LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING, (AUTONOMOUS)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
ISO 21001 : 2018, 50001 : 2018, 14001: 2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

**FRESHMAN ENGINEERING DEPARTMENT**

**COURSE HANDOUT**

**Part-A**

**PROGRAM** : II B. Tech., I-Sem., ASE
**ACADEMIC YEAR** : 2024-25
**COURSE NAME & CODE** : NUMERICAL METHODS AND TRANSFORM TECHNIQUES & 23FE09
**L-T-P STRUCTURE** : 3-0-0
**COURSE CREDITS** : 3
**COURSE INSTRUCTOR** : Dr. D. VIJAY KUMAR
**COURSE COORDINATOR** : Dr. K.R. KAVITHA
**PRE-REQUISITES** : Basics of **Differentiation**, Integration.

## COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

**COURSE OUTCOMES (COs)**

After completion of the course, the student will be able to

CO1: Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)

CO2: Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

CO3: Apply the Laplace transform for solving differential equations (L3)

CO4: Find or compute the Fourier series of periodic signals (L3)

CO5: Know and be able to apply integral expressions for the forwards and inverse Fourier Transform to a range of non-periodic waveforms (L3)

**COURSE ARTICULATION MATRIX (Correlation between Cos &POs, PSOs):**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | 2 | - | - | - | - | - | - | - | 1 |
| CO2 | 3 | 2 | - | 2 | - | - | - | - | - | - | - | 1 |
| CO3 | 3 | 2 | - | 2 | - | - | - | - | - | - | - | 1 |
| CO4 | 3 | 2 | - | 2 | - | - | - | - | - | - | - | 1 |
| CO5 | 3 | 2 | - | 2 | - | - | - | - | - | - | - | 1 |

**Note:** Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
**1-** Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

**BOS APPROVED TEXT BOOKS:**

**T1** Dr. B.S. Grewal, "Higher Engineering Mathematics", 44nd Edition, Khanna Publishers, New Delhi, 2017.

**T2** B. V. Ramana, "*Higher Engineering Mathematics*", 2007 Edition , Tata McGraw Hill Education.

**BOS APPROVED REFERENCE BOOKS:**

**R1** Erwin Kreyszig, *"Advanced Engineering Mathematics"*, 10th Edition, John Wiley – India.

**R2** Steven c. chopra, "*Applied numerical methods with MAT lab for engineering and science*", Tata McGraw Hill Education.

**R3** R.K. Jain and S.R.K. Iyengar, "*Numerical methods for Scientificand engineering computation",* New age international publications.

**R4** Lawrence Turyn, "*Advanced engineering mathematics",* CRC press.

**Part-B**

**COURSE DELIVERY PLAN (LESSON PLAN):**

| S. No | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 1. | Introduction to the course | 1 | 15- 07 - 24 | | TLM2 | | | |
| 2. | Course Outcomes, Program Outcomes | 1 | 16 – 07 - 24 | | TLM2 | | | |

**UNIT-I: Iterative Methods**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 3. | Introduction to Unit I | 1 | 18- 07 - 24 | | TLM1 | CO1 | T1,T2 | |
| 4. | Bisection method | 1 | 19- 07 - 24 | | TLM1 | CO1 | T1,T2 | |
| 5. | Secant method | 1 | 22- 07 - 24 | | TLM1 | CO1 | T1,T2 | |
| 6. | False – position method | 1 | 23- 07 - 24 | | TLM1 | CO1 | T1,T2 | |
| 7. | Iteration method | 1 | 25- 07 - 24 | | TLM1 | CO1 | T1,T2 | |
| 8. | Newton – Raphson method | 1 | 26- 07 - 24 | | TLM1 | CO1 | T1,T2 | |
| 9. | Simultaneous equations | 1 | 29- 07 - 24 | | TLM1 | CO1 | T1,T2 | |
| 10. | Newton's forward interpolation | 1 | 30- 07 - 24 | | TLM1 | CO1 | T1,T2 | |
| 11. | Newton's backward interpolation | 1 | 01- 08 - 24 | | TLM1 | CO1 | T1,T2 | |
| 12. | Lagrange's interpolation for unequal parts | 1 | 02- 08 - 24 | | TLM1 | CO1 | T1,T2 | |
| 13. | Tutorial – I | 1 | 05- 08 - 24 | | TLM3 | CO1 | T1,T2 | |
| No. of classes required to complete UNIT-I | | 13 | | | No. of classes taken: | | | |

**UNIT-II: Linear Differential equations of higher order (Constant Coefficients)**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 14. | Introduction to Unit - 2 | 1 | 06- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 15. | Trapezoidal rule | 1 | 08- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 16. | Simpson's 1/3 rule | 1 | 09- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 17. | Simpson's 3/8 rule | 1 | 12- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 18. | Taylor's series method | 1 | 13- 08 - 24 | | TLM1 | CO2 | T1,T2 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 19. | Picard's method | 1 | 16- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 20. | Euler's method | 1 | 19- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 21. | Runge – Kutta method of 2nd order | 1 | 20- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 22. | Runge – Kutta method of 4th order | 1 | 22- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 23. | Runge – Kutta method of 4th order | 1 | 23- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 24. | Milne's predictor and corrector method | 1 | 27- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 25. | Revision | 1 | 29- 08 - 24 | | TLM1 | CO2 | T1,T2 | |
| 26. | Tutorial – II | 1 | 30- 08 - 24 | | TLM3 | CO2 | T1,T2 | |
| No. of classes required to complete UNIT-II | | 13 | | | No. of classes taken: | | | |

**I MID EXAMINATIONS (02-09-2024 TO 07-09-2024)**

**UNIT-III: LAPLACE TRANSFORMS**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 27. | Introduction to Unit - III | 1 | 09- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 28. | Laplace transform of standard functions | 1 | 10- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 29. | Properties | 1 | 12- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 30. | Shifting theorems | 1 | 13- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 31. | Transforms of derivatives & integrals | 1 | 17- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 32. | Unit step function & Dirac's delta function | 1 | 19- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 33. | Inverse Laplace by partial fractions | 1 | 20- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 34. | Inverse Laplace by Convolution theorem | 1 | 23- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 35. | Applications to ODE | 1 | 24- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 36. | Applications to ODE | 1 | 26- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 37. | Integral equations | 1 | 27- 09 - 24 | | TLM1 | CO3 | T1,T2 | |
| 38. | Tutorial - III | 1 | 30- 09 - 24 | | TLM3 | CO3 | T1,T2 | |
| No. of classes required to complete UNIT-III | | 11 | | | No. of classes taken: | | | |

**UNIT-IV: FOURIER SERIES**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 39. | Introduction to Unit - IV | 1 | 24-04-2024 | | TLM1 | CO4 | T1,T2 | |
| 40. | Fourier series of periodic functions | 1 | 01-10-2024 | | TLM1 | CO4 | T1,T2 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 41. | Dirichlet's conditions | 1 | 03-10-2024 | | TLM1 | CO4 | T1,T2 | |
| 42. | Problems on Fourier series | 1 | 04-10-2024 | | TLM1 | CO4 | T1,T2 | |
| 43. | Even and odd functions | 1 | 07-10-2024 | | TLM1 | CO4 | T1,T2 | |
| 44. | Even and odd functions | 1 | 09-10-2024 | | TLM1 | CO4 | T1,T2 | |
| 45. | Change of intervals | 1 | 10-10-2024 | | TLM1 | CO4 | T1,T2 | |
| 46. | Change of intervals | 1 | 14-10-2024 | | TLM1 | CO4 | T1,T2 | |
| 47. | Half range sine & cosine series | 1 | 15-10-2024 | | TLM1 | CO4 | T1,T2 | |
| 48. | Half range sine & cosine series | 1 | 17-10-2024 | | TLM1 | CO4 | T1,T2 | |
| 49. | Tutorial - IV | 1 | 18-10-2024 | | TLM3 | CO4 | T1,T2 | |
| No. of classes required to complete UNIT-IV | | 11 | | | No. of classes taken: | | | |

