LOK JAGRUTI UNIVERSITY (LJU)

INSTITUTE OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering (710)

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

Course Code:	**017101291**
Course Name:	**Mathematics - II**
Category of Course:	Basic Science Course (BSC)
Prerequisite Course:	Mathematics - I (017101191)

Teaching Scheme				
Lecture (L)	**Tutorial (T)**	**Practical (P)**	**Credit**	**Total Hours**
3	**2**	**0**	**5**	**50**

Syllabus

Unit No.	Topic	Prerequisite Topic	Successive Topic	Teaching Hours
01	**Matrices**			**7 (14%)**
	1.1 Elementary row operations of matrices	---	Linear Programming Problems (017107701-Unit-2)	
	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)			
	1.7 Eigen values & vectors			
	1.8 Diagonalization of matrix (Only for Non symmetric Matrix)			
	1.9 Cayley-Hamilton theorem			
02	**Fourier Series**			**5 (10%)**
	2.1 Periodic function	Basic Differentiation and Integration (017101191-Unit-3)	---	
	2.2 Dirichlet's condition			
	2.3 Trigonometric series of sine and cosine function			
	2.4 Fourier series of a function of period 2L			
	2.5 Fourier series of even and odd function			
	2.6 Half range expansions			
03	**Fourier Integral and Fourier Transform**			**3 (6%)**
	3.1 Define Fourier integral	Fourier series of a function (017101291-Unit-3)	---	
	3.2 Cosine and sine integral			
	3.3 Define Fourier transform			
	3.4 Cosine and sine transform			
04	**Power Series**			**4 (8%)**
	4.1 Classification of singularities	---	---	
	4.2 Series solution near ordinary points			
	4.3 Series solution near regular singular points (Frobenius method)			
05	**Laplace Transform**			**8 (16%)**
	5.1 Laplace transform of elementary functions	Basic Differentiation and Integration (07101191-Unit-3)	---	
	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 (4%)**
	6.1 Solution of linear ordinary differential equation	Laplace Transform (017101291-Unit-5)		
	6.2 Solution of simultaneous equations (Ordinary Differential Equation)			
07	**Vector Differentiation**			**5 (10%)**
	7.1 Parametrization of curves	Basic Differentiation and Integration (017101191-Unit-3)	Motion of Fluid Particles and Streams (017103491 – Unit-9)	
	7.2 Orientation of parametric curve			
	7.3 Arc length of curve in space			
	7.4 Curvature and surfaces			
	7.5 Gradient of a scalar point function and surface normal vector			
	7.6 Directional derivatives			
	7.7 Divergence of vector field			

	7.8 Curl of vector field and scalar potential of conservative field			
08	**Vector Integral-I**			**5 (10%)**
	8.1 Line integral (Work Done)	Basic integration (017101191-Unit-3), Multiple Integral (017101191-Unit-8)	---	
	8.2 Green's theorem in the plane (without proof)			
09	**Vector Integral-II**			**6 (12%)**
	9.1 Surface integral	Multiple Integral (017101191-Unit-8)	---	
	9.2 Gauss divergence theorem (without proof)			
	9.3 Stoke's theorem (without proof)			
	9.4 Volume integral			
10	**Basic Probability and Statistics**			**5 (10%)**
	10.1 Mathematical definition of probability	---	---	
	10.2 Axiomatic approach of probability			
	10.3 Addition law of probability			
	10.4 Conditional of probability (Baye's theorem)			
	10.5 Mathematical expectation			
	10.6 Basic introduction of statistics: Central tendency			

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

L:	3	T:	2	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	5	5	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
1	Utilize matrix methods to analyze and solve problems in areas such as structural analysis, electrical circuits, and control systems. Use of Fourier series techniques to solve partial differential equations relevant to heat conduction and wave propagation in engineering systems.
2	Apply Laplace & Fourier transforms to analyze and design control systems & signal system respectively in mechanical engineering.
3	Apply power series and vector calculus concepts to analyze and solve engineering problems in diverse fields such as fluid dynamics.
4	Develop proficiency in the use of Gauss's theorem, and Stokes' theorem for solving practical engineering problems and understand the fundamental concepts of probability, random variables, and probability distributions.
Suggested Reference Books	
1	Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition.
2	Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.
3	Calculus, Volumes 2, T. M. Apostol, Wiley Eastern
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/courses/