in plane, surface and volume integrals Gauss's Divergence theorem, Stoke's theorem. Applications	**39-40**	TB1 (16.4,16.7 &16.8) TB2 (9.12,9.14,9.16)	

Assessment tools & Evaluation procedure

Assessment Tool	% Contribution during Assessment
Mid Sem. Examination Marks	25
End Sem. Examination Marks	60
Quiz (Best of Two out of Three)	15

NOTICE: All notices related to the course will be displayed in the Department of Mathematics notice board.