**UNIT-V: Fourier transforms**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 50 | Introduction to Unit -V | 1 | 21-10-2024 | | TLM1 | CO5 | T1,T2 | |
| 51 | Fourier integrals | 1 | 22-10-2024 | | TLM1 | CO5 | T1,T2 | |
| 52 | Fourier sine & cosine integrals | 1 | 24-10-2024 | | TLM1 | CO5 | T1,T2 | |
| 53 | Infinite Fourier transforms | 1 | 25-10-2024 | | TLM1 | CO5 | T1,T2 | |
| 54 | Infinite Fourier transforms | 1 | 28-10-2024 | | TLM1 | CO5 | T1,T2 | |
| 55 | Infinite Fourier cosine & sine transforms | 1 | 29-10-2024 | | TLM1 | CO5 | T1,T2 | |
| 56 | Infinite Fourier cosine & sine transforms | 1 | 01-11-2024 | | TLM1 | CO5 | T1,T2 | |
| 57 | Convolution theorem | 1 | 04-11-2024 | | TLM1 | CO5 | T1,T2 | |
| 58 | Finite Fourier transforms | 1 | 05-11-2024 | | TLM1 | CO5 | T1,T2 | |
| 59 | Finite Fourier transforms | 1 | 07-11-2024 | | TLM1 | CO5 | T1,T2 | |
| 60 | Tutorial - V | 1 | 08-11-2024 | | TLM3 | CO5 | T1,T2 | |
| No. of classes required to complete UNIT-V | | 11 | | | No. of classes taken: | | | |

**Content beyond the Syllabus**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 61 | To find current using Laplace in simple electrical circuits | 1 | 07-11-2024 | | TLM2 | CO3 | T1,T2 | |
| No. of classes | | 1 | | | No. of classes taken: | | | |

**II MID EXAMINATIONS (03-06-2024 TO 08-06-2024)**

| **Teaching Learning Methods** | | | |
|---|---|---|---|
| **TLM1** | Chalk and Talk | **TLM4** | Demonstration (Lab/Field Visit) |

| | | | |
|---|---|---|---|
| **TLM2** | PPT | **TLM5** | ICT (NPTEL/SwayamPrabha/MOOCS) |
| **TLM3** | Tutorial | **TLM6** | Group Discussion/Project |

## PART-CEVALUATION PROCESS (R23 Regulation):

| **Evaluation Task** | **Marks** |
|---|---|
| Assignment-I (Units-I, II) | A1=5 |
| I-Descriptive Examination (Units-I, II) | M1=15 |
| I-Quiz Examination (Units-I, II) | Q1=10 |
| Assignment-II (Unit-III, IV & V) | A2=5 |
| II- Descriptive Examination (UNIT-III, IV & V) | M2=15 |
| II-Quiz Examination (UNIT-III, IV & V) | Q2=10 |
| Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2)) | M=30 |
| Cumulative Internal Examination (CIE): | 30 |
| Semester End Examination (SEE) | 70 |
| Total Marks = CIE + SEE | 100 |

## PART-D PROGRAMME OUTCOMES (POs):

| | |
|---|---|
| **PO 1** | **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems. |
| **PO 2** | **Problem analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| **PO 3** | **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations. |
| **PO 4** | **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions. |
| **PO 5** | **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations |
| **PO 6** | **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice |
| **PO 7** | **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development. |
| **PO 8** | **Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **PO 9** | **Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings. |
| **PO 10** | **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions. |
| **PO 11** | **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| **PO 12** | **Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

| | | | |
|---|---|---|---|
| **Dr. D. VIJAY KUMAR** | Dr. K.R. KAVITHA | **Dr. A. RAMI REDDY** | **Dr. A. RAMI REDDY** |
| Course Instructor | Course Coordinator | Module Coordinator | HOD |

# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

**(AUTONOMOUS)**
**Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution**
**Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada**
**L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.**
Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF AEROSPACE ENGINEERING


## COURSE HANDOUT

## PART-A

**Name of Course Instructor**: K. LAKSHMI PRASAD
**Course Name** : UHV- II: Understanding Harmony and Ethical Human Conduct
**Course Code** : (23HS01) **Credits:** 3 **L-T-P Structure:** 3-0-0
**Program/Sem/Sec** : B.Tech III Semester – ASE Section-A **A.Y.:** 2024-25

**PREREQUISITE: Nil**

**COURSE EDUCATIONAL OBJECTIVES (CEOs)**: To become more aware of themselves and their surroundings (family, society, nature); they would become more responsible in life and in handling problems with sustainable solutions while keeping human relationships and human nature in mind.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

- **CO1:** Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)
- **CO2:** Identify one's self, and one's surroundings (family, society nature) (L2)
- **CO3:** Relate human values with human relationship and human society. (L2)
- **CO4:** Illustrate the need for universal human values and harmonious existence (L2)
- **CO5:** Develop as socially and ecologically responsible engineers (L3)

**COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs):

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | | 1 | | | 2 | 2 | 2 | 2 | | | 2 | | | |
| CO2 | 1 | | 1 | | | 2 | 2 | 2 | 2 | | | 2 | | | |
| CO3 | 1 | | 1 | | | 3 | 3 | 3 | 3 | | | 3 | | | |
| CO4 | 1 | | 1 | | | 3 | 3 | 3 | 3 | | | 3 | | | |
| CO5 | 1 | | 1 | | | 3 | 3 | 3 | 3 | | | 3 | | | |

**TEXTBOOKS:**

**T1** R R Gaur, r singal, G P Bagaria, "Human values and Professional Ethics", Excel Books, New Delhi,2010

**REFERENCE BOOKS:**

**R1** Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999
**R2** Human values, A N Tripathi, New Age Publishers, New Delhi, 2004
**R3** The story of my experiments with Truth, Mohandas Karamchand Gandhi

# PART-B

**COURSE DELIVERY PLAN (LESSON PLAN):**

**UNIT-I: Introduction to Value Education**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 1. | Introduction, Cos | 1 | 15.07.24 | | TLM2 | |
| 2. | Process for self exploration: Natural Acceptance | 1 | 16.07.24 | | TLM.2 | |
| 3. | Right Understanding, Relationship and Physical Facility | 2 | 18.07.24<br>22.07.24 | | TLM2 | |
| 4. | Understanding Value Education | 1 | 23.07.24 | | TLM2 | |
| 5. | self-exploration as the Process for Value Education | 1 | 24.07.24 | | TLM2 | |
| 6. | Continuous Happiness and Prosperity | 2 | 25.07.24<br>29.07.24 | | TLM2 | |
| 7. | Happiness and Prosperity | 1 | 30.07.24 | | TLM2 | |
| 8. | Method to Fulfill the Basic Human Aspirations | 1 | 31.07.24 | | TLM2 | |
| 9. | Tutorial | 1 | 01.08.24 | | TLM2 | |
| **No. of classes required to complete UNIT-I: 11** | | | | **No. of classes taken:** | | |

**UNIT-II: Harmony in the Human Being**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 10. | Understanding Human being as the Co-existence of the self and the body | 1 | 05.08.24 | | TLM2 | |
| 11. | Distinguishing between the Needs of the self and the body | 2 | 06.08.24<br>07.08.24 | | TLM2 | |
| 12. | The body as an Instrument of the self | 1 | 08.08.24 | | TLM2 | |
| 13. | Understanding Harmony in the self | 2 | 12.08.24<br>13.08.24 | | TLM2 | |
| 14. | Harmony of the self with the body | 1 | 14.08.24 | | TLM2 | |
| 15. | Programme to ensure self-regulation and Health | 1 | 19.08.24 | | TLM2 | |
| 16. | Tutorial - 1 | 1 | 20.08.24 | | TLM2 | |
| 17. | Tutorial -2 | 1 | 21.08.24 | | TLM1 | |
| **No. of classes required to complete UNIT-II: 10** | | | | **No. of classes taken:** | | |

