



SRI VENKATESWARA COLLEGE OF ENGINEERING  
COURSE DELIVERY PLAN - THEORY

**Department of Applied Mathematics**  
B.Tech : CHEMICAL ENGINEERING Regulation: 2022 LP: MA22351  
Academic Year: 2023-2024 Rev. No.: 00  
Sub. Code / Sub. Name : MA22351 –APPLIED MATHEMATICS-III Date: 04.08.2023  
Unit I : Applications of Differential Equations

**Unit Syllabus:** Applications of Differential Equations of First Order-Geometrical Applications-Orthogonal Trajectories-Physical Applications-Application of Linear Differential Equations-Simple Harmonic Motions-Deflection of Beams-Applications of Simultaneous Linear Differential Equations.

**Objective:** Competent in solving applications of ordinary differential equations using analytical methods to obtain their exact solutions

| Session No *  | Topics to be covered   | Ref                     | Teaching Aids |
|---|--|-------------------------|---------------|
| 1   | Introduction to ODE of first order                           | 1-Ch. 12;<br>Pg.751     | LCD/BB        |
| 2   | Geometrical Applications                                     | 1-Ch. 12;<br>Pg.751     | LCD/BB        |
| 3   | Pblms. based on Geometrical Applications                     | 1-Ch 12;<br>Pg.752-754  | LCD/BB        |
| 4   | Orthogonal Trajectories                                      | 1-Ch. 12;<br>Pg.755     | LCD/BB        |
| 5   | Pblms. based on Orthogonal Trajectories                      | 1-Ch. 12;<br>Pg.755     | LCD/BB        |
| 6   | Physical Applications-Pblms.                                 | 1-Ch 12;<br>Pg.758      | LCD/BB        |
| 7   | Application of Linear Differential Equations                 | 1-Ch. 14;<br>Pg.815     | LCD/BB        |
| 8   | Pblms. based on application of Linear Differential Equations | 1-Ch 14;<br>Pg.815      | LCD/BB        |
| 9   | Simple Harmonic Motions                                      | 1-Ch. 14;<br>Pg.815-820 | LCD/BB        |
| 10  | Deflection of Beams  | 1-Ch 14;<br>Pg.842-843  | LCD/BB        |
| 11  | Applications of Simultaneous Linear Differential Equations.  | 1-Ch 14;<br>Pg.846      | LCD/BB        |
| 12  | Tutorial class   | Worksheet               | LCD/BB        |
| <b>Content beyond syllabus covered (if any):</b><br>Application in system engineering included. |  |                         |               |

\* Session duration: 50 mins

**Sub. Code / Sub. Name: MA22351- APPLIED MATHEMATICS-III****Unit II : Partial Differential Equations****Unit Syllabus:** Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear homogeneous partial differential equations of second and higher order with constant coefficients.**Objective:** To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes

| Session No * | Topics to be covered  | Ref                       | Teaching Aids |
|--------------|---|---------------------------|---------------|
| 13           | Introduction to PDE and Formation of PDE by elimination of arbitrary constants and by elimination of arbitrary functions. | 2 – Ch.17;<br>Pg.577-579  | LCD/BB        |
| 14           | Formation of PDE by elimination of arbitrary functions.   | 2 – Ch.17;<br>Pg.577-579  | LCD/BB        |
| 15           | Tutorial class  | Worksheet                 | LCD/BB        |
| 16           | Various solutions of a general PDE – complete, singular, particular and general integrals                                 | 2 – Ch.17;<br>Pg.579-5584 | LCD/BB        |
| 17           | Solving standard types of PDEs of the form $F(p, q) = 0$ .  | 2 – Ch.17;<br>Pg.584-586  | LCD/BB        |
| 18           | Solving standard types of PDEs of the form $F(z, p, q) = 0$ .   | 2 – Ch.17;<br>Pg.584-586  | LCD/BB        |
| 19           | Solving standard types of PDEs of the form $z = px + qy + f(p, q)$ .  | 2 – Ch.17;<br>Pg.586-587  | LCD/BB        |
| 20           | Solving standard types of PDEs of the form $F(x, p) = F(y, q)$ .  | 3 – Ch.6;<br>Pg.241-244   | LCD/BB        |
| 21           | Equations reducible to standard forms   | Worksheet                 | LCD/BB        |
| 22           | Solving Lagrange's linear equation by Method of multipliers   | 3 – Ch.6;<br>Pg.244-251   | LCD/BB        |
| 23           | Solution of homogeneous linear partial differential equations of second and higher order with constant coefficients.      | 2 – Ch.17;<br>Pg.590-596  | LCD/BB        |
| 24           | More problems on homogeneous linear partial differential equations of second and higher order with constant coefficients. | 2 – Ch.17;<br>Pg.590-596  | LCD/BB        |

