Applied Mathematics-II

University of Mumbai			
CLASS: F.E (All Branches of Engineering)		**Semester - II**	
SUBJECT: Applied Mathematics - II			
Periods per week 01 Period of 60 min.	Lecture	4	
	Practical	--	
	Tutorial	1	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	--
	Term Work	-	25
	Total		100

Detailed Syllabus		Lectures/Week
	Prerequisite : Idea of curve tracing in Cartesian, Parametric and Polar Forms. Standard curves such as straight lines, Circles, Parabolas, Hyperbola, Catenary Cissoid, Astroid, Cycloid, Lemniscate of Bernoulli. Cardiode, Concept of Solid Geometry- Planes, Spheres, Cones, Cylinders, Paraboloids.	02
2.1	**Beta and Gamma functions, Differentiation under integral sign** 2.1.1 Definition of Beta and Gamma functions and properties. 2.1.2 Relation between Beta and Gamma functions (with proof). Duplicaiton formula (with proof). 2.1.3 Differentiation under the integral sign with constant limits of integration.	06
2.2	**Differential Equations of first order and first degree** 2.2.1 Exact differential equations and those which can be reducible to the exact form by using integrating factors (four rules) 1. Homogeneous differential equations 2. f(xy)ydx + g(xy)xdy = 0 3. I.F= $\int_e f(x)dx$ where f(x) = $\frac{\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}}{N}$ 4. I.F = $\int_e g(y)dy$ where g(y) = $\frac{\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}}{M}$ 2.2.2 Linear differential equations and differential reducible to the linear form 2.2.3 Numerical solutions of differential equations using Taylor's series method.	04

2.3	**Numerical solutions of differential equations of first order and first degree, differential equations of order n.**	
	2.3.1 Euler's method, Modified Euler's method, Runge Kutta method of 4^{th} order. Comparison of numerical solution with the exact solutions.	03
	2.3.2 Linear differential equations with constant coefficients- Complimentary functions, particular integrals of differential equations of the type $f(D)y = X$ where X is e^{ax}, $\sin(ax+b)$, $\cos(ax+b)$, x^n, $e^{ax}V$, xV	05
2.4	**Linear differential equations with variable coefficients, Method of variation of parameters and Rectification.**	
	2.4.1 Cachy's homogeneous linear differential equatin and Legendre's differential equation.	02
	2.4.2 Method of variation of parameters.	01
	2.4.3 Simple application of differential equations of first and second order to electrical and mechanical engineering problems (no formulation of differential equation)	02
	2.4.4 Rectification of plane curves.	02
2.5	**Integral Calculus-Double Integrals**	
	2.5.1 Double Integration- Definition, geometrical interpolation, properties and evaluation	03
	2.5.2 Evaluation of double integrals by changing the order of integration and changing to polar form	06
2.6	**Integral Calculus- Triple Integral and application of double and triple integrals, computer oriented techniques**	
	2.6.1 Triple Integration – definition and evaluation (Cartesian, Cylindrical and Spherical polar coordinates), Concept of Jacobians.	03
	2.6.2 Applications of double integrals to compute Area, Mass and Volume. Application of triple integrals to compute Volume .	03
	2.6.3 Computer oriented techniques in problem solving using Scilab.	02

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only five questions need to be solved.
3. Question 1 will be compulsory and based on entire syllabus.
4. Remaining question will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).
5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Term Work	**Marks**
1. Attendance (Theory and Tutorial)	05
2. Tutorials covering entire portion	05
3. Programming Assignments using Scilab -Curve Tracing, Intersection of surfaces, evaluation of Double and Triple Integrals, Solution of Differential equations of 1^{st} order and 1^{st} degree	05
4. Test (at least one)	10
	25

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Recommeded Books :

- Higher Engineering Mathematics, Dr. B.S. Grewal Khanna Publication.
- Differential Equation, Ross, Wiley India 3^{rd} Ed.
- A textbook of Applied Mathematics, P.N. and J.N. Wartikar, Volume 1 and 2 , Pune Vidyarthi Griha.
- Advanced Engineering Mathematics, Erwin Kreyszing, Wiley India, 8^{th} Ed.
- Elementary Differential Equation, E.D.Rainville, P.E. & R.E. Bedient, Prentice Hall, 8^{th} edition.