LOK JAGRUTI UNIVERSITY (LJU)

INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication (707)

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

Course Code:	**017071291**
Course Name:	**Mathematics - II**
Category of Course:	Basic Science Course (BSC)
Prerequisite Course:	Mathematics - I (017071191)

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	---	---	
	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	Factorization(017071191-Unit-1)	---	
	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 integration (017071191-Unit-3)	Introduction to Fourier Series (017071401-Unit5)	
	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	**Some Special Functions**			**4 (8%)**
	3.1Gamma function, Beta function. (And its Properties)	---	Signal Operations and Properties (017071401 – Unit-1)	
	3.2 Bessel function, Dirac's Delta function (Definition only)	---		
	3.3 Error function and complementary Error function (Definition only)	---		
	3.4 Heaviside's function, pulse unit height and duration function (Definition only)	---		
	3.5 Rectangle function, Gate function (Definition only)	---		
	3.6 Signum function, Saw tooth wave function (Definition only)	---		
	3.7 Triangular wave function, Halfwave rectified sinusoidal function, Full rectified sine wave, Square wavefunction. (Definition only)	---		
04	**Fourier Integral and Fourier Transform**			**4 (8%)**
	4.1 Define Fourier integral	Basic integration (017071191-Unit-3)	---	
	4.2 Cosine and sine integral		---	
	4.3 Define Fourier transform		Energy Spectral Density (ESD) & Power Spectral Density (PSD)(017073501-Unit-1 - 1.4), Representation of Sequences by Discrete-Time Fourier Transform (017071401 Unit-7 – 7.1), Fourier Transform (017071401 – Unit-6)	
	4.4 Cosine and sine transform			
05	**First Order Ordinary Differential Equations**			**5 (10%)**
	5.1 Geometric meaning of $y' = f(x, y)$ direction fields	---	Time domain response of First Order Circuits (017073301 – Unit-4)	
	5.2 Exact differential equations and integrating factor	Basic differentiation & integration(017071191-Unit-3)		
	5.3 Linear differential equations			
	5.4 Bernoulli equations			
06	**Higher Order Ordinary Differential Equations**			**7 (14%)**
	6.1 Linear differential equations of second and higher order	---	Time domain response of Second Order Circuits (017073301 – Unit-5)	
	6.2 Homogeneous linear differential equations of higher order	Factorization(017071191-Unit-1)		
	6.3 Higher order non-homogeneous equations			
	6.4 Solution by undetermined coefficients		---	
	6.5 Solution by variation of parameters		---	
	6.6 Solution by [1/f(D)] r(x) method for finding particular integral.		---	

	6.7 Ordinary differential equations with variable coefficient (Reducible to constant coefficient) (Cauchy-Euler's & Legendre's Equation)	Solution by undetermined coefficients (017071291-Unit-6), Solution by [1/f(D)] r(x) method for finding particular integral (017071291-Unit-6)	---	
07	**Modeling of Ordinary Differential Equations**			**3 (6%)**
	7.1 Orthogonal trajectories of curves (Only Cartesian Curves)	First order ordinary differential equations (017071291-Unit-5)	---	
	7.2 Oscillations and resonance (For undamped Forced Oscillations)	Higher order ordinary differential equations (017071291-Unit-6)	---	
	7.3 Modeling: Electric Circuits (Only RLC-Circuit)		---	
08	**Power Series**			**5 (10%)**
	8.1 Classification of singularities	---	---	
	8.2 Series solution near ordinary points	---	---	
	8.3 Series solution near regular singular points (Frobenius Method)	---	---	
09	**Laplace Transform**			**7 (14%)**
	9.1 Laplace transform of elementary functions	Basic differentiation & integration(017071191-Unit-3)	Laplace and Inverse Laplace Transformation (017073301 Uint-10)	
	9.2 Differentiation of Laplace transform			
	9.3 Integration of Laplace transform			
	9.4 Laplace transform of derivatives			
	9.5 Laplace transform of integrals			
	9.6 Unit step function and Dirac's delta function			
	9.7 Inverse Laplace transform			
	9.8 Convolution theorem			
10	**Application of Laplace Transform**			**3 (6%)**
	10.1 Solution of linear ordinary differential equation	Laplace transform of elementary functions, Laplace transform of derivatives, Unit step function and Dirac's delta function, Inverse Laplace transform, Convolution theorem(017071291-Unit-9)	---	
	10.2 Solution of simultaneous equations		---	

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
CO1	Understand the techniques for analyzing and solving engineering problems involving matrices, perform matrix computation. The Fourier series of functions in the differential equation often gives some prediction about the behavior of the solution of differential equation. They are useful to find out the dynamics of the solution.
CO2	Fourier transform enables engineers to analyze and manipulate signals efficiently.
CO3	Apply effective mathematical methods for the solutions of higher order ordinary differential equations and working knowledge of basic application problems described by second order linear differential equations with constant coefficient. Use power series to solve differential equations appears in engineering filed
CO4	Apply the Laplace transform as tools which are used to solve differential equations.

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.

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