**UNIT III: Harmony in the Family and Society**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 18. | Harmony in the Family | 2 | 26.08.24<br>27.08.24 | | TLM2 | |
| 19. | 'Trust' – the Foundational Value in Relationship | 1 | 28.08.24 | | TLM2 | |
| 20. | Practice Session PS7 Exploring the Feeling of Trust | 1 | 29.08.24 | | TLM2 | |
| 21. | 'Respect' – as the Right Evaluation | 1 | 09.09.24 | | TLM1 | |
| 22. | Practice Session PS8 Exploring the Feeling of Respect | 2 | 10.09.24<br>11.09.24 | | TLM2 | |
| 23. | Other Feelings, Justice in Human-to-Human Relationship | 1 | 12.09.24 | | TLM2 | |
| 24. | Understanding Harmony in the Society | 2 | 17.09.24<br>18.09.24 | | TLM2 | |
| 25. | Vision for the Universal Human Order | 1 | 19.09.24 | | TLM2 | |
| **No. of classes required to complete UNIT-III: 11** | | | | **No. of classes taken:** | | |

**UNIT-IV: Harmony in the Nature/Existence**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 26. | Understanding Harmony in the Nature | 2 | 23.09.24<br>24.09.24 | | TLM2 | |
| 27. | Interconnectedness, self-regulation | 1 | 25.09.24 | | TLM2 | |
| 28. | Mutual Fulfilment among the Four Orders of Nature | 1 | 26.09.24 | | TLM2 | |
| 29. | Realizing Existence as Co-existence at All Levels | 2 | 30.09.24<br>01.10.24 | | TLM2 | |
| 30. | The Holistic Perception of Harmony in Existence | 2 | 03.10.24<br>07.10.24 | | TLM2 | |
| 31. | Tutorial -1 | 2 | 08.10.24<br>14.10.24 | | TLM2 | |
| **No. of classes required to complete UNIT-IV: 10** | | | | **No. of classes taken:** | | |

**UNIT-V: Implications of the Holistic Understanding**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 32. | Natural acceptance of human values | 1 | 15.10.24 | | TLM2 | |
| 33. | Definitiveness of ethical human conduct | 1 | 16.10.24 | | TLM2 | |
| 34. | Basis for humanistic education | 1 | 17.10.24 | | TLM2 | |
| 35. | A Basis for Humanistic Education, Humanistic Constitution and Universal Human | 2 | 21.10.24<br>22.10.24 | | TLM2 | |
| 36. | Competence in professional ethics | 1 | 23.10.24 | | TLM2 | |
| 37. | Strategy for transition from the present state to universal human order | 1 | 24.10.24 | | TLM2 | |
| 38. | Holistic Technologies, Production Systems and Management Models-Typical Case | 1 | 28.10.24 | | TLM2 | |
| No. of classes required to complete UNIT-V: 8 | | | | No. of classes taken: | | |

| **Teaching Learning Methods** | | | |
|---|---|---|---|
| **TLM1** | Chalk and Talk | **TLM4** | Demonstration (Lab/Field Visit) |
| **TLM2** | PPT | **TLM5** | ICT (NPTEL/Swayam Prabha/MOOCS) |
| **TLM3** | Tutorial | **TLM6** | Group Discussion/Project |

**ACADEMIC CALENDAR**:

| Description | From | To | Weeks |
|---|---|---|---|
| **Commencement of Class Work: 15.07.2024** | | | |
| **I Phase of Instructions** | 15.07.2024 | 31.08.2024 | 7 |
| **I Mid Examinations** | 02.09.2024 | 07.09.2024 | 1 |
| **II Phase of Instructions** | 09.09.2024 | 09.11.2024 | 9 |
| **II Mid Examinations** | 11.11.2024 | 16.11.2024 | 1 |
| **Preparation and Practical** | 18.11.2024 | 23.11.2024 | 1 |
| **Semester End Examinations** | 25.11.2024 | 07.12.2024 | 2 |

## PART-C

**EVALUATION PROCESS (R17 Regulation):**

| **Evaluation Task** | **Marks** |
|---|---|
| Assignment-I (Units-I & II) | A1=5 |
| I-Descriptive Examination (Units-I & II) | M1=15 |
| I-Quiz Examination (Units-I & II) | Q1=10 |
| Assignment-II (Unit-III, IV & V) | A2=5 |
| II- Descriptive Examination (UNIT-III, IV & V) | M2=15 |
| II-Quiz Examination (UNIT-III, IV & V) | Q2=10 |
| Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2)) | M=30 |
| Cumulative Internal Examination (CIE): M | 30 |
| Semester End Examination (SEE) | 70 |
| Total Marks = CIE + SEE | 100 |

# PART-D

## PROGRAMME OUTCOMES (POs):

| | |
|---|---|
| **PO 1** | **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| **PO 2** | **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| **PO 3** | **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| **PO 4** | **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |
| **PO 5** | **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations |
| **PO 6** | **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice |
| **PO 7** | **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. |
| **PO 8** | **Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **PO 9** | **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| **PO 10** | **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. |
| **PO 11** | **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| **PO 12** | **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

## PROGRAMME SPECIFIC OUTCOMES (PSOs):

| | |
|---|---|
| **PSO 1** | To apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design. |
| **PSO 2** | To prepare the students to work effectively in Aerospace and Allied Engineering organizations. |

| Title | Course Instructor | Course Coordinator | Module Coordinator | Head of the Department |
|---|---|---|---|---|
| **Name of the Faculty** | **K. LAKSHMI PRASAD** | **Dr. B. SRINIVASA RAO** | **Dr. B. SRINIVASA RAO** | **Dr. M. B. S. SREEKARA REDDY** |
| **Signature** | | | | |

# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

**(AUTONOMOUS)**
**Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution**
**Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada**
**L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.**
Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF AEROSPACE ENGINERRING


## COURSE HANDOUT

## PART-A

**Name of Course Instructor:** Ashutosh Shukla
**Course Name & Code** **:** Introduction to aerospace engineering & 23AE01
**L-T-P Structure** **:2-0-0** **Credits:** 2
**Program/Sem/Sec** : B.Tech./ IV-Sem **A.Y.:** 2024-25

**PREREQUISITE:** **Engineering Mechanics**

**COURSE EDUCATIONAL OBJECTIVES (CEOs)**:

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

| | |
|---|---|
| **CO1** | Describle fuctions of various external and internal component of an airplane (L2) |
| **CO2** | Classify the various forces and moments acting on an airfoil, (L2) |
| **CO3** | Differentiatethe working principles of various aircraft engines systems. (L2) |
| **CO4** | Formulate the basic aspects of space flight. (L3) |

**COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs):

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | | | | | | | | | 2 | 3 | 3 |
| CO2 | 3 | 3 | | | | | | | | | | 2 | 3 | 3 |
| CO3 | 3 | 3 | | | | | | | | | | 2 | 3 | 3 |
| CO4 | 3 | 3 | | | | | | | | | | 2 | 3 | 3 |
| CO5 | 3 | 3 | | | | | | | | | | 2 | 3 | 3 |
| **1 -** Low **2 –**Medium **3 -** High | | | | | | | | | | | | | | |

