LOK JAGRUTI UNIVERSITY (LJU)

INSTITUTE OF ENGINEERING & TECHNOLOGY

Department of Civil Engineering (709)

Bachelor of Engineering (B.E.) – Semester – II

Course Code:	**017091201**
Course Name:	**Mathematics - II**
Category of Course:	Basic Science Course (BSC)
Prerequisite Course:	Mathematics - I (017091191)

Teaching Scheme				
Lecture (L)	**Tutorial (T)**	**Practical (P)**	**Credit**	**Total Hours**
3	**1**	**0**	**4**	**40**

Syllabus

Unit No.	Topic	Prerequisite Topic	Successive Topic	Teaching Hours
01	**Matrices**			**4 (10%)**
	1.1 Elementary row operations of matrices	---	Stiffness Matrix Method (Beam and Frame) (017093501-Unit-6) Flexibility Matrix Method (Beam and Frame) (017093501- Unit-7)	
	1.2 Row and reduced row echelon form	---		
	1.3 System of linear equations	---		
	1.4 Homogeneous system of linear equations			
	1.5 Non-homogeneous system of linear equations			
	1.6 Inverse of Matrix (Using Gauss Jordan Method)	---		
02	**Eigen Values and Eigen Vectors**			**2 (5%)**
	2.1 Eigen values and vectors	---	---	
	2.2 Diagonalization of matrix (Only for Non symmetric Matrix)		---	
	2.3 Cayley-Hamilton theorem		---	
03	**Fourier Series**			**4 (10%)**
	3.1 Periodic function	Basic Differentiation and Integration (017091191-Unit-3)	---	
	3.2 Dirichlet's condition		---	
	3.3 Trigonometric series of sine and cosine function		---	
	3.4 Fourier series of a function of period 2L		---	
	3.5 Fourier series of even and odd function		---	
	3.6 Half range expansions		---	
04	**Fourier Integral and Fourier Transform**			**3 (7.5%)**
	4.1 Define Fourier integral	Fourier series of a function (017091201-Unit-3)	---	
	4.2 Cosine and sine integral		---	
	4.3 Define Fourier transform		---	
	4.4 Cosine and sine transform		---	
05	**Laplace Transform**			**6 (15%)**
	5.1 Laplace transform of elementary functions	Basic Differentiation and Integration (017091191-Unit-3)	Seepage Analysis (017093303 - Unit-10.1)	
	5.2 Differentiation of Laplace transform			
	5.3 Integration of Laplace transform			
	5.4 Laplace transform of derivatives			
	5.5 Laplace transform of integrals			
	5.6 Unit step function and Dirac's delta function			
	5.7 Inverse Laplace transform			
	5.8 Convolution theorem (Without Proof)			
06	**Application of Laplace Transform**			**2 (5%)**
	6.1 Solution of linear ordinary differential equation	Laplace transform (017091201- Unit-5)	---	
	6.2 Solution of simultaneous equations (Ordinary Differential Equation)		---	
07	**Parameterization of Curves and Surfaces**			**4 (10%)**
	7.1 Parametrization of curves	---	Application of Surveying in Construction (017093404 - Unit-10)	
	7.2 Orientation of parametric curve			
	7.3 Arc length of curve in space			
	7.4 Curvature and surfaces			
08	**Vector Differentiation**			**5 (12.5%)**
	8.1 Gradient of a scalar point function and surface normal vector	---	---	
	8.2 Directional derivatives		---	
	8.3 Divergence of vector field		---	
	8.4 Curl of vector field and scalar potential of conservative field		---	
09	**Vector Integral-I**			**5 (12.5%)**
	9.1 Line integral (Work Done)		---	

	9.2 Green's theorem in the plane (without proof)	Basic Differentiation and Integration (017091191-Unit-3)	---	
10	**Vector Integral-II**			**5 (12.5%)**
	10.1 Surface integral	Basic Differentiation and Integration (017091191-Unit-3)	---	
	10.2 Gauss divergence theorem (without proof)		---	
	10.3 Stoke's theorem (without proof)		---	
	10.4 Volume integral		---	

Proposed Theory + Practical Evaluation Scheme by Academicians
(% Weightage Category Wise and it's Marks Distribution)

L :	3	T:	1	P:	0

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%

Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage
Theory	**4**	**4**	MCQ	15%	15
Theory			Theory Descriptive	0%	0
Theory			Formulas and Derivation	10%	10
Theory			Numerical	75%	75
Expected Theory %	**100%**		**Calculated Theory %**	**100%**	**100**
Practical	**0**		Individual Project	0%	0
Practical			Group Project	0%	0
Practical			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	Understand and apply matrix operation and properties, solve systems of linear equations using matrices, Analyze systems using eigen values and eigne vectors, Apply matrices in signal processing tasks, Explain the concept of Fourier series and its properties
CO2	Design filter and modulation schemes and Implement algorithms like FFT for efficient computation of Fourier transforms, Understand and apply Laplace transforms to solve linear ODEs with constant coefficients.
CO3	Understanding of parametric curves, including their representation, orientation, arc length calculation, and curvature properties, preparing students for further study and application in various fields of mathematics and engineering.
CO4	Apply gradient to solve problems involving normal vectors to level surfaces and to Explain the concept of a vector integration in a plane(2-dimensions) and in the space(3-dimensions).

Suggested Reference Books

1	Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition.
2	Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.
3	Advanced Engineering Mathematics, Dennis G. Zill, 4th edition, Jones and Bartlett Publishers.
4	Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers.
5	Thomas' Calculus, Maurice D. Weir, Joel Hass, Early Transcendentals, 13e, Pearson, 2014

List of Open Source Software/Learning website

1	https://nptel.ac.in/