Course Code	18MAB201T	Course Name	TRANSFORMS AND BOUNDARY VALUE PROBLEMS		Course Category	B	Basic Sciences	L	T	P	C
								3	1	0	4

Pre-requisite Courses	18MAB102T	Co-requisite Courses	NIl	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards	Nil		

CourseLearning Rationale(CLR):	The purpose of learning this course is :	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14 15
CLR-1 :	Describe types of Partial differential equations interpret solutions relate PDE to the respective branches of engineering																	
CLR-2 :	Relate Fourier series expansion in solving problems under RMS value and Harmonic Analysis.																	
CLR-3 :	Infer the most general form to the PDE and relate to half range sine and cosine series as the case may be																	
CLR-4 :	Evaluate the various types of integral transforms																	
CLR-5 :	Conclude that the purpose of studying z transform is to solve linear difference equations having constant coefficients																	
CLR-6 :	Predicting the importance of PDE, Fourier series, Boundary value problems and Fourier , Z – transform applications																	

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
CLO-1 :	Determine Partial differential equation	2	85	80	M	H	L	-	-	-	-	-	M	-	-	H	-	-	-
CLO-2 :	Explain the expansion of a discontinuous function as an infinite form of trigonometric sine and cosine series	2	85	80	M	H	-	M	M	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Decide a proper form of solution for the differential equations which are of hyperbolic and parabolic type	2	85	80	M	H	-	-	-	-	-	-	M	-	-	H	-	-	-
CLO-4 :	Justify the relationship between aperiodic signals and linear combination of exponentials	2	85	80	M	H	-	M	-	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Relate signal analysis with that of z transform	2	85	80	M	H	L	-	-	-	-	-	M	-	-	H	-	-	-
CLO-6 :	Relate PDE, Fourier series, Boundary value problems, Fourier and Z transforms	2	85	80	L	L	L	H	H	H	L	H	H	H	-	H	-	-	-

Duration (hour)	12		Learning Unit / Module 1	Proposed Date & Hour	Conducted Date & Hour	Remark
S-1	SLO-1	Formation of partial differential equation by eliminating arbitrary constants				
	SLO-2	Formation of partial differential equation by eliminating two or more arbitrary constants				
S-2	SLO-1	Formation of partial differential equation by eliminating arbitrary functions				
	SLO- 2	Formation of partial differential equation by eliminating two or more arbitrary functions				

				Proposed Date & Hour	Conducted Date & Hour	
S-3	SLO-1	Formation of partial differential equation by eliminating arbitrary functions of the form $\phi(u, v) = 0$				
	SLO-2	Solution of first order non-linear partial differential equations-standard type I $F(p,q)=0$				
S-4	SLO-1 SLO-2	Problem solving using tutorial sheet 1				
S-5	SLO-1	Solution of first order nonlinear partial differential equations-standard type –II Clairaut's form				
	SLO-2	Solution of first order non-linear partial differential equations-standard type III $F(z, p, q)=0$				
S-6	SLO-1	Solution of first order non-linear partial differential equations-standard type-IV separation of variable $f(x, p) = g(y, q)$				
	SLO-2	Lagrange's linear equation: Method of grouping				
S-7	SLO-1	Lagrange's linear equation: Method of multipliers				
	SLO-2	Lagrange's linear equation: Method of multipliers				
S-8	SLO-1 SLO-2	Problem solving using tutorial sheet 2				
S-9	SLO-1	Linear Homogeneous partial differential equations of second and higher order with constant coefficients- CF and PI Type 1: e^{ax+by}				
	SLO-2	PI Type2: sin(ax+by) or cos(ax+by)				
S-10	SLO-1	Type 3: PI of polynomial				
	SLO-2	Type 4 Exponential shifting $e^{ax+by} f(x, y)$				
S-11	SLO-1	Linear Homogeneous partial differential equations of second and higher order with constant coefficients type 5 General rule				
	SLO-2	Applications of Partial differential equations in Engineering				
S-12	SLO-1 SLO-2	Problem solving using tutorial sheet 3				

Duration hour)	12	Learning Unit -II/ Module 2	Proposed Date & Hour	Conducted Date & Hour	
S-1	SLO-1	Introduction of Fourier series - Dirichlet's conditions for existence of Fourier Series			
	SLO-2	Fourier series –related problems in $(0,2\pi)$			
S-2	SLO-1	Fourier series –related problems in $(-\pi, \pi)$			
	SLO-2	Change of interval Fourier series –related problems in $(0,2l)$			
S-3	SLO-1	Fourier series –related problems in $(-l, l)$			
	SLO-2	Fourier series –half range cosine series related problems$(0, \pi)$			
S-4	SLO-1 SLO-2	Problem solving using tutorial sheet 4			

			Proposed Date & Hour	Conducted Date & Hour	
S-5	SLO-1	Fourier series –half range cosine series related problems$(0, l)$			
	SLO-2	Fourier series –half range sine series related problems$(0, \pi)$			
S-6	SLO-1	Fourier series –half range sine series related problems$(0, l)$			
	SLO-2	Parseval's Theorem (without proof)- related problems in Fourier series			
S-7	SLO-1	Parseval's Theorem (without proof)- related problems in cosine series			
	SLO-2	Parseval's Theorem (without proof)- related problems in sine series			
S-8	SLO-1	Problem solving using tutorial sheet 5			
	SLO-2				
S-9	SLO-1	Introduction to Harmonic Analysis			
	SLO-2	Harmonic Analysis for finding harmonic in $(0,2\pi)$			
S-10	SLO-1	Harmonic Analysis for finding harmonic in $(0,2l)$			
	SLO-2	Harmonic Analysis for finding harmonic in periodic interval $(0, T)$			
S-11	SLO-1	Harmonic Analysis for finding cosine series			
	SLO-2	Harmonic Analysis for finding sine series			
S-12	SLO-1	Problem solving using tutorial sheet 6			
	SLO-2				

Duration (hour)	12	Learning Unit -III/ Module 3	Proposed Date & Hour	Conducted Date & Hour	
S-1	SLO-1	Classification of second order partial differential equations			
	SLO-2	Method of separation of variables			
S-2	SLO-1	One dimensional Wave Equation and its possible solutions			
	SLO-2	One dimensional Wave Equation-initial displacement with zero initial velocity-type 1 Algebraic function			
S-3	SLO-1	One dimensional Wave Equation-initial displacement with zero initial velocity-type 2 Trigonometric function			
	SLO-2	One dimensional Wave Equation-initial displacement with zero initial velocity-type 3 – Midpoint of the string is displaced			
S-4	SLO-1	Problem solving using tutorial sheet 7			
	SLO-2				
S-5	SLO-1	One dimensional Wave Equation-initial displacement with non-zero initial velocity Type 1 Algebraic function			
	SLO-2	One dimensional Wave Equation-initial displacement with non-zero initial velocity Type 2 Trigonometric function			
S-6	SLO-1	Wave Equation-initial displacement with non-zero initial velocity Type 3 split function			
	SLO-2	One dimensional heat equation and its possible solutions			
S-7	SLO-1	One dimensional heat equation related problem			
	SLO-2	One dimensional heat equation -Steady state conditions			
S-8	SLO-1	Problem solving using tutorial sheet 8			
	SLO-2				

				Proposed Date & Hour	Conducted Date & Hour
S-9	SLO-1	One dimensional heat equation -Steady state conditions more problems			
	SLO-2	One dimensional heat equation -Steady state conditions with zero velocity			
S-10	SLO-1	One dimensional heat equation -Steady state conditions with zero velocity more problems			
	SLO-2	One dimensional heat equation -Steady state conditions with zero velocity more related problems			
S-11	SLO-1	Steady state conditions and Non-zero boundary conditions- related problems			
	SLO-1	Steady state conditions and Non-zero boundary conditions- more problems			
S-12	SLO-1 SLO-2	Problem solving using tutorial sheet 9			