**TEXTBOOKS:**


**T1** Anderson,J.D Marry L Bowden S.,Introduction to flight, Ninth Edition, McGraw- Hill Education, 2021


## REFERENCE BOOKS:


**R1** Houghon. E. L Carpenter P.W., Aerodynamics for Engineering students, Sevnth Edition Butterworth-Heinemann,2017

**R2** E. Rathakrishnan.,Introduction to Aerospace Engineering (Basic principle of flight) Wiley, First Edition,2021

**R3** Kermode, A.C, Mechanics of flight,eleventh Edition,Pearson Education, 2007

# PART-B

## COURSE DELIVERY PLAN (LESSON PLAN):

### UNIT-I: Basic Aspects

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 1 | History-Early Planes | 1 | 15-07-2024 | | TLM1 | |
| 2. | Components of airplane and their Functions, types | 1 | 20-07-2024 | | TLM1 | |
| 3. | Types of Flight vehicles | 1 | 22-07-2024 | | TLM1 | |
| 4. | Standard Atmosphere | 1 | 24-07-2024 | | TLM1 | |
| 5. | Hydrostatic Equation, | 1 | 29-07-2024 | | TLM1 | |
| 6. | Geopotential and geometric altitude | 1 | 31-07-2024 | | TLM1 | |
| 7. | Tutorial-1 | 1 | 03-08-2024 | | TLM | |
| **No. of classes required to complete UNIT-I: 7** | | | | **No. of classes taken:** | | |

### UNIT-II: Basic Aerodynamics

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 8. | Airfoils (nomenclature) | 1 | 05-08-2024 | | TLM1 | |
| 9. | NACA Airfoils | 1 | 07-08-2024 | | TLM1 | |
| 10. | Geometry, Aerodynamic Forces | 1 | 10-08-2024 | | TLM1 | |
| 11. | Lift, Drag and Moment Coefficients, Co-Efficient of Pressure, | 1 | 12-08-2024 | | TLM1 | |
| 12. | Centre of Pressure, Aerodynamics Centre, Pressure Distribution Over Aerofoil | 1 | 14-08-2024 | | TLM1 | |
| 13. | Types of Drag | 1 | 17-08-2024 | | TLM3 | |
| 14. | Tutorial-2 | 1 | 19-08-2024 | | TLM3 | |
| **No. of classes required to complete UNIT-II: 7** | | | | **No. of classes taken:** | | |

### UNIT-III: Propulsion

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 15. | Propeller | 1 | 21-08-2024 | | TLM1 | |
| 16. | Reciprocating Engine, Jet Propulsion | 1 | 24-08-2024 | | TLM1 | |
| 17. | The Thrust Equation, Elements of Turbojet Engine | 2 | 28-08-2024<br>31-08-2024 | | TLM1 | |
| 18. | Turbofan Engine-Rocket Engine | 1 | 9-09-2024 | | TLM1 | |
| 19. | Rocket Propellants- Liquid Propellants, Solid Propellants | 2 | 11-09-2024<br>14-09-2024 | | TLM3 | |
| 20. | Rocket Staging | 1 | 18-09-2024 | | TLM1 | |
| 21. | Tutorial-3 | 1 | 21-09-2024 | | | |
| **No. of classes required to complete UNIT-III: 9** | | | | **No. of classes taken:** | | |

**UNIT-IV: Flight Vehicle structures**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 22. | Fuselage-Monocoque, Semi-Monocoque | 1 | 23-09-2024 | | TLM1 | |
| 23. | Components of Wing-Spars, Ribs, Longerons | 2 | 25-09-2024 | | TLM1 | |
| 24. | Stringers, Bulkheads | 1 | 28-09-2024 | | TLM1 | |
| 25. | Aircraft Materials-Metallic and Non-Metallic Materials | 2 | 30-09-2024<br>05-10-2024 | | TLM1 | |
| 26. | Use of Aluminium Alloy, Titanium, | 2 | 07-10-2024<br>09-10-2024 | | TLM1 | |
| 27. | Stainless Steel and Composite Materials. | 1 | 14-10-2024 | | TLM1 | |
| 28. | Tutorial-4 | 1 | 16-10-2024 | | | |
| **No. of classes required to complete UNIT-IV: 10** | | | | **No. of classes taken:** | | |

**UNIT-V: Space Flight**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 29. | Orbit Equation, Basic Aspects of Space Vehicle Trajectories | 1 | 19-10-2024 | | TLM1 | |
| 30. | Kepler's Laws, Earth and Planetary Entry, | 2 | 21-10-2024<br>23-10-2024 | | TLM1 | |
| 31. | Space Explorations- Space Vehicles and Its Types | 2 | 26-10-2024<br>28-10-2024 | | TLM1 | |
| 32. | Reusable Space Vehicles, Space Shuttle, | 1 | 30-10-2024 | | TLM1 | |
| 33. | Satellites | 1 | 2-11-2024 | | TLM1 | |
| 34. | Types of Satellites and Their Functions | 1 | 04-11-2024 | | TLM1 | |
| 35. | Tutorial-5 | 1 | 06-11-2024 | | | |
| **No. of classes required to complete UNIT-V: 9** | | | | **No. of classes taken:** | | |

| **Teaching Learning Methods** | | | |
|---|---|---|---|
| **TLM1** | Chalk and Talk | **TLM4** | Demonstration (Lab/Field Visit) |
| **TLM2** | PPT | **TLM5** | ICT (NPTEL/Swayam Prabha /MOOCS) |
| **TLM3** | Tutorial | **TLM6** | Group Discussion/Project |

## PART-C

**EVALUATION PROCESS (R17 Regulation):**

| Evaluation Task | Marks |
|---|---|
| Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus)) | A1=5 |
| I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus)) | M1=15 |
| I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus)) | Q1=10 |
| Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V) | A2=5 |
| II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V) | M2=15 |
| II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V) | Q2=10 |
| Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2)) | M=30 |
| Cumulative Internal Examination (CIE): M | 30 |
| Semester End Examination (SEE) | 70 |
| Total Marks = CIE + SEE | 100 |

# PART-D

**PROGRAMME OUTCOMES (POs):**

| | |
|---|---|
| **PO 1** | **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| **PO 2** | **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| **PO 3** | **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| **PO 4** | **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |
| **PO 5** | **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations |
| **PO 6** | **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice |
| **PO 7** | **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. |
| **PO 8** | **Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **PO 9** | **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| **PO 10** | **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. |
| **PO 11** | **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| **PO 12** | **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

| | |
|---|---|
| **PSO 1** | To apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design |
| **PSO 2** | To prepare the students to work effectively in Aerospace and Allied Engineering organizations |

| | | |
|---|---|---|
| | | |
| Course Instructor | Module Coordinator | HOD |
| (Ashutosh shukla) | | (Dr.P.Lovaraju) |

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
L.B.Reddy Nagar, Mylavaram – 521 230, N.T.R. District, Andhra Pradesh, India
Affiliated to JNTUK, Kakinada & Approved by AICTE New Delhi
Accredited by NBA under Tier - I, Accredited by NAAC
An ISO 21001:2018, 500001:2018, 14001:2015 Certified Institution
DEPARTMENT OF AEROSPACE ENGINEERING
Estd.: 1998 Website: https://www.lbrce.ac.in/ase/index.php Email: hodaero@lbrce.ac.in Phone:08659-222933 Ext:624/623

# COURSE HANDOUT

## PART-A

**PROGRAM** : B.Tech., III-Sem., ASE

**ACADEMIC YEAR** : 2024-25

**COURSE NAME & CODE : Engineering Fluid Mechanics-23AE02**

**L-T-P STRUCTURE** : 3-0-0

**COURSE CREDITS** : 3

**COURSE INSTRUCTOR** : **Dr. P. Lovaraju**

**Course Objectives:**

- To demonstrate the properties of fluids and behavior of fluids under static conditions.
- To teach differential relations for fluid flows, features of flow though pipes.
- To understand the working of Hydraulic turbines and Hydraulic pumps.

**Course Outcomes:**

| COs | Statements | Blooms Level |
|---|---|---|
| CO1 | Apply fluid static principles on objects submerged in fluids | L3 |
| CO2 | Apply the conservation laws to solve elementary fluid flow problems | L3 |
| CO3 | Apply the fluid flow principles to simple pipe network for fluid transportation | L3 |
| CO4 | Determine the performance of various hydraulic turbines and pumps | L3 |

**COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):**

| Course Code | Cos | Program Outcomes | | | | | | | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 23AE02 | CO1 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| | CO2 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO3 | **3** | **3** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **2** | **3** | **3** |
| | CO4 | **3** | **2** | **3** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **2** | **2** | **2** |
| **1 = Slight (Low)** **2 = Moderate (Medium)** **3-Substantial(High)** | | | | | | | | | | | | | | | |

**Note:** Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-' 1-** Slight(Low), **2 -** Moderate(Medium), **3 -** Substantial (High).

