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 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 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: | 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 Residue theorem involving problems in Science and Engineering | 2 | 85 | 80 | | M | M | | | | | | M | | | H | | | |

| | 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 second order with constant coefficient only | bilinear transformation | Contour integration: semicircular contour· |
| S-11 | SLO-1 | Triple integration in Cartesian coordinates | Stoke's theorems (without proof) - Applications to | Solution of Integral equation and integral equation | Cauchy's integral theorem (without proof) | Contour integration: semicircular contour· |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | cubes | involving convolution type | | |
| | 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.<br>2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.<br>3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008<br>4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010<br>5. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002<br>6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008 |

| | Level of Thinking | Continuous Assessment | | | | Final Examination (50%) |
|---|---|---|---|---|---|---|
| | | CLAT - 1 (10%) | CLAT - 2 (15%) | CLAT - 3 (15%) | CLAT - 4 (10%) | |
| Level 1 | Remember<br>Understand | 40 % | 30 % | 30 % | 30 % | 30 % |
| Level 2 | Apply<br>Analyze | 40 % | 40 % | 40 % | 40 % | 40 % |
| Level 3 | Evaluate<br>Create | 20 % | 30 % | 30 % | 30 % | 30 % |

# CLAT - 4 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.sundarammalkesavan | SRMIST | Sundarammal.k@srmuniv.ac.in |

| | |
|---|---|
| Commencement of Cycle Test – I | 07.05.2021<br>(Portions Unit-I) |
| Commencement of Cycle Test – II | 21.06.2021<br>(Portions Unit - II, III) |
| Commencement of Cycle Test – III | 27.07.2021 |
| Last working day | 13.08.2021 |


Dr. N. Parvathi
Professor
Course Coordinator
Email: parvathn@srmist.edu.in
Mobile: 9443004036


1/4/2021


Dr. A. Govindarajan
Professor & Head
Department of Mathematics
Email: hod.maths.ktr@srmist.edu.in
Tel: +91-44-27417000 Ext: 2701


1/4/2021

DEPT. OF MATHEMATICS * SRMIST * SRM Nagar Kattankulathur - 603203 Kancheepuram Dist Tamil Nadu, India

Dr. A. GOVINDARAJAN, M.Sc.,M.Phil.,Ph.D.,
Professor & Head
Department of Mathematics
Faculty of Engineering & Technology
SRM Institute of Science and Technology
SRM Nagar, Kattankulathur - 603 203.
Kancheepuram Dist., Tamil Nadu, India.