Course Code:	017071191
Course Name:	Mathematics - I
Category of Course:	Basic Science Course (BSC)
Prerequisite Course:	---

Teaching Scheme				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Total Hours
4	2	0	6	60

Syllabus				
Unit No.	Topic	Prerequisite Topic	Successive Topic	Teaching Hours
01	**Basic Algebra** 1.1 Indices 1.2 Surds 1.3 Expansions and factorization 1.4 Logarithm and Exponential Function with its Application	---	--- --- --- ---	4 (7%)
02	**Trigonometry and Geometry** 2.1 Angles 2.2 Trigonometric functions And Hyperbolic functions 2.3 Trigonometric functions of sum and difference of two angles 2.4 Inverse trigonometric functions 2.5 Law of sines and cosines 2.6 Area of geometric curves 2.7 Volume of geometric curves	---	--- --- --- --- --- --- ---	2 (3%)
03	**Basic Differentiation and Integration** 3.1 Basic differentiation by formulae 3.2 Product and quotient rule 3.3 Chain rule and composite function 3.4 Basic integration by formulae 3.5 Integration by parts 3.6 Roll's theorem 3.7 Lagrange's theorem 3.8 Cauchy's mean value theorem 3.9 Indeterminate forms and L'Hospital's rule	--- --- --- --- --- Basic differentiation (017071191-Unit-3)	--- --- --- --- --- --- --- --- ---	6 (10%)
04	**Sequence and Series** 4.1 Convergence and divergence of an infinite series. 4.2 Geometric series 4.3 Integral test and p- series test 4.4 Comparison test 4.5 Ratio test 4.6 Root test 4.7 Taylor's series 4.8 Maclaurin's series	--- --- --- p- series test, Geometric series test ((017071191-Unit-4) --- --- Basic differentiation ((017071191-Unit-3)	--- --- --- --- --- --- ---	6 (10%)
05	**Partial Derivatives** 5.1 Functions of several variables 5.2 Geometric interpretation of partial derivatives 5.3 Limits and continuity of function of several variables 5.4 First and higher order partial derivatives 5.5 Euler's theorem and modified Euler's theorem 5.6 Total derivatives and chain rule 5.7 Implicit function	--- --- --- Basic differentiation ((017071191-Unit-3) Basic differentiation ((017071191-Unit-3) First and higher order partial derivatives ((017071191-Unit-5)	--- --- --- --- --- --- ---	6 (10%)
06	**Application of Partial Derivatives** 6.1 Tangent plane and normal line 6.2 Total differentiation and approximation 6.3 Extreme values 6.4 Method of Lagrange multipliers. 6.5 Jacobian	First order partial derivatives(017071191-Unit-5) First and higher order partial derivatives(017071191-Unit-5) First order partial derivatives(017071191-Unit-5)	--- --- --- --- ---	6 (10%)

	Multiple Integral			
07	7.1 Double integral over rectangles and general regions	Basic integration(017071191-Unit-3)	---	**12 (20%)**
	7.2 Change of order of integration	Double integral over rectangles and general regions (017071191-Unit-7)	---	
	7.3 Double integration in polar coordinates	Basic integration(017071191-Unit-3)	---	
	7.4 Change of variables in double integration by Jacobian		---	
	7.5 Triple integration		---	
	7.6 Area enclosed by plane curve using double integration	Double integral over rectangles and general regions, Double integration in polar coordinates (017071191-Unit-7)	---	
	7.7 Triple integration in cylindrical and spherical co-ordinates	Triple integration (017071191-Unit-7)	---	

	Complex Numbers			
08	8.1 Complex numbers	---	---	**6 (10%)**
	8.2 Geometrical representation of complex numbers	---	---	
	8.3 Algebra of complex numbers	---	---	
	8.4 Different forms of complex numbers	---	---	
	8.5 Modulus and argument (or amplitude) of complex numbers	---	---	
	8.6 Properties complex numbers	---	---	
	8.7 De Moivre's theorem	---	---	
	8.8 Circular and hyperbolic functions	---	---	
	8.9 Logarithm of a complex number	**---**	---	

	Vector Calculus-I			
09	9.1 Vector and its properties		---	**6 (10%)**
	9.2 Parametrization of curves	---	---	
	9.3 Arc length of curve in space	Basic integration (017071191-Unit-3)	---	
	9.4 Gradient of a scalar point function and surface normal vector	First order partial derivatives(017071191-Unit-5)	Models: Linear Modeling (017012591-Unit -4), Stochastic Gradient Descent (017012591-Unit -4)	
	9.5 Directional derivatives	Gradient(017071191-Unit-9)	---	
	9.6 Divergence of vector field	First order partial derivatives(017071191-Unit-5)	---	
	9.7 Curl of vector field		---	
	9.8 Scalar potential function of conservative field		---	

	Vector Integral			
10	10.1 Line integral	Basic integration (017071191-Unit-3)	---	**6 (10%)**
	10.2 Work done	Line integral (017071191-Unit-10)	---	
	10.3 Circulation and Flux	Line integral (017071191-Unit-10)	---	
	10.4 Green's theorem in the plane (without proof)	Line integral (017071191-Unit-10), Double integral over rectangles and general regions (017071191-Unit-8)	---	

<table>
<tr><td colspan="8">Proposed Theory + Practical Evaluation Scheme by Academicians
(% Weightage Category Wise and it's Marks Distribution)</td></tr>
<tr><td>L :</td><td>4</td><td>T:</td><td colspan="3">2</td><td>P :</td><td>0</td></tr>
<tr><td colspan="8">Note : In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject.
Each Test will be of 25 Marks.
Each Test Syllabus Weightage: Range should be 20% - 30%</td></tr>
</table>

Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage
Theory			MCQ	15%	15
Theory	**6**		Theory Descriptive	0%	0
Theory			Formulas and Derivation	10%	10
Theory			Numerical	75%	75
Expected Theory %	**100%**	**6**	**Calculated Theory %**	**100%**	**100**
Practical			Individual Project	0%	0
Practical			Group Project	0%	0
Practical	**0**		Internal Practical Evaluation (IPE)	0%	0
Practical			Viva	0%	0
Practical			Seminar	0%	0
Expected Practical %	**0%**		**Calculated Practical %**	**0%**	**0**
Overall %	**100%**			**100%**	**100**

	Course Outcome
	Upon completion of the course students will be able to
CO1	Evaluate exponential, trigonometric and hyperbolic functions of a complex number and To apply the various tests of convergence to sequence, series and the tool of power series for learning advanced Engineering Mathematics.
CO2	Apply the knowledge to solve some practical problems, such as constrained optimization problems and other problems involving Partial differentiation
CO3	Evaluate a double integral in polar coordinates. Reverse the order of integration for a double integral. Evaluate a triple integral to find volume in rectangular coordinates, cylindrical coordinates, and spherical coordinates. To compute the areas and volumes using multiple integral techniques.
CO4	Calculate directional derivatives and gradients. Apply gradient to solve problems involving normal vectors to level surfaces. Explain the concept of a vector integration a plane and in space.

	Suggested Reference Books
1	Calculus with Early Transcendental Functions, James Stewart, Cengage Learning.
2	Thomas' Calculus, Maurice D. Weir, Joel Hass, Frank R. Giordano, Pearson Education.
3	Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers.
4	Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.

	List of Open Source Software/Learning website
1	https://nptel.ac.in