|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | 21MAB201T | **Course**  **Name** | Transforms and boundary value problems | **Course Category** | B | Basic Sciences | **L** | **T** | **P** | **C** |
| **3** | **1** | **0** | **4** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Pre-requisite Courses** | 21MAB102T | **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:* |  | Learning |  | **Program Outcomes (PO)** | | | | | | | | | | | | |
| **CLR-1:** | *Analyze partial differential equations, and interpret the solutions related to PDE in engineering problems.* | | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* | *12* |
| **CLR-2:** | *Compute the Fourier series expansion and express the sine and cosine series.* | | *Blooms Level (1-6)* | *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* |
| **CLR-3:** | *Analyze one-dimensional wave and heat equations using PDE and Fourier series concepts.* | |
| **CLR-4:** | *Analyze Fourier transforms and their properties.* | |
| **CLR-5:** | *Analyze Z transform for solving discrete-time Signal problems.* | |
| **CLR-6:** | *Distinguish the importance of PDE, Fourier series, one-dimensional wave, and heat equations, Fourier and Z – transforms.* | |
|  |  | |  |
| **Course Outcomes (CO):** | | *At the end of this course, learners will be able to:* | |
| **CO-1:** | *Construct and solve partial differential equations using various techniques.* | | | *4* | *3* | *3* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |
| **CO-2:** | *Explain the Fourier series expansion of a function in terms of sine and cosine series.* | | | *4* | *3* | *3* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |
| **CO-3:** | *Identify partial differential equations and utilize Fourier series techniques to solve one dimensional wave and heat equations.* | | | *4* | *3* | *3* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |
| **CO-4:** | *Apply Fourier transforms techniques in signal analysis.* | | | *4* | *3* | *3* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |
| **CO-5:** | *Solve discrete-time signal problems using Z transforms.* | | | *4* | *3* | *3* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |
| **CO-6:** | *Utilize PDE, Fourier series, one dimensional wave and heat equations, Fourier and Z transforms to solve engineering problems.* | | | *4* | *3* | *3* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* | *-* |

|  |
| --- |
| **Unit-1: Partial Differential Equations**  Formation of partial differential equations by eliminating arbitrary constants & arbitrary functions- Solutions of standard types of first order partial differential equations – Lagrange’s linear equation – Linear partial differential equations of second and higher order with constant coefficients of homogeneous types. |
| **Unit-2: Fourier Series**  Dirichlet’s conditions – General Fourier series – Odd and even functions - Half range sine and cosine series - Parseval’s identity – Harmonic Analysis. |
| **Unit-3: Applications of Partial differential equations**  Classification of second order partial differential equations - Method of separation of variables – Solutions of one dimensional wave equation - One dimensional equation of heat conduction (Insulated edges excluded) - Steady state condition with zero boundary - Steady state condition with non-zero boundary conditions. |
| **Unit-4: Fourier Transforms**  Fourier transform pair – Properties -Fourier sine and cosine transforms – Properties– Transforms of simple functions - Convolution theorem (without proof) – Parseval’s identity. |
| **Unit-5: Z Transforms**  Z - transforms – Properties of Z transforms – Inverse Z transforms – Convolution theorem (without Proof) – Solution of linear difference equations with constant coefficients using Z-transform |

|  |  |
| --- | --- |
| ***Learning***  ***Resources*** | 1. Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2015. 2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2015. 3. Veerarajan T., Transforms and Partial Differential Equations, Tata McGraw-Hill, New Delhi, 3rd edition,2012. 4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 2010 3rd Edition. 5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, New Delhi, 10th edition,2016. 6. Kandasamy P., etal. Engineering Mathematics, Vol.II & Vol.III (4th revised edition), S. Chand & Co., New Delhi,2000 |

Student learning shall be assessed with a weightage of 60% for internal assessment and 40% for end semester examination.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Bloom’s Level of Thinking | **Continuous Learning Assessment (CLA)**  **- By the Course Faculty** | | | | **By The CoE** | |
| **Formative**  CLA-1 Average of unit test (50%) | | **Life Long Learning** CLA-2 (10%) | | **Summative** Final Examination  (40% weightage) | |
| Theory | Practice | Theory | Practice | Theory | Practice |
| Level 1 | Remember | 20% | - | 20% | - | 20% | - |
| Level 2 | Understand | 20% | - | 20% | - | 20% | - |
| Level 3 | Apply | 30% | - | 30% | - | 30% | - |
| Level 4 | Analyze | 30% | - | 30% | - | 30% | - |
| Level 5 | Evaluate | - | - | - | - | - | - |
| Level 6 | Create | - | - | - | - | - | - |
|  | Total | 100 % | | 100 % | | 100 % | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Course Designers** |  |  |  |  |  |  |
| **a) Experts from Industry** | | **b) Experts from Higher Technical Institutions** | | | **c) Internal Experts** | |
| Mr. Madhan Shanmugasundaram, Infosys Technologies | | Prof. Y.V.S.S. Sanyasiraju, IIT Madras | | | Dr. B.Vennila  hod.maths.ktr@srmist.edu.in | |
|  | | Prof. K.C. Sivakumar, IIT Madars | | | Staff Name  Mail id: | |