Course code	Course title	L	T	P	J	C
BMAT101L	Calculus	3	0	0	0	3
Pre-requisite		Syllabus version				
		v. 1.0				

Course Objectives

1. To provide the requisite and relevant background necessary to understand the other important engineering mathematics courses offered for Engineers and Scientists.
2. To introduce important topics of applied mathematics, namely Single and Multivariable Calculus and Vector Calculus etc.
3. Enhance to use technology to model the physical situations into mathematical problems, experiment, interpret results, and verify conclusions.

Course Outcomes

At the end of the course the student should be able to:

1. Apply single variable differentiation and integration to solve applied problems in engineering and find the maxima and minima of functions
2. Evaluate partial derivatives, limits, total differentials, Jacobians, Taylor series and optimization problems involving several variables with or without constraints
3. Evaluate multiple integrals in Cartesian, Polar, Cylindrical and Spherical coordinates.
4. Use special functions to evaluate various types of integrals.
5. Understand gradient, directional derivatives, divergence, curl, Green's, Stokes and Gauss Divergence theorems.

Module:1	Single Variable Calculus	8 hours

Differentiation- Extrema on an Interval Rolle's Theorem and the Mean value theorem-Increasing and decreasing functions.-First derivative test-Second derivative test-Maxima and Minima-Concavity. Integration-Average function value - Area between curves - Volumes of solids of revolution.

Module:2	Multivariable Calculus	5 hours

Functions of two variables-limits and continuity-partial derivatives –total differential-Jacobian and its properties.

Module:3	Application of Multivariable Calculus	5 hours

Taylor's expansion for two variables–maxima and minima–constrained maxima and minima-Lagrange's multiplier method.

Module:4	Multiple integrals	8 hours

Evaluation of double integrals–change of order of integration–change of variables between Cartesian and polar co-ordinates - evaluation of triple integrals-change of variables between Cartesian and cylindrical and spherical co-ordinates.

Module:5	Special Functions	6 hours

Beta and Gamma functions–interrelation between beta and gamma functions-evaluation of multiple integrals using gamma and beta functions. Dirichlet's integral -Error functions complementary error functions.

Module:6	Vector Differentiation	5 hours

Scalar and vector valued functions – gradient, tangent plane–directional derivative-divergence and curl–scalar and vector potentials. Statement of vector identities-simple problems.

Module:7	Vector Integration	6 hours

Line, surface and volume integrals - Statement of Green's, Stoke's and Gauss divergence theorems -verification and evaluation of vector integrals using them.			
Module:8	**Contemporary Topics**		**2 hours**
Guest lectures from Industry and, Research and Development Organizations			
	Total Lecture hours:		**45 hours**
Text Book			
1.	George B.Thomas, D.Weir and J. Hass, Thomas Calculus, 2014, 13th edition, Pearson		
Reference Books			
1.	Erwin Kreyszig, Advanced Engineering Mathematics, 2015, 10th Edition, Wiley India		
2.	B.S. Grewal, Higher Engineering Mathematics, 2020, 44th Edition, Khanna Publishers		
3.	John Bird, Higher Engineering Mathematics, 2017, 6th Edition, Elsevier Limited.		
4.	James Stewart, Calculus: Early Transcendental, 2017, 8th edition, Cengage Learning.		
5.	K.A.Stroud and Dexter J. Booth, Engineering Mathematics, 2013, 7th Edition, Palgrave Macmillan.		
Mode of Evaluation: CAT, Assignment, Quiz and FAT			
Recommended by Board of Studies	24-06-2021		
Approved by Academic Council	No. 62	Date	15-07-2021