**TEXT BOOK**

1. Rathakrishnan. E, Fluid Mechanics an Introduction, Fourth Edition, Prentice Hall of India, 2021.
2. Balachandran P, Engineering Fluid Mechanics, Prentice Hall of India, 2012.

**REFERENCES**


1. White. F.M, Fluid Mechanics, Seventh Edition, McGraw-Hill Education 2011
2. Fox. R.W, Mcdonald, A.J, Introduction of Fluid Mechanics, Fifth Edition, John Wiely, 1999.
3. Douglas. J.F, Gesiorek. J.M., Swaffield. J, A., Fluid Mechanics, Fourth Edition, Pearson Education, 2002.
4. Shames. I.H, Mechanics of Fluids, Third Edition, McGraw-Hill, 1992.


**PART-B**

**COURSE DELIVERY PLAN (LESSON PLAN):**

**UNIT-I: Introduction and Fluid Statics**

| S.No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 1. | Introduction and Overview of the course, Dissemination of course outcomes, General description of Fluid Mechanics, Applications of Fluid Mechanics, Classification of Fluids, Fluids and Continuum | 2 | 15-07-2024<br>16-07-2024 | | TLM1 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. | Properties of Fluid – Pressure, Temperature, Density, Specific Weight, Specific Gravity, Viscosity-Newton's Law of Viscosity | 2 | 20-7-2024<br>22-07-2024 | | TLM1 | |
| 3. | Compressibility, Surface Tension, Capillarity, Vapor Pressure | 1 | 23-07-2024 | | TLM1 | |
| 4. | Fluid Statics: Pressure Acting at a Point in a Static Fluid-Pascal's Law | 1 | 24-07-2024 | | TLM1 | |
| 5. | Basic Equation of Fluid Statics, Hydrostatic Pressure Distributions | 1 | 27-07-2024 | | TLM1 | |
| 6. | Manometers | 2 | 29-07-2024<br>30-07-2024 | | TLM1 | |
| 7. | Hydrostatic Pressure Distributions in gases (earth's atmosphere) | 1 | 31-07-2024 | | TLM1 | |
| 8. | Hydrostatic forces on submerged plane surface (derivation) | 1 | 3-08-2024 | | TLM1 | |
| 9. | Buoyancy and Stability | 1 | 5-08-2024 | | TLM1 | |
| 10. | Tutorial | 1 | 6-08-2024 | | TLM3 | |
| 11. | Assignment/Quiz-1 | | | | --- | |
| **No. of classes required to complete UNIT-I** | | **13** | | **No. of classes taken:** | | |

**UNIT-II: Analysis of Fluid Flow and Differential Relations for Fluid Flow**

| **S.No.** | **Topics to be covered** | **No. of Classes Required** | **Tentative Date of Completion** | **Actual Date of Completion** | **Teaching Learning Methods** | **HOD Sign Weekly** |
|---|---|---|---|---|---|---|
| 12. | Lagrangian and Eulerian approaches, | 2 | 7-08-2024 | | TLM1, TLM2 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Flow Patterns- Pathline, Streamline, Streakline, Timeline, Stream Tube | | 12-08-2024 | | | |
| 13. | Differential Relations of Fluid Flow: Velocity Field, Acceleration Field of a Fluid | 2 | 13-08-2024<br>14-08-2024 | | TLM1,TLM2 | |
| 14. | Differential Equation of Mass Conservation | 1 | 17-08-2024 | | TLM1,TLM2 | |
| 15. | Stream Function, Velocity Potential Vorticity, Rotationality, Irrotationality | 1 | 19-08-2024 | | TLM1 | |
| 16. | Differential Equation of Linear Momentum, Euler's Equations | 1 | 20-08-2024 | | TLM1, TLM2 | |
| 17. | Potential Flow<br>Bernoulli's Equation and its Applications, Orifice Tank | 2 | 21-08-2024<br>24-08-2024 | | TLM1 | |
| 18. | Venturi meter, Pitot-static Tube, Nozzle, Water Siphon and various other applications | 2 | 27-08-2024<br>28-08-2024 | | | |
| 19. | Tutorial | 1 | 31-08-2024 | | TLM3 | |
| 20. | Assignment/Quiz-2 | | | | ---- | |
| **No. of classes required to complete UNIT-II** | | **12** | | **No. of classes taken:** | | |

**I Mid Examination (02-09-2024 to 07-09-2024)**

**UNIT-III: Flow through Pipes, Dimensional Analysis & Similarity**

| **S.No.** | **Topics to be covered** | **No. of Classes** | **Tentative Date of** | **Actual Date of** | **Teaching Learning** | **HOD Sign** |
|---|---|---|---|---|---|---|

| | | Required | Completion | Completion | Methods | Weekly |
|---|---|---|---|---|---|---|
| 21. | Flow Through Pipes: Reynolds Experiment, Reynolds number | 1 | 09-09-2024 | | TLM1,TLM4 | |
| 22. | Head loss, Darcy-Wiesbach equation, Hydraulic Gradient &Total Energy Lines | 2 | 10-09-2024<br>11-09-2024 | | TLM1, TLM2 | |
| 23. | Laminar Fully Developed Pipe Flow-Hagen Poiseuille Law | 2 | 17-09-2024<br>18-09-2024 | | TLM1 | |
| 24. | Pipes in Series, Pipes in Parallel | 2 | 21-09-2024<br>23-09-2024 | | TLM1, TLM2 | |
| 25. | Equivalent Pipe, Hydraulic Diameter, Minor Losses, Moody Chart and its usage | 1 | 24-09-2024 | | TLM1 | |
| 26. | Introduction, Principle of Dimensional Homogeneity, | 1 | 25-09-2024 | | TLM1 | |
| 27. | Buckingham's Pi Theorem | 1 | 28-09-2024 | | TLM1 | |
| 28. | Dimensionless Groups, Similarity | 1 | 30-09-2024 | | TLM1 | |
| 29. | Tutorial | 1 | 1-10-2024 | | TLM3 | |
| 30. | Assignment/Quiz-3 | | | | | |
| **No. of classes required to complete UNIT-III** | | **12** | | **No. of classes taken:** | | |

**UNIT-IV: Hydraulic Turbines**

| S.No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 31. | Introduction, Classification of turbines- Hydro-electric power plants | 1 | 5-10-2024 | | TLM1 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | impulse and reaction turbines, | | | | | |
| 32. | Pelton Turbine working principle | 1 | 7-10-2024 | | TLM1,TLM5 | |
| 33. | Velocity triangles, Work done, Efficiency, | 1 | 8-10-2024 | | TLM1 | |
| 34. | Francis Turbine, working principle, | 1 | 9-10-2024 | | TLM1 | |
| 35. | Velocity triangles, Work done and Efficiency | 1 | 14-10-2024 | | | |
| 36. | Kaplan Turbine, working principle, Velocity triangles, Work done and Efficiency | 1 | 15-10-2024 | | TLM1 | |
| 37. | Draft Tube and its theory, surge tank | 1 | 16-10-2024 | | TLM1 | |
| 38. | Unit and specific quantities | 1 | 19-10-2024 | | TLM1 | |
| 39. | Tutorial | 1 | 21-10-2024 | | TLM3 | |
| 40. | Assignment/Quiz-4 | | | | | |
| **No. of classes required to complete UNIT-IV** | | 9 | | **No. of classes taken:** | | |

