Template 6 : Course Learning Syllabus

Course Learning Syllabus *(// includes Learning Outcomes & Learning Plan & Assessment Plan)*

Course Code	18MAB102T	Course Name	ADVANCED CALCULUS AND COMPLEX ANALYSIS	Course Category	BS	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	18MAB101T	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards	nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1:	To gain knowledge in evaluation of Double and triple Integral and apply then in problems in Engineering· Industries·
CLR-2:	To gain knowledge in evaluation of Surface and Volume Integral are Application of Gauss theorem, Stokes and Green's theorem all Engineering fields
CLR-3:	To know the techniques of Laplace Transforms and inverse transform and apply them in the problems of Science and Engineering
CLR-4:	To know the properties of Complex functions and apply them in the all Engineering fields
CLR-5:	To gain knowledge of evaluation of improper integrals involving complex functions using Residue theorem and apply them in Engineering fields

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning: Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO): 1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt· & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO - 3
CLO-1:	Gain familiarity in evaluation of multiple integrals using change of variables,	2	85	80	L		M						M			H			
CLO-2:	Gain knowledge in applying the techniques of vector calculus in problems involving Science and Engineering In solving ODE	2	85	80	L			M	M										
CLO-3:	Many Engineering problems can be transformed in to problems involving ODE, PDE and integrals· Laplace transform method and complex analytic methods can be used for solving them	2	85	80		M							M			H			
CLO-4:	Gain knowledge in Fundamentals of complex analytic functions and its properties	2	85	80	L	M		L					M			H			
CLO-5	Gain knowledge in evaluating improper integrals using	2	85	80		M	M						M			H			

:	Residue theorem involving problems in Science and Engineering																

		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
Duration (hour)		12	12	12	12	12
S-1	SLO-1	Evaluation of double integration Cartesian and plane polar coordinates	Review of vectors in 2,3 dimensions ,	Laplace Transforms of standard functions	Definition of Analytic Function – Cauchy Riemann equations	Cauchy's integral formulae - Problems
	SLO-2	Evaluation of double integration of plane polar coordinates	Gradient, divergence,	Transforms properties	Cauchy Riemann equations	Cauchy's integral formulae- Problems
S-2	SLO-1	Evaluation of double integration of plane polar coordinates	curl – Solenoidal	Transforms of Derivatives and Integrals	Properties of analytic function functions	Cauchy's integral formulae- Problems
	SLO-2	Evaluation of double integration of plane polar coordinates	Irrotational fields	Transform of derivatives and integrals	Determination of analytic function using – Milne-Thomson's method	Taylor's expansions with simple problems
S-3	SLO-1	Evaluation of double integral by changing of order of integration	Vector identities (without proof) – Directional derivatives	Initial value theorems (without proof) and verification for some problems	Determination of analytic function using – Milne-Thomson's method	Taylor's expansions with simple problems
	SLO-2	Evaluation of double integral by changing of order of integration	Line integrals	Final value theorems (without proof) and verification for some problems	Determination of analytic function using – Milne-Thomson's method	Laurent's expansions with simple problems
S-4	SLO-1	Problem solving using tutorial sheet 1	Problem solving using tutorial sheet 4	Problem solving using tutorial sheet 7	Problem solving using tutorial sheet 10	Problem solving using tutorial sheet 13
	SLO-2	Problem solving using tutorial sheet 1	Problem solving using tutorial sheet 4	Problem solving using tutorial sheet 7	Problem solving using tutorial sheet 10	Problem solving using tutorial sheet 13
S-5	SLO-1	Evaluation of double integral by changing of order of integration	Line integrals	Inverse Laplace transforms using partial fractions	Conformal mappings: magnification	Laurent's expansions with simple problems

	SLO-2	Area as a double integral (Cartesian)	Surface integrals	Inverse Laplace transforms sing Partial fractions	Conformal mappings: rotation	Singularities
S-6	SLO-1	Area as a double integral (Cartesian)	Surface integrals	Inverse Laplace transforms section shifting theorem	Conformal mappings: inversion	Types of Poles and Residues
	SLO-2	Area as a double integral (polar)	Volume Integrals	LT using Convolution theorem -problems only	Conformal mappings: inversion	Types of Poles and Residues
S-7	SLO-1	Area as a double integral (polar)	Green's theorem (without proof),	LT using Convolution theorem -problems only	Conformal mappings: reflection	Cauchy's residue theorem (without proof)-
	SLO-2	Triple integration in Cartesian coordinates	Green's theorem (without proof),	ILT using Convolution theorem -problems only	Conformal mappings: reflection	Contour integration: Unit circle·
S-8	SLO-1	Problem solving using tutorial sheet 2	Problem solving using tutorial sheet 5	Problem solving using tutorial sheet 8	Problem solving using tutorial sheet 11	Problem solving using tutorial sheet 14
	SLO-2	Problem solving using tutorial sheet 2	Problem solving using tutorial sheet 5	Problem solving using tutorial sheet 8	Problem solving using tutorial sheet 11	Problem solving using tutorial sheet 14
S-9	SLO-1	Conversion from Cartesian to polar in double integrals	Gauss divergence theorem (without proof), verification	LT of periodic functions -problems only	bilinear transformation	Contour integration: Unit circle·
	SLO-2	Conversion from Cartesian to polar in double integrals	Gauss divergence theorem (without proof) applications to cubes·	LT of periodic functions -problems only	bilinear transformation	Contour integration: Unit circle
S-10	SLO-1	Triple integration in Cartesian coordinates	Gauss divergence theorem (without proof applications to parallelepiped·	Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficient only	bilinear transformation	Contour integration: semicircular contour·
	SLO-2	Triple integration in Cartesian coordinates	Stoke's theorems (without proof) - Verification	Applications of Laplace transforms for solving linear ordinary differential equations up to	bilinear transformation	Contour integration: semicircular contour·

				second order with constant coefficient only		
S-11	SLO-1	Triple integration in Cartesian coordinates	Stoke's theorems (without proof) - Applications to cubes	Solution of Integral equation and integral equation involving convolution type	Cauchy's integral theorem (without proof)	Contour integration: semicircular contour·
	SLO-2	Area of triple Integral	Stoke's theorems (without proof) - Applications to parallelepiped only·	Solution of Integral equation and integral equation involving convolution type	Cauchy's integral theorem applications	Contour integration: semicircular contour·
S-12	SLO-1	Problem solving using tutorial sheet 3	Problem solving using tutorial sheet 6	Problem solving using tutorial sheet 9	Problem solving using tutorial sheet 12	Problem solving using tutorial sheet 15
	SLO-2	Application of Multiple integral in engineering	Application of Line and Volume Integrals in engineering	Application of Laplace Transform in engineering	Application of Bilinear Transformation and Cauchy Integral in engineering	Application Contour integration in engineering

Learning Resources	1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006. 2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010. 3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008 4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010 5. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002 6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008

	Level of Thinking	Continuous Assessment			Final Examination (40%)
		CA - 1 (20%)	CA - 2 (20%)	CA - 3 (20%) #	
Level 1	Remember Understand	40 %	30 %	30 %	30 %
Level 2	Apply Analyze	40 %	40 %	40 %	40 %
Level 3	Evaluate Create	20 %	30 %	30 %	30 %

CA - 3 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf· Paper etc·,

SLO - Session Learning Outcome

Course Designers							
(a) Experts from Industry							
1	Mr.V.Maheswaran	CTS, Chennai	maheswaran@yahoo.com	2			
(b) Experts from Higher Technical Institutions							
3	Dr.K.C.SivaKumar	IIT, Chennai	kcskumar@iitm.ac.in	4	Dr.nanjundan	Bangalore University	nanzandan@gmail.com
(b) Internal Experts							
5	Dr.A.Govindarajan	SRMIST	givindarajan.a@ktr.srmuniv.ac.in	6	Dr.sundarammal kesavan	SRMIST	Sundarammal.k@srmuniv.ac.in

To emerge as a World - Class University in creating and disseminating knowledge, and providing students a unique learning experience in Science, Technology, Medicine, Management and other areas of scholarship that will best serve the world and betterment of mankind.

MOVE UP through international alliances and collaborative initiatives to achieve global excellence.
ACCOMPLISH A PROCESS to advance knowledge in a rigorous academic and research environment.

ATTRACT AND BUILD PEOPLE in a rewarding and inspiring environment by fostering freedom, empowerment, creativity and innovation.