Duration (hour)	12	Learning Unit -IV/ Module 4	Proposed Date & Hour	Conducted Date & Hour
S-1	SLO-1	Introduction of Fourier Transforms		
	SLO-2	Fourier Transforms- problems		
S-2	SLO-1	Properties of Fourier transforms		
	SLO- 2	Standard results of Fourier transform		
S-3	SLO-1	Fourier Sine Transforms - problems		
	SLO- 2	Fourier Cosine Transforms - problems		
S-4	SLO-1 SLO- 2	Problem solving using tutorial sheet 10		
S-5	SLO-1	Properties of Fourier sine Transforms		
	SLO-2	Fourier sine Transforms applications		
S-6	SLO-1	Properties of Fourier cosine Transform		
	SLO- 2	Fourier cosine Transforms applications		
S-7	SLO-1	Convolution of two function		
	SLO- 2	Convolution Theorem		
S-8	SLO-1 SLO- 2	Problem solving using tutorial sheet 11		
S-9	SLO-1	Parseval's Identity for Fourier transform		
	SLO- 2	Parseval's Identity for Fourier sine & cosine transforms		
S-10	SLO-1	Parseval's Identity for Fourier sine & cosine transforms applications		
	SLO- 2	Fourier Transforms Using Differentiation property		
S-11	SLO-1	Solving integral equation		
	SLO- 2	Self-reciprocal using Fourier Transform, sine and cosine transform		
S-12	SLO-1 SLO- 2	Problem solving using tutorial sheet 12		

Duration (hour)	12	Learning Unit -V/ Module 5	Proposed Date & Hour	Conducted Date & Hour
S-1	SLO-1	Introduction of Z-transform		
	SLO-2	Z-transform-elementary properties		
S-2	SLO-1	Z-transform- change of scale property, shifting property		
	SLO- 2	Z-transform of a^n, $1/n$, $1/n+1$		
S-3	SLO-1	Z-transform of $1/n^2$, $1/(n+1)^2$		
	SLO- 2	Z-transform $r^n \cos n\theta$		
S-4	SLO-1 SLO- 2	Problem solving using tutorial sheet 13		

	SLO-1	Z-transform of $r^n \sin n\theta$		
	SLO-2	Initial value theorem		
	SLO-1	Finial value theorem		
S-6	SLO-2	Inverse Z-transform- long division method		
	SLO-1	Inverse Z-transform, related problems, long division method		
S-7	SLO-2	Inverse Z-transform, Partial fraction method		
S-8	SLO-1	Problem solving using tutorial sheet 14		
	SLO-2			
	SLO-1	Inverse Z-transform, Partial fraction method related problems		
S-9	SLO-2	Inverse Z-transform - residue theorem method		
	SLO-1	Inverse Z-transform - residue theorem method-problems		
S-10	SLO-2	Convolution theorem (without proof)		
	SLO-1	Convolution theorem applications		
S-11	SLO-2	Solution of linear difference equations with constant coefficients using Z-transform		
S-12	SLO-1	Problem solving using tutorial sheet 15		
	SLO-2			

Learning Resources	1. K. Sembulingam, Prema Sembulingam, Essentials of Medical Physiology, Jaypee brothers medical publishers, 7th ed., 2016	2. Guyton and Hall, Textbook of Medical Physiology, (Guyton Physiology), Saunders, 13th ed., 2015)

Learning Assessment

	Bloom's Level of Thinking		CLA – 1 (10%)		Continuous Learning Assessment (50% weightage)						Final Examination (50% weightage)	
					CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
			Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember		40 %	-	30 %	-	30 %	-	30 %	-	30%	
	Understand											
Level 2	Apply		40 %	-	40 %	-	40 %	-	40 %	-	40%	
	Analyze											
Level 3	Evaluate		20 %	-	30 %	-	30 %	-	30 %	-	30%	
	Create											
	Total		100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

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HOD, MATHEMATICS