**Content beyond syllabus covered (if any): Nil**

**\* Session duration: 50 mins**



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## COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: MA22351 – APPLIED MATHEMATICS-III

Unit III : FOURIER SERIES

**Unit Syllabus:** Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic Analysis.

**Objective:** To introduce Fourier series analysis this is central to many applications in engineering apart from its uses in solving boundary value problems.

| Session No * | Topics to be covered  | Ref  | Teaching Aids |
|--------------|---|--|---------------|
| 25           | Introduction to periodic functions, Bernoulli's formula, Fourier series and Dirichlet's conditions. | 2 – Ch.10;<br>Pg.395-401                           | LCD/BB        |
| 26           | General Fourier series and problems based on that.  | 2 – Ch.10;<br>Pg. 401-408                          | LCD/BB        |
| 27           | Fourier series for functions with arbitrary intervals   | 2 – Ch.10;<br>Pg. 401-408                          | LCD/BB        |
| 28           | Tutorial class  | Worksheet  | LCD/BB        |
| 29           | Introduction to odd and even functions and Fourier series for odd and even functions                | 2 – Ch.10;<br>Pg. 408-412<br>3-Ch.7<br>Pg. 294-298 | LCD/BB        |
| 30           | Half range cosine series and problems.  | 2 – Ch.10;<br>Pg. 412-416                          | LCD/BB        |
| 31           | Half range sine series and problems.  | 2 – Ch.10;<br>Pg. 412-416                          | LCD/BB        |
| 32           | Tutorial class  | Worksheet  | LCD/BB        |
| 33           | RMS value of a function, Derivation of Parseval's Identity  | 2 – Ch.10;<br>Pg. 418- 419                         | LCD/BB        |
| 34           | Problems using Parseval's Identity  | 2 – Ch.10;<br>Pg. 417- 418                         | LCD/BB        |
| 35           | Harmonic analysis for functions with period 2 and arbitrary period                                  | 2 – Ch.10;<br>Pg. 420- 423                         | LCD/BB        |
| 36           | Tutorial class  | 2 – Ch.10;<br>Pg. 424- 425                         | LCD/BB        |

**Content beyond syllabus covered (if any):**

Application to specific area's included (like medical electronics) heat pulse.

**\* Session duration: 50 minutes**



Sub. Code / Sub. Name: **MA22351 – APPLIED MATHEMATICS-III**

**Unit IV : BOUNDARY VALUE PROBLEMS**

**Unit Syllabus:** Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

**Objective:** Acquire the knowledge of using Fourier series techniques in Boundary value problems

| Session No * | Topics to be covered  | Ref                        | Teaching Aids |
|--------------|---|----------------------------|---------------|
| 37           | Introduction and Classification of PDE.   | 2 – Ch.18;<br>Pg. 600      | LCD/BB        |
| 38           | Method of separation of variables.  | 2 – Ch.18;<br>Pg. 600– 601 | LCD/BB        |
| 39           | Solutions of one dimensional wave equation by method of separation of variables                           | 2 – Ch.18;<br>Pg. 602– 603 | LCD/BB        |
| 40           | Problems on wave equation with the given initial and boundary conditions                                  | 2 – Ch.18;<br>Pg. 603– 609 | LCD/BB        |
| 41           | Tutorial class  | Worksheet                  | LCD/BB        |
| 42           | Solution of one-dimensional heat equation by method of separation of variables                            | 2 – Ch.18;<br>Pg. 611      | LCD/BB        |
| 43           | Problems on heat equation with the given initial and boundary conditions                                  | 2 – Ch.18;<br>Pg. 612– 616 | LCD/BB        |
| 44           | Tutorial class  | Worksheet                  | LCD/BB        |
| 45           | Steady state solution of two dimensional equation of heat conduction by method of separation of variables | 2 – Ch.18;<br>Pg. 618– 620 | LCD/BB        |
| 46           | Problems on Laplace equation for a finite plate.  | 2 – Ch.18;<br>Pg. 621– 623 | LCD/BB        |
| 47           | Problems on Laplace equation for a semi - infinite plate.   | 2 – Ch.18;<br>Pg. 620– 621 | LCD/BB        |
| 48           | Tutorial class  | Worksheet                  | LCD/BB        |

**Content beyond syllabus covered (if any):**  
Knowledge of heat transfer in circular plate is included.

\* Session duration: 50 mins

Sub. Code / Sub. Name: **MA22351- APPLIED MATHEMATICS-III**

**Unit V : FOURIER AND Z -TRANSFORMS**

**Unit Syllabus:** Fourier transform pair – Fourier sine and cosine transforms – Properties (without proof) – Convolution theorem – Parseval's identity. Z- Transforms – Elementary properties – Inverse Z - transform (using partial fraction) – Convolution theorem – Solution of difference equations using Z - transform

**Objective:** Achieve an understanding of the basic concepts of the Fourier transform and Z-transform techniques and its application in Engineering.

| Session No * | Topics to be covered   | Ref                                 | Teaching Aids |
|--------------|--|-------------------------------------|---------------|
| 49           | Fourier transforms pair and problems.  | 2 – Ch 22;<br>Pg.769-772            | LCD/BB        |
| 50           | Fourier cosine and sine transform and problems   | 2 – Ch.22,<br>Pg.769&<br>Pg.772-777 | LCD/BB        |
| 51           | Properties of Fourier transforms,  | 3– Ch.8;<br>Pg.4 – 7                | LCD/BB        |
| 52           | Properties of Fourier sine transforms and cosine transforms.                                 | Pg.23 – 24<br>3– Ch.8;<br>Pg.4 – 7  | LCD/BB        |
| 53           | Problems on properties of Fourier transforms, Fourier sine transforms and cosine transforms. | Pg.23 – 24<br>3– Ch.8,<br>Pg.4 – 7  | LCD/BB        |
| 54           | Derivation of Convolution theorem and Parseval's identity for Fourier transforms             | 2 – Ch.22,<br>Pg.777-778            | LCD/BB        |
| 55           | Introduction to Z- transforms and Elementary properties of Z-transforms                      | 2 – Ch.23,<br>Pg.793                | LCD/BB        |
| 56           | Problems based on elementary properties of Z-transforms                                      | 2 – Ch.23;<br>Pg.793-799            | LCD/BB        |
| 57           | Inverse Z – transform using partial fraction   | 2 – Ch.23,<br>Pg.805-806            | LCD/BB        |
| 58           | Inverse Z – transform using Convolution theorem.   | 2 – Ch.23,<br>Pg.802                | LCD/BB        |
| 59           | Formation of difference equations  | 2 – Ch.23,<br>Pg.808                | LCD/BB        |
| 60           | Solution of difference equation using Z-transforms   | 2 – Ch.23,<br>Pg.808-811            | LCD/BB        |

**Content beyond syllabus covered (if any): Applications of transforms.**

\* Session duration: 50 mins



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Sub Code / Sub Name: **MA22351- APPLIED MATHEMATICS-III****TEXT BOOKS:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India, 2011.
2. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi 2012.
3. Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt. Ltd. 1998.

**REFERENCES:**

1. Bali.N.P. and Manish Goyal, "A Textbook of Engineering Mathematics", 8<sup>th</sup> Edition, Laxmi Publications Pvt Ltd, 2007.
2. Glyn James, "Advanced Modern Engineering Mathematics", 4<sup>th</sup> Edition, Pearson Education, 2011.
3. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2012.
4. Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, New Delhi, 2012.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt. Ltd. 7<sup>th</sup> Edition, New Delhi, 2012.

|              | Prepared by                | Approved by             |
|--------------|----------------------------|-------------------------|
| Signature    |                            |                         |
| Name         | Ms. VISALAKSHI SUBRAMANIAN | Dr. R. MUTHUCUMARASWAMY |
| Designation  | Assistant Professor        | Professor and Head      |
| Date         | 04/08/2023                 | 04/08/2023              |
| Remarks *: - |                            |                         |
| Remarks *: - |                            |                         |

\* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD