



# NEW HORIZON COLLEGE OF ENGINEERING

New Horizon Knowledge Park, Ring Road, Marathalli  
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC  
Accredited by NAAC with 'A' Grade, Accredited by NBA

The Trust is a Recipient of Prestigious Rajyotsava State Award 2012 Conferred by the Government of Karnataka  
**Awarded Outstanding Technical Education Institute in Karnataka-2016**  
Ring Road, Bellandur Post, Near Marathalli, Bangalore -560 103, INDIA



**Batch of 2020-2024**  
***BE – Mechanical Engineering***

**Third and Fourth Semesters B.E**  
**Scheme and Syllabus**

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## VISION

To create competent mechanical engineers capable of working in diversified disciplines for transformative impact on societal progressive development in the field of mechanical engineering through creative research and lifelong learning.

## MISSION

- To impart excellent education by providing state of art research facilities in the field of mechanical engineering.
- To develop alliances with industries and other organizations for excellence in teaching learning process, research and consultancy projects.
- To enhance the students in intellectual, entrepreneurial and ethical challenges through active participation by critical thinking.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- **PEO 1:** The graduates will be able to apply the overall knowledge of Mechanical Engineering along with concepts of Mathematics, Science, Communication and Computing skills to understand specific problem areas and finding the optimal solutions for the same.
- **PEO 2:** The graduates will be able to implement ideas of Mechanical Engineering for the challenging tasks in the interdisciplinary areas like Electrical, Electronics, Computer Science, Civil, Bio-Technology and allied branches.
- **PEO 3:** The graduates will be widely talented in the fields of manufacturing, service and design industries, which will not only improve their employability but also aid in establishing the above said industries.
- **PEO 4:** The graduates will develop lifelong learning attitudes, ethics and values that will help their career employability and growth in engineering, academia, defence, state and central government sectors.

## MAPPING OF PEOs TO DEPARTMENT MISSION

| Program Educational Objectives | M1 | M2 | M3 |
|--------------------------------|----|----|----|
| PEO 1                          | 3  | 2  | 3  |
| PEO 2                          | 2  | 1  | 3  |
| PEO 3                          | 3  | 2  | 2  |
| PEO 4                          | 2  | 2  | 3  |

## PROGRAM OUTCOMES (POs)

| Graduate Attributes                        | PO # | Program Outcomes   |
|--|------|--|
| Engineering knowledge                      | 1    | Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex mechanical engineering problems  |
| Problem Analysis                           | 2    | Identify, formulate, review research literature, and analyze complex engineering problems in Mechanical Engineering reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.  |
| Design Development of Solutions            | 3    | Design solutions for complex engineering problems and design system components or processes of Mechanical Engineering that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| Conduct Investigations of Complex Problems | 4    | Use research-based knowledge and research methods including design of experiments in Mechanical Engineering, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.   |
| Modern tool usage                          | 5    | Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities in Mechanical Engineering with an understanding of the limitations.   |
| The Engineer and society                   | 6    | 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 in Mechanical Engineering.  |
| Environment and Sustainability             | 7    | Understand the impact of the professional engineering solutions of mechanical Engineering in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.  |
| Ethics                                     | 8    | Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.   |
| Individual & team work                     | 9    | Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.  |
| Communication                              | 10   | 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. |
| Project management and finance             | 11   | 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, manage projects and in multidisciplinary environments.   |
| Lifelong learning                          | 12   | 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)

After successful completion of mechanical Engineering Program, the graduates will be able to:

|      |  |
|------|--|
| PSO1 | Specify, fabricate, test and operate various machines along with essential documentations. |
|------|--|

PSO2

Analyze, design, develop and implement the concepts of mechanical systems and processes towards product development

## New Horizon College of Engineering

Department of Mechanical Engineering

### Third Semester Scheme (Cycle-A)

| Sl. No.      | Course Code | Course Name                                 | BOS | Credit Distribution |   |   |   | Overall Credits | Contact Hours | Marks      |            |            |
|--------------|-------------|---|-----|---------------------|---|---|---|-----------------|---------------|------------|------------|------------|
|              |             |   |     | L                   | T | P | S |                 |               | CIE        | SEE        | Total      |
| 1            | 20MEE31A    | Applied Mathematics-III                     | BS  | 2                   | 1 | 0 | 0 | 3               | 4             | 50         | 50         | 100        |
| 2            | 20HSS322A   | Life Skills for Engineers                   | HSS | 3                   | 0 | 0 | 0 | 3               | 3             | 50         | 50         | 100        |
| 3            | 20HSS323A   | Environmental Science and Awareness         | HSS | 0                   | 0 | 0 | 0 | 0               | 2             | 25         | 25         | 50         |
| 4            | 19MEE331    | Computer Aided Machine Drawing              | MEE | 2                   | 0 | 2 | 0 | 4               | 6             | 50         | 50         | 100        |
| 5            | 19MEE341    | Casting, Forging and Joining Technology     | MEE | 3                   | 0 | 0 | 0 | 3               | 3             | 50         | 50         | 100        |
| 6            | 19MEE351    | Mechanics of Materials                      | MEE | 2                   | 1 | 0 | 0 | 3               | 4             | 50         | 50         | 100        |
| 7            | 19MEE361    | Material Science & Metallurgy               | MEE | 3                   | 0 | 0 | 0 | 3               | 3             | 50         | 50         | 100        |
| 8            | 19MEL341    | Casting, Forging and Joining Technology Lab | MEE | 0                   | 0 | 2 | 0 | 2               | 4             | 25         | 25         | 50         |
| 9            | 19MEL351    | Mechanics of Materials Lab                  | MEE | 0                   | 0 | 1 | 0 | 1               | 2             | 25         | 25         | 50         |
| 10           | 19MEL361    | Material Science & Metallurgy Lab           | MEE | 0                   | 0 | 1 | 0 | 1               | 2             | 25         | 25         | 50         |
| 11           | 20DMAT31A*  | Basic Applied Mathematics-I                 | BS  | 0                   | 0 | 0 | 0 | 0               | 2             | 25         | 25         | 50         |
| 12           | 19HSS171*   | Essential English                           | HSS | 0                   | 0 | 0 | 0 | 0               | 2             | 25         | 25         | 50         |
| <b>Total</b> |             |   |     |                     |   |   |   | <b>23</b>       | <b>35</b>     | <b>400</b> | <b>400</b> | <b>800</b> |

\*Applicable only for lateral entry students

### Third Semester Scheme (Cycle-B)

| Sl. No.      | Course Code  | Course Name                               | BOS | Credit Distribution |   |   |   | Overall Credits | Contact Hours | Marks      |            |            |
|--------------|--------------|---|-----|---------------------|---|---|---|-----------------|---------------|------------|------------|------------|
|              |              |   |     | L                   | T | P | S |                 |               | CIE        | SEE        | Total      |
| 1            | 20MEE31A     | Applied Mathematics-III                   | BS  | 2                   | 1 | 0 | 0 | 3               | 4             | 50         | 50         | 100        |
| 2            | 20HSS321A    | Economics for Engineers                   | HSS | 2                   | 0 | 0 | 0 | 2               | 3             | 25         | 25         | 50         |
| 3            | 20HSS324/325 | Aadalitha Kannada/ Vyavaharika Kannada    | HSS | 1                   | 0 | 0 | 0 | 1               | 2             | 25         | 25         | 50         |
| 4            | 19MEE332     | Basic Thermodynamics                      | MEE | 2                   | 1 | 0 | 0 | 3               | 4             | 50         | 50         | 100        |
| 5            | 19MEE342     | Machines for Manufacturing Technology     | MEE | 3                   | 0 | 0 | 0 | 3               | 3             | 50         | 50         | 100        |
| 6            | 19MEE352     | Mechanical Measurements & Metrology       | MEE | 3                   | 0 | 0 | 0 | 3               | 3             | 50         | 50         | 100        |
| 7            | 19MEE362     | Fluid Mechanics                           | MEE | 2                   | 1 | 0 | 0 | 3               | 4             | 50         | 50         | 100        |
| 8            | 19MEL342     | Machines for Manufacturing Technology Lab | MEE | 0                   | 0 | 1 | 0 | 1               | 2             | 25         | 25         | 50         |
| 9            | 19MEL352     | Mechanical Measurements & Metrology Lab   | MEE | 0                   | 0 | 1 | 0 | 1               | 2             | 25         | 25         | 50         |
| 10           | 19MEL362     | Fluid Mechanics Lab                       | MEE | 0                   | 0 | 1 | 0 | 1               | 2             | 25         | 25         | 50         |
| 11           | 20DMAT31A*   | Basic Applied Mathematics-I               | BS  | 0                   | 0 | 0 | 0 | 0               | 2             | 25         | 25         | 50         |
| 12           | 19HSS171*    | Essential English                         | HSS | 0                   | 0 | 0 | 0 | 0               | 2             | 25         | 25         | 50         |
| <b>Total</b> |              |   |     |                     |   |   |   | <b>21</b>       | <b>29</b>     | <b>375</b> | <b>375</b> | <b>750</b> |

# New Horizon College of Engineering

## Department of Mechanical Engineering

### Fourth Semester Scheme (Cycle-A)

| Sl. No. | Course Code | Course Name                                   | BOS | Credit Distribution |   |   |   | Overall Credits | Contact Hours | Marks |     |       |
|---------|-------------|---|-----|---------------------|---|---|---|-----------------|---------------|-------|-----|-------|
|         |             |   |     | L                   | T | P | S |                 |               | CIE   | SEE | Total |
| 1       | 20MEE41A    | Applied Mathematics-IV                        | BS  | 2                   | 1 | 0 | 0 | 3               | 4             | 50    | 50  | 100   |
| 2       | 20HSS422A   | Life Skills for Engineers                     | HSS | 3                   | 0 | 0 | 0 | 3               | 3             | 50    | 50  | 100   |
| 3       | 20HSS423A   | Environmental Science and Awareness           | HSS | 0                   | 0 | 0 | 0 | 0               | 2             | 25    | 25  | 50    |
| 4       | 19MEE431    | Computer Aided Machine Drawing                | MEE | 2                   | 0 | 2 | 0 | 4               | 6             | 50    | 50  | 100   |
| 5       | 19MEE441    | Casting, Forging and Joining Technology       | MEE | 3                   | 0 | 0 | 0 | 3               | 3             | 50    | 50  | 100   |
| 6       | 19MEE451    | Mechanics of Materials                        | MEE | 2                   | 1 | 0 | 0 | 3               | 4             | 50    | 50  | 100   |
| 7       | 19MEE461    | Material Science & Metallurgy                 | MEE | 3                   | 0 | 0 | 0 | 3               | 3             | 50    | 50  | 100   |
| 8       | 19MEL441    | Casting, Forging and Joining Technology Lab   | MEE | 0                   | 0 | 2 | 0 | 2               | 4             | 25    | 25  | 50    |
| 9       | 19MEL451    | Mechanics of Materials Lab                    | MEE | 0                   | 0 | 1 | 0 | 1               | 2             | 25    | 25  | 50    |
| 10      | 19MEL461    | Material Science & Metallurgy Lab             | MEE | 0                   | 0 | 1 | 0 | 1               | 2             | 25    | 25  | 50    |
| 11      | 19MEE47     | Mini Project-I                                | MEE | 0                   | 0 | 2 | 0 | 2               | -             | 25    | 25  | 50    |
| 12      | 20DMAT41A*  | Basic Applied Mathematics-II                  | BS  | 0                   | 0 | 0 | 0 | 0               | 2             | 25    | 25  | 50    |
| 13      | 19HSS272*   | Constitution of India and Professional Ethics | HSS | 0                   | 0 | 0 | 0 | 0               | 2             | 25    | 25  | 50    |
| Total   |             |   |     |                     |   |   |   | 25              | 35            | 425   | 425 | 850   |

\*Applicable only for lateral entry students

### Fourth Semester Scheme (Cycle-B)

| Sl. No. | Course Code  | Course Name                                   | BOS | Credit Distribution |   |   |   | Overall Credits | Contact Hours | Marks |     |       |
|---------|--------------|---|-----|---------------------|---|---|---|-----------------|---------------|-------|-----|-------|
|         |              |   |     | L                   | T | P | S |                 |               | CIE   | SEE | Total |
| 1       | 20MEE41A     | Applied Mathematics-IV                        | BS  | 2                   | 1 | 0 | 0 | 3               | 4             | 50    | 50  | 100   |
| 2       | 20HSS421A    | Economics for Engineers                       | HSS | 2                   | 0 | 0 | 0 | 2               | 2             | 25    | 25  | 50    |
| 3       | 20HSS424/425 | Aadalitha Kannada/<br>Vyavaharika Kannada     | HSS | 1                   | 0 | 0 | 0 | 1               | 2             | 25    | 25  | 50    |
| 4       | 19MEE432     | Basic Thermodynamics                          | MEE | 2                   | 1 | 0 | 0 | 3               | 4             | 50    | 50  | 100   |
| 5       | 19MEE442     | Machines for Manufacturing Technology         | MEE | 3                   | 0 | 0 | 0 | 3               | 3             | 50    | 50  | 100   |
| 6       | 19MEE452     | Mechanical Measurements & Metrology           | MEE | 3                   | 0 | 0 | 0 | 3               | 3             | 50    | 50  | 100   |
| 7       | 19MEE462     | Fluid Mechanics                               | MEE | 2                   | 1 | 0 | 0 | 3               | 4             | 50    | 50  | 100   |
| 8       | 19MEL442     | Machines for Manufacturing Technology Lab     | MEE | 0                   | 0 | 1 | 0 | 1               | 2             | 25    | 25  | 50    |
| 9       | 19MEL452     | Mechanical Measurements & Metrology Lab       | MEE | 0                   | 0 | 1 | 0 | 1               | 2             | 25    | 25  | 50    |
| 10      | 19MEL462     | Fluid Mechanics Lab                           | MEE | 0                   | 0 | 1 | 0 | 1               | 2             | 25    | 25  | 50    |
| 11      | 19MEE47      | Mini Project-I                                | MEE | 0                   | 0 | 2 | 0 | 2               | -             | 25    | 25  | 50    |
| 12      | 20DMAT41A*   | Basic Applied Mathematics-II                  | BS  | 0                   | 0 | 0 | 0 | 0               | 2             | 25    | 25  | 50    |
| 13      | 19HSS272*    | Constitution of India and Professional Ethics | HSS | 0                   | 0 | 0 | 0 | 0               | 2             | 25    | 25  | 50    |
| Total   |              |   |     |                     |   |   |   | 23              | 28            | 400   | 400 | 800   |

# **THIRD SEMESTER SYLLABUS**

### APPLIED MATHEMATICS – III

|                    |                 |
|--------------------|-----------------|
| <b>Course Code</b> | <b>20MEE31A</b> |
| <b>L: T: P:S</b>   | <b>2:1:0:0</b>  |
| <b>Exams Hours</b> | <b>03</b>       |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>03</b> |
| <b>CIE Marks</b> | <b>50</b> |
| <b>SEE Marks</b> | <b>50</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                   |   |
|-------------------|---|
| <b>20MEE31A.1</b> | Use appropriate numerical methods to solve algebraic equations and transcendental equations   |
| <b>20MEE31A.2</b> | Differentiate the physical problems numerically, evaluate a definite integral numerically and use appropriate numerical methods to solve boundary value problems in partial differential equations. |
| <b>20MEE31A.3</b> | Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data and obtain the extremal of a functional.                                    |
| <b>20MEE31A.4</b> | Express the periodic functions as Fourier series expansion analytically and numerically   |
| <b>20MEE31A.5</b> | Solve the continuous model problems using Fourier transforms  |
| <b>20MEE31A.6</b> | Solve the discrete model problems using Fast Fourier transform  |

Mapping of Course Outcomes to Program Outcomes:

|                   | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PS02 |
|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>20MEE31A.1</b> | 3   | 3   | 3   | 3   | 3   |     | 3   |     |     |      | 3    | 3    |      | 2    |
| <b>20MEE31A.2</b> | 3   | 3   | 3   | 3   | 3   |     | 3   |     |     |      | 3    | 3    |      | 2    |
| <b>20MEE31A.3</b> | 3   | 3   | 3   | 3   | 3   | 1   | 3   |     |     | 1    | 3    | 3    |      | 2    |
| <b>20MEE31A.4</b> | 3   | 3   | 3   | 3   | 3   |     |     |     |     |      | 3    | 3    |      | 2    |
| <b>20MEE31A.5</b> | 3   | 3   | 3   | 3   | 3   |     |     |     |     |      | 3    | 3    |      | 2    |
| <b>20MEE31A.6</b> | 3   | 3   | 3   | 3   | 3   |     |     |     |     |      | 3    | 3    |      | 2    |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

#### **TEXT BOOKS:**

- 1) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
- 2) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014, ISBN: 978-81-7409-195-5.

#### **REFERENCE BOOKS:**

- 1) Glyn James, Modern Engineering Mathematics, Prentice Hall, 4th Edition, 2015, ISBN: 978-0-273-73409-3
- 2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4th Edition, 2016, ISBN: 978-0-07-063419-0.
- 3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28th Edition, 2012, ISBN: 81-219-0345-9.
- 4) N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.



| Module No | Module Contents   | Hrs | COs                      |
|-----------|---|-----|--------------------------|
| 1         | <p><b>Numerical Methods-1:</b> Numerical solution of algebraic and transcendental equations: Regula-falsi method and Newton-Raphson method-Problems.</p> <p><b>Interpolation:</b> Newton's forward and backward formulae for equal intervals, Newton divided difference and Lagrange's formulae for unequal intervals (without proofs)-Problems.</p>  | 9   | 20MEE31A.1               |
| 2         | <p><b>Numerical Methods-2:</b> Numerical Differentiation: Derivatives of first order and second order using Newton's forward differences and Newton's backward differences.</p> <p><b>Numerical integration:</b> Simpson's <math>1/3^{\text{rd}}</math> rule, Simpson's <math>3/8^{\text{th}}</math> rule, Weddle's rule (without proofs)-Problems.</p> <p><b>Applications:</b> Application of numerical integration to velocity of a particle and volume of solids. Numerical solution of one-dimensional wave equation, heat equation and two-dimensional Laplace's equation.</p> | 9   | 20MEE31A.2               |
| 3         | <p><b>Statistical Methods and Calculus of Variation:</b> Fitting of the curves of the form <math>y = a + bx</math>, <math>y = a + bx + cx^2</math>, <math>y = ae^{bx}</math>, <math>y = ax^b</math>, and <math>y = ab^x</math> by the method of least square-Problems. Correlation and Regression lines - Problems. Variation of a function and a functional, variational problems, Euler's equation and Isoperimetric problems.</p> <p><b>Applications:</b> Minimal surface of revolution and Hanging cable.</p>   | 9   | 20MEE31A.3               |
| 4         | <p><b>Fourier series:</b> Periodic function, Dirichlet's conditions, Fourier series of periodic functions of period <math>2l</math> and arbitrary period <math>2l</math>, half range series-Problems.</p> <p><b>Applications:</b> Fourier series and half Range Fourier series of periodic square wave, half wave rectifier, full wave rectifier, Saw-tooth wave with graphical representation, practical harmonic analysis-Problems.</p>   | 9   | 20MEE31A.4               |
| 5         | <p><b>Fourier Transforms:</b> Infinite Fourier transforms, Fourier Sine and Cosine transforms, Inverse Fourier sine and cosine transforms.</p> <p>Discrete Fourier Transform and Fast Fourier Transform: Definition of N-Point DFT, problems for 4-points and inverse DFT for four points only. FFT algorithm to compute the Fourier transforms 4-point only.</p>   | 9   | 20MEE31A.5<br>20MEE31A.6 |

#### Assessment Pattern

CIE (50 Marks – Theory)

| Bloom's Category | Tests     | Assignments | Quizzes   |
|------------------|-----------|-------------|-----------|
| <b>Marks</b>     | <b>25</b> | <b>15</b>   | <b>10</b> |
| Remember         | 5         | 5           |           |
| Understand       | 5         | 5           |           |
| Apply            | 10        | 5           | 10        |
| Analyze          | 2.5       |             |           |
| Evaluate         | 2.5       |             |           |
| Create           |           |             |           |

SEE (50 Marks – Theory)

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 10             |
| Understand       | 10             |
| Apply            | 20             |
| Analyze          | 5              |
| Evaluate         | 5              |
| Create           |                |

## LIFE SKILLS FOR ENGINEERS

|                    |                       |
|--------------------|-----------------------|
| <b>Course Code</b> | <b>20HSS322A/422A</b> |
| <b>L: T: P:S</b>   | <b>3:0:0:0</b>        |
| <b>Exams Hours</b> | <b>03</b>             |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>03</b> |
| <b>CIE Marks</b> | <b>50</b> |
| <b>SEE Marks</b> | <b>50</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                         |   |
|-------------------------|---|
| <b>20HSS322A/422A.1</b> | Relate "SMART GOALS" to personal and professional life  |
| <b>20HSS322A/422A.2</b> | Articulate and communicate ideas and thoughts with clarity and focus                                  |
| <b>20HSS322A/422A.3</b> | Develop critical and creative thinking skills for problem solving and decision making for leadership. |
| <b>20HSS322A/422A.4</b> | Analyze the importance of the concepts of personality development and grooming in corporate life      |
| <b>20HSS322A/422A.5</b> | Determine personal and professional responsibility by using ownership task bar                        |

Mapping of Course Outcomes to Program Outcomes:

|                         | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PSO2 |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>20HSS322A/422A.1</b> |     |     |     |     |     |     |     | 3   | 3   | 3    | 3    | 3    |      |      |
| <b>20HSS322A/422A.2</b> |     |     |     |     |     | 3   | 3   | 3   | 3   | 1    | 3    | 3    |      |      |
| <b>20HSS322A/422A.3</b> |     |     |     |     |     | 3   | 3   | 3   | 3   | 3    | 2    | 3    |      |      |
| <b>20HSS322A/422A.4</b> |     |     |     |     |     |     | 3   | 3   | 3   | 3    | 2    | 3    |      |      |
| <b>20HSS322A/422A.5</b> |     |     |     |     |     | 3   | 2   | 3   | 3   | 2    | 3    | 3    |      |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### REFERENCE BOOKS:

- 1) The 7 – Habits of Highly Effective People, Stephen R Covey, Neha Publishers.
- 2) Seven Habits of Highly Effective Teens, Convey Sean, New York, Fireside Publishers, 1998.
- 3) Emotional Intelligence, Daniel Coleman, Bantam Book, 2006.
- 4) How to win friends and influence people, Dale Carnegie
- 5) BHAGAVDGITA for college students Sandeepa Guntreddy

| Module No | Module Contents  | Hrs | COs                                  |
|-----------|--|-----|--------------------------------------|
| 1         | <b>Goal Setting:</b> Importance of Goals: Achiever's goal - Creating SMART for personal and professional life, Right action at right time, career planning, overcoming fear and face uncertainty, Mind Mapping. Communication – Intellectual preparation/Idea generation.  | 6   | 20HSS322A/422A.1<br>20HSS322A/422A.2 |
| 2         | <b>You are the creator</b> - Taking Ownership, Being Responsible and Accountable. Meaning of Ownership, Responsibility and Accountability, Practicing these philosophies in course, career. Social responsibility. Communication – Organizing thought flow.  | 6   | 20HSS322A/422A.2<br>20HSS322A/422A.5 |
| 3         | <b>Self-Awareness and Self-Management:</b> Emotional Intelligence, Know yourself- understanding personality, perception, techniques to understand self – Johari window and SWOT, reason for fall and opportunities to grow. Individual behaviour, attitude towards change and work, being proactive and positive. Interpersonal skills - Knowing others, working well with others. Communication – Structured articulation | 9   | 20HSS322A/422A.2<br>20HSS322A/422A.2 |
| 4         | <b>Leadership:</b> meaning, self- motivation, coming out of comfort zone, mental preparation - accepting failure and resilience, decision making, thinking skills – critical and creative, six thinking hats, watchfulness - proactive risk management, problem solving mind set .Communication – Tips for Jam session, GD and Presentation  | 9   | 20HSS322A/422A.2<br>20HSS322A/422A.3 |
| 5         | <b>Personality Development and Grooming:</b> - Expectations from the industry, building personal presence, corporate grooming, corporate etiquettes, Personal branding and image management. Communication – Mock GD sessions  | 6   | 20HSS322A/422A.2<br>20HSS322A/422A.4 |

### Assessment Pattern

SEE (50 Marks – Theory)

NOTE: Being a Life skills course we felt it would be suitable to do the final assessment through a structured group discussion which will provide an opportunity to test students in all levels of Bloom's Taxonomy.

CIE (50 Marks – Theory)

| Bloom's Category | Tests     | Assignments | Self Study | Peer Evaluation |
|------------------|-----------|-------------|------------|-----------------|
| <b>Marks</b>     | <b>10</b> | <b>15</b>   | <b>15</b>  | <b>10</b>       |
| Remember         |           |             |            |                 |
| Understand       |           |             |            |                 |
| Apply            | 5         | 5           |            | 5               |
| Analyze          |           |             | 5          |                 |
| Evaluate         |           |             |            |                 |
| Create           | 5         | 10          | 10         | 5               |

| Bloom's Category | Group Discussion |
|------------------|------------------|
| Remember         | 5                |
| Understand       | 10               |
| Apply            | 10               |
| Analyze          | 10               |
| Evaluate         | 5                |
| Create           | 10               |

## ENVIRONMENTAL SCIENCE AND AWARENESS

|                    |                       |
|--------------------|-----------------------|
| <b>Course Code</b> | <b>20HSS323A/423A</b> |
| <b>L: T: P:S</b>   | <b>0:0:0:0</b>        |
| <b>Exams Hours</b> | <b>02</b>             |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>00</b> |
| <b>CIE Marks</b> | <b>25</b> |
| <b>SEE Marks</b> | <b>25</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                         |  |
|-------------------------|--|
| <b>20HSS323A/423A.1</b> | Explain the concepts of environment, ecosystem and biodiversity.   |
| <b>20HSS323A/423A.2</b> | Differentiate the use of natural resources for sustainability.   |
| <b>20HSS323A/423A.3</b> | Analyze the control measures of Environmental pollution, the role of Government and NGO in solving Socio-Environmental issues. |
| <b>20HSS323A/423A.4</b> | Apply the Environmental ethics, acts and amendments in protecting Environment and human health.                                |

Mapping of Course Outcomes to Program Outcomes:

|                         | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>20HSS323A/423A.1</b> |     |     |     |     |     | 3   | 3   |     |     |      |      |      |      |      |
| <b>20HSS323A/423A.2</b> |     |     |     |     |     | 3   | 3   |     |     |      |      | 3    | 3    |      |
| <b>20HSS323A/423A.3</b> |     |     |     |     |     | 3   | 3   | 3   |     | 3    |      | 3    | 3    |      |
| <b>20HSS323A/423A.4</b> |     |     |     |     |     | 3   | 3   | 3   |     | 3    |      | 3    | 3    |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) "Environmental Studies: Basic Concepts" by Ahluwalia, V. K. . The Energy and Resources Institute (TERI) Publication, 2nd edition, 2016. ISBN: 817993571X, 9788179935712.
- 2) "Textbook of Environmental Studies for Undergraduate Courses of all branches of Higher Education" by Bharucha, Erach for UGC, New Delhi, 2004. ISBN: 8173715408, 9788173715402.

### **REFERENCE BOOKS:**

- 1) Handbook of Environmental Engineering by Rao Surampalli, Tian C. Zhang, Satinder Kaur Brar, Krishnamoorthy Hegde, Rama Pulicharla, Mausam Verma; McGraw Hill Professional, 2018. ISBN: 125986023X, 9781259860232
- 2) Environmental Science and Engineering by P. Venugopala, Prentice Hall of India Pvt. Ltd, New Delhi, 2012 Edition. ISBN: 978-81-203-2893-8.
- 3) Environmental Science- Working with the earth by G Taylor Miller Jr, Brooks Cole Thompson Publications, 10th Edition. ISBN: 10: 0534424082.
- 4) Elements of Environmental Science and Engineering by P. Meenakshi, Prentice Hall of India