**UNIT-V: Centrifugal Pumps and Reciprocating Pumps**

| S.No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 41. | Centrifugal Pumps: Classification, Working | 1 | 22-10-2024 | | TLM1,TLM5 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Principle, Constructional Details | | | | | |
| 42. | Velocity Triangles, Work done, Head and Efficiencies | 2 | 23-10-2024<br>26-10-2024 | | TLM1 | |
| 43. | Losses, Specific Speed, Pumps in Series and Parallel | 2 | 28-10-2024<br>29-10-2024 | | TLM1,TLM5 | |
| 44. | Reciprocating Pumps: Classification, Working Principle | 1 | 30-10-2024 | | TLM1 | |
| 45. | Co-efficient of Discharge and Slip, Indicator Diagram | 2 | 4-11-2024<br>5-11-2024 | | TLM1 | |
| 46. | Tutorial -5 | 1 | 6-11-2024 | | TLM3 | |
| 47. | Assignment/Quiz-5 | | | | | |
| 48. | Revision | | | | TLM2 | |
| **No. of classes required to complete**<br>**UNIT-V** | | **9** | | **No. of classes taken:** | | |

| **Teaching Learning Methods** | | | |
|---|---|---|---|
| **TLM1** | Chalk and Talk | **TLM4** | Demonstration (lab or field visit) |
| **TLM2** | PPT | **TLM5** | ICT (NPTEL, Swayam Prabha, MOOCS) |
| **TLM3** | Tutorial | **TLM6** | Group Discussion/project |

**PART-C**

**EVALUATION PROCESS (R23 Regulation):**

| Evaluation Task | Marks |
|---|---|
| Assignment-I (Units-I, II) | A1=5 |
| I-Descriptive Examination (Units-I, II) | M1=15 |
| I-Quiz Examination (Units-I, II) | Q1=10 |
| Assignment-II (Unit-III, IV & V) | A2=5 |
| II- Descriptive Examination (UNIT-III, IV & V) | M2=15 |
| II-Quiz Examination (UNIT-III, IV & V) | Q2=10 |
| Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2)) | M=30 |
| Cumulative Internal Examination (CIE): | 30 |
| Semester End Examination (SEE) | 70 |
| Total Marks = CIE + SEE | 100 |

## PART-D

## PROGRAM OUTCOMES (Pos)

**Engineering Graduates will be able to:**

**PO1: Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

**PO3: Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4: Conduct Investigation of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

**PO5: Modern Tool Usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including predictions and modeling to complex engineering activities with an understanding of the limitations.

**PO6: The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7: Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9: Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11: Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12: Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAM SPECIFIC OUTCOMES (PSOs)**

**PSO1:** To apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design

**PSO2:** To prepare the students to work effectively in Aerospace and Allied Engineering organizations

| | | |
|---|---|---|
| **Course Instructor** | **Module Coordinator** | **HOD** |

# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

**(AUTONOMOUS)**

**Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015**

**Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada**

**L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.**

**DEPARTMENT OF AEROSPACE ENGINEERING**

## COURSE HANDOUT

**PART-A**

**Name of Course Instructor: Mr. A.Pratyush**

| | | |
|---|---|---|
| **Course Name & Code** | **:** Engineering Thermodynamics (23AE03) | **Regulation**: R23 |
| **L-T-P Structure** | **: 2-1-0** | **Credits:** 3 |
| **Program/Sem/Sec** | : B.Tech/III/-- | **A.Y.:** 2024-2025 |

**PREREQUISITE: NIL**

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** To learn the basic concepts of energy conversions, laws of thermodynamics, concept of entropy, the properties of different gas mixtures and pure substances and basic aspects of ideal thermal cycles.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

| | |
|---|---|
| **CO1** | Describe the thermodynamic properties of various systems (Understand-L2) |
| **CO2** | Apply the laws of thermodynamics to analyze various thermal systems. (Apply-L3) |
| **CO3** | Analyze the entropy change of various processes (Apply-L3) |
| **CO4** | Analyze the properties of different gas mixtures and pure substances. (Analyze-L4) |
| **CO5** | Analyze ideal gas power cycles and refrigeration cycle to estimate various performance parameters (Analyze-L4) |

**COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs):

| **COs** | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | **PO 12** | **PSO 1** | **PSO 2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 3 | 3 | 3 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO4** | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| **CO5** | 2 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| | | | **1** - Low **2** –Medium **3** - High | | | | | | | | | | | |

**TEXTBOOKS:**

**T1** Rathakrishnan. E, Fundamentals of Engineering Thermodynamics, Second Edition, Prentice Hall of India, 2010

**REFERENCE BOOKS:**

**R1** Nag. P.K, Engineering Thermodynamics- Fifth Edition, McGraw-Hill, 2013.

**R2** Cengel. Y.A and Boles, M.A, Thermodynamics: An Engineering Approach, Seventh Edition, McGraw-Hill, 2011.

**R3** Sonntag. R. E, Borgnakke. C, Van Wylen. G. J, Fundamentals of Thermodynamics, Fifth Edition John Wiley & sons, publications Inc, 1998.

**PART-B**

**COURSE DELIVERY PLAN (LESSON PLAN):**

**UNIT-I: BASIC CONCEPTS AND DEFINITIONS**

| S.No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 1. | **Basic Concepts and Definitions:** Introduction | 1 | 16-07-2024 | | TLM 1 | |
| 2. | Macroscopic and Microscopic View Point, Thermodynamic system, Continuum, System, Control Volume, Properties of System | 1 | 18-07-2024 | | TLM 1 | |
| 3. | State and Equilibrium, Thermodynamic Equilibrium | 1 | 19-07-2024 | | TLM 1 | |
| 4. | **Tutorial – I** | 1 | 20-07-2024 | | TLM 3 | |
| 5. | Process- Quasi static process-Cycle | 1 | 23-07-2024 | | TLM 1 | |
| 6. | Temperature -Temperature scales, Problems | 1 | 25-07-2024 | | TLM 1 | |
| 7. | Zeroth law of Thermodynamics, energy-forms of energy. | 1 | 26-07-2024 | | TLM 1 | |
| 8. | **Tutorial – II** | 1 | 27-07-2024 | | TLM 3 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9. | Heat, work, Mechanical forms of work | 1 | 30-07-2024 | | TLM 1 &2 | |
| 10. | Work done in various non-flow process, Problems on Pdv Work | 1 | 01-08-2024 | | TLM 1 &2 | |
| 11. | Problems on Pdv Work, Path and point function | 1 | 02-08-2024 | | TLM 1 &2 | |
| 12. | **Tutorial - III** | 1 | 03-08-2024 | | TLM 3 | |
| 13. | Revision & Summary | 1 | 06-08-2024 | | | |
| **No. of classes required to complete UNIT-I: 13** | | | | **No. of classes Taken:** | | |

**UNIT-II: FIRST LAW OF THERMODYNAMICS & ITS ANALYSIS OF CONTROL VOLUME**

| **S.No.** | **Topics to be covered** | **No. of Classes Require d** | **Tentative Date of Completion** | **Actua l Date of Comp letion** | **Teaching Learning Methods** | **HOD Sign Weekly** |
|---|---|---|---|---|---|---|
| 14. | **First Law of Thermodynamics**: Introduction | 1 | 08-08-2024 | | TLM 1 | |
| 15. | Joule's Experiment | 1 | 09-08-2024 | | TLM 1 &2 | |
| 16. | First Law Analysis of closed system,Different Forms of Stored Energy | 1 | 10-08-2024 | | TLM 1 &2 | |
| 17. | **Tutorial – IV** | 1 | 13-08-2024 | | TLM 3 | |
| 18. | Energy balance, Internal energy, specific heat, Enthalpy, PMM-I,Principle flow work. | 1 | 16-08-2024 | | TLM 1 &2 | |
| 19. | Conservation of Energy & mass, Flow Work, Problems on First law applied to closed system | 1 | 17-08-2024 | | TLM 1 &2 | |
| 20. | **First law analysis of control volume-** The Steady Flow Process, Steady Flow Energy Equation | 1 | 20-08-2024 | | TLM 1 &2 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 21. | **Tutorial – V** | 1 | 22-08-2024 | | TLM 3 | |
| 22. | Steady flow engineering devices- Nozzle,Turbine, compressor, Heat Exchanger | 1 | 23-08-2024 | | TLM 1 &2 | |
| 23. | Problems on Steady Flow Devices | 1 | 24-08-2024 | | TLM 1 &2 | |
| 24. | Revision & Summary | 1 | 27-08-2024 | | | |
| No. of classes required to complete UNIT-II: 11 | | | | **No. of classes Taken:** | | |

**UNIT-III: SECOND LAW OF THERMODYNAMICS & ENTROPY**

| S.No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 25. | **Second law of thermodynamics** :Introduction, Thermal energy reservoirs, heat engines | 1 | 29-08-2024 | | TLM 1 | |
| 26. | Kelvin-Planks, clausius statement of second law of thermodynamics, Refrigerator, heat pumps | 1 | 30-08-2024 | | TLM 1 | |
| 27. | Equivalence of kelvin-plank and clausius statements, Perpetual motion machines, reversible and irreversible process | 1 | 31-08-2024 | | TLM 2 | |
| 28. | **Tutorial – VI** | 1 | 10-09-2024 | | TLM 3 | |
| 29. | Carnot cycle, Carnot principles, Corollary of Carnot Theorem, Absolute Thermodynamic Temperature Scale,the carnot heat engine. | 2 | 12-09-2024 13-09-2024 | | TLM 1 | |
| 30. | Problems | 2 | 14-09-2024 17-09-2024 | | TLM 1 &2 | |
| 31. | **Entropy**: Introduction, Clausius inequality, property diagrams, Max well Relation. | 2 | 19-09-2024 20-09-2024 | | TLM 1 &2 | |
| 32. | **Tutorial - VII** | 1 | 21-09-2024 | | TLM 3 | |
| 33. | Entropy change for compressible and incompressible substances, Isentropic relations for ideal gases, Principle of increase of Entropy, TD third law. | 2 | 24-09-2024 26-09-2024 | | TLM 1 &2 | |
| **No. of classes required to complete UNIT-III: 13** | | | **No. of classes Taken:** | | | |

**UNIT-IV: PROPERTIES OF PURE SUBSTANCES & GAS POWER CYCLES**

| S.No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | HOD Sign Weekly |
|---|---|---|---|---|---|---|
| 34. | Pure substance: Introduction, phase of pure substance, Phase change processes, property diagrams | 1 | 27-09-2024 | | TLM 1 &2 | |
| 35. | P-V-T surface, property tables, h-s Diagram or Mollier Diagram for pure Substance | 2 | 28-09-2024<br>01-10-2024 | | TLM 1 &2 | |
| 36. | Dryness Fraction-Saturated Liquid Vapor Mixture. | 2 | 03-10-2024<br>04-10-2024 | | TLM 1 &2 | |
| 37. | **Tutorial – VIII** | 1 | 05-10-2024 | | TLM 3 | |
| 38. | Problems on Pure Substances | 1 | 08-10-2024 | | TLM 1 &2 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 39. | **Gas power cycles**-Introduction,Analysis of power cycles- Carnot, Air-standard Assumptions , Otto | 2 | 10-10-2024<br>11-10-2024 | | TLM 1 &2 | |
| 40 | Analysis of Diesel, Dual cycle | 1 | 15-10-2024 | | TLM 1 &2 | |
| 41 | Analysis of Brayton Cycle, Problems on gas power cycles | 1 | 17-10-2024 | | TLM 1 &2 | |
| **No. of classes required to complete UNIT-IV: 9** | | | **No. of classes Taken:** | | | |

**UNIT-V: INTERNAL COMBUSTION ENGINES**

| **S.No.** | **Topics to be covered** | **No. of Classes Required** | **Tentative Date of Completion** | **Actual Date of Completion** | **Teaching Learning Methods** | **HOD Sign Weekly** |
|---|---|---|---|---|---|---|
| 42. | Classification of IC Engines, Components of IC engines | 2 | 18-10-2024<br>19-10-2024 | | TLM 1 &2 | |
| 43. | working Principles of 4-Stroke and 2-Storke Engines, Working | 2 | 22-10-2024<br>24-10-2024 | | TLM 1 &2 | |
| 44. | Principles of Spark Ignition (SI) Engine, Compression Ignition (CI) Engine | 2 | 25-10-2024<br>26-10-2024 | | TLM 1 &2 | |
| 45. | Tutorial – IX | 1 | 29-10-2024 | | TLM 3 | |
| 46. | Valve and Port Timing Diagrams, Air-fuel Mixture | 2 | 01-11-2024<br>02-11-2024 | | TLM 1 &2 | |
| 47 | Carburation, Performance Analysis of IC engines. | 2 | 05-11-2024<br>07-11-2024 | | TLM 1 &2 | |
| 48 | Revision of Important Concepts | 2 | 08-11-2024<br>09-11-2024 | | TLM 1 &2 | |
| **No. of classes required to complete UNIT-V: 11** | | | **No. of classes Taken:** | | | |

| Teaching Learning Methods | | | |
|---|---|---|---|
| **TLM1** | Chalk and Talk | **TLM4** | Demonstration (Lab/Field Visit) |
| **TLM2** | PPT | **TLM5** | ICT (NPTEL/Swayam Prabha/MOOCS) |
| **TLM3** | Tutorial | **TLM6** | Group Discussion/Project |

**PART-C**

**EVALUATION PROCESS (R20 Regulation):**

| **Evaluation Task** | **Marks** |
|---|---|
| Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus)) | A1=5 |
| I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus)) | M1=15 |
| I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus)) | Q1=10 |
| Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V) | A2=5 |
| II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V) | M2=15 |
| II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V) | Q2=10 |
| Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2)) | M=30 |
| Cumulative Internal Examination (CIE): M | 30 |
| Semester End Examination (SEE) | 70 |
| Total Marks = CIE + SEE | 100 |

# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

**(AUTONOMOUS)**
**Accredited by NAAC & NBA (Under Tier - I), ISO 21001:2018,50001:2018,14001:2015 Certified Institution**
**Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada**
**L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.**
Phone: 08659-222933, Fax: 08659-222931


## FRESHMAN ENGINEERING DEPARTMENT

## COURSE HANDOUT

**Part-A**

| | |
|---|---|
| **PROGRAM** | **:** II B. Tech., III-Sem., ASE |
| **ACADEMIC YEAR** | **:** 2024-25 |
| **COURSE NAME & CODE** | **: Environmental Science & 20MC01** |
| **L-T-P STRUCTURE** | **:** 2-0-0 |
| **COURSE CREDITS** | **:** 0 |
| **COURSE INSTRUCTOR** | **:** Dr. V. Bhagya Lakshmi |
| **COURSE COORDINATOR** | **:** Dr. Shaheda Niloufer |
| **PRE-REQUISITES** | **:** biology, chemistry, geology, mathematics or physics |

## COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To enlighten the learners in the concept of differential equations and multivariable calculus
- To furnish the learners with basic concepts and techniques at intermediate level to lead them into advanced level by handling various real-world applications.

## COURSE OUTCOMES (COs)

In this course the student will learn about

**CO1:** The necessity of resources, their exploitation and sustainable management **(Understand – L2)**

**CO2:** The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation. **(Understand – L2)**

**CO3:** Environmental problems like pollution, disasters and possible solutions. **(Remember – L1)**

**CO4:** The importance of environmental decision making in organizations through understanding the environmental law and environmental audits. **(Remember – L1)**

**CO5:** Environmental issues like over population, human health etc related to local, regional and global levels. **(Understand – L2)**

## COURSE ARTICULATION MATRIX (Correlation between Cos &POs, PSOs):

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | - | - | - | 3 | 3 | 3 | - | - | - | 3 | - | - | - |
| CO2 | 3 | 3 | - | - | - | 3 | 3 | - | - | - | - | 3 | - | - | - |
| CO3 | 3 | - | 3 | - | - | - | 2 | - | - | - | - | 2 | - | - | - |
| CO4 | 3 | - | - | - | - | 2 | 3 | 2 | - | - | - | 3 | - | - | - |
| CO5 | 3 | 3 | 3 | 3 | - | 3 | 3 | 3 | - | - | - | 3 | - | - | - |

**Note:** Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**

**1-** Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

**BOS APPROVED TEXT BOOKS:**

**T1.** Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses,Universities Press (India) Private Limited, 2019.

**T2.** Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.

**T3.** S.Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.

**T4.** K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

**R1.** KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.

**R2.** Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.

**R3.** M.Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.

**R4.** J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.

**R5.** J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.

**R6.** G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.

**R7.** Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

**Online Learning Resources:**

- **https://onlinecourses.nptel.ac.in/noc23_hs155/preview**
- **https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental- science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-**

**Part-B**

**COURSE DELIVERY PLAN (LESSON PLAN):**

| S. No | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 1. | Introduction to the course | 1 | 15-07-2024 | | TLM2 | | | |
| 2. | Multidisciplinary Nature of Environmental Studies | 1 | 19-07-2024 | | TLM2 | | | |

**UNIT-I**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 3. | Natural Resources – Forest resources | 1 | 22-07-2024 | | TLM1 | CO1 | T1,T2 | |
| 4. | Water resources | 1 | 26-07-2024 | | TLM1 | CO1 | T1,T2 | |
| 5. | Mineral resources | 1 | 29-07-2024 | | TLM1 | CO1 | T1,T2 | |
| 6. | Food resources | 1 | 02-08-2024 | | TLM1 | CO1 | T1,T2 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7. | Energy resources | 1 | 05-08-2024 | | TLM1 | CO1 | T1,T2 | |
| No. of classes required to complete UNIT-I | | 07 | | | No. of classes taken: | | | |

**UNIT-II**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 8. | Ecosystems – Structure & Functions | 1 | 09-08-2024 | | TLM1 | CO1 | T1,T2 | |
| 9. | Ecological succession & Food chains, Food webs & Ecological Pyramids | 1 | 12-08-2024 | | TLM1 | CO1 | T1,T2 | |
| 10. | Types of ecosystems | 1 | 16-08-2024 | | TLM1 | CO1 | T1,T2 | |
| 11. | Biodiversity – introduction, levels, biogeographic classification | 1 | 19-08-2024 | | TLM1 | CO1 | T1,T2 | |
| 12. | Values of Biodiversity, India as mega diversity nation | 1 | 23-08-2024 | | TLM1 | CO1 | T1,T2 | |
| 13. | Threats to biodiversity Conservation of biodiversity | 1 | 30-08-2024 | | TLM1 | CO1 | T1,T2 | |
| No. of classes required to complete UNIT-II | | 06 | | | No. of classes taken: | | | |

**I MID EXAMINATIONS (02-09-2024 TO 09-09-2024)**

**UNIT-III**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 14. | Environmental pollution -Air pollution | 1 | 13-09-2024 | | TLM1 | CO2 | T1,T2 | |
| 15. | Water pollution, Marine pollution, Thermal pollution | 1 | 20-09-2024 | | TLM1 | CO2 | T1,T2 | |
| 16. | Soil pollution | 1 | 23-09-2024 | | TLM1 | CO2 | T1,T2 | |
| 17. | Noise pollution & Nuclear Hazards | 1 | 27-09-2024 | | TLM1 | CO2 | T1,T2 | |
| 18. | Solid waste management | 1 | 30-09-2024 | | TLM1 | CO2 | T1,T2 | |
| 19. | Disaster management | 1 | 04-10-2024 | | TLM1 | CO2 | T1,T2 | |
| No. of classes required to complete UNIT-III | | 06 | | | No. of classes taken: | | | |

**UNIT-IV**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 20. | From Unsustainable to Sustainable development | 1 | 07-10-2024 | | TLM1 | CO3 | T1,T2 | |
| 21. | Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns | 1 | 14-10-2024 | | TLM1 | CO3 | T1,T2 | |
| 22. | Environmental ethics, Climate change | 1 | 18-10-2024 | | TLM1 | CO3 | T1,T2 | |
| 23. | Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products | 1 | 21-10-2024 | | TLM1 | CO3 | T1,T2 | |
| 24. | Environmental Acts | 1 | 25-10-2024 | | TLM1 | CO3 | T1,T2 | |
| No. of classes required to complete UNIT-IV | | 05 | | | No. of classes taken: | | | |

**UNIT-V**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 25. | Population growth, variation among nations. Population explosion – Family Welfare Programmes. | 1 | 28-10-2024 | | TLM1 | CO4 | T1,T2 | |
| 26. | Environment and human health –Human Rights – Value Education | 1 | 01-11-2024 | | TLM1 | CO4 | T1,T2 | |
| 27. | HIV/AIDS – Women and Child Welfare | 1 | 04-11-2024 | | TLM1 | CO4 | T1,T2 | |
| 28. | Role of information Technology in Environment and human health , Case studies | 1 | 08-11-2024 | | TLM1 | CO4 | T1,T2 | |
| No. of classes required to complete UNIT-V | | 04 | | | No. of classes taken: | | | |

**Content beyond the Syllabus**

| S. No. | Topics to be covered | No. of Classes Required | Tentative Date of Completion | Actual Date of Completion | Teaching Learning Methods | Learning Outcome COs | Text Book followed | HOD Sign Weekly |
|---|---|---|---|---|---|---|---|---|
| 29. | Case studies | 2 | 24-09-2024<br>05-11-2024 | | TLM2 | CO2 | T1,T2 | |
| No. of classes | | 2 | | | No. of classes taken: | | | |

**II MID EXAMINATIONS (11-11-2024 TO 16-11-2024)**

| Teaching Learning Methods | | | |
|---|---|---|---|
| **TLM1** | Chalk and Talk | **TLM4** | Demonstration (Lab/Field Visit) |
| **TLM2** | PPT | **TLM5** | ICT (NPTEL/SwayamPrabha/MOOCS) |
| **TLM3** | Tutorial | **TLM6** | Group Discussion/Project |

**PART-C EVALUATION PROCESS (R23 Regulation):**

| Evaluation Task | Marks |
|---|---|
| Assignment-I (Units-I, II) | A1=5 |
| I-Descriptive Examination (Units-I, II) | M1=15 |
| I-Quiz Examination (Units-I, II) | Q1=10 |
| Assignment-II (Unit-III, IV & V) | A2=5 |
| II- Descriptive Examination (UNIT-III, IV & V) | M2=15 |
| II-Quiz Examination (UNIT-III, IV & V) | Q2=10 |
| Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2)) | M=30 |
| Cumulative Internal Examination (CIE): | 30 |
| Semester End Examination (SEE) | 70 |
| Total Marks = CIE + SEE | 100 |

**PART-D PROGRAMME OUTCOMES (POs):**

| | |
|---|---|
| **PO 1** | **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems. |
| **PO 2** | **Problem analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| **PO 3** | **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations. |
| **PO 4** | **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions. |
| **PO 5** | **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations |
| **PO 6** | **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice |
| **PO 7** | **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development. |
| **PO 8** | **Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **PO 9** | **Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings. |
| **PO 10** | **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions. |

| | |
|---|---|
| **PO 11** | **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| **PO 12** | **Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

| | | | |
|---|---|---|---|
| **Dr. V. Bhagya Lakshmi** | Dr. Shaheda Niloufer | **Dr. Shaheda Niloufer** | **Dr. A. RAMI REDDY** |
| Course Instructor | Course Coordinator | Module Coordinator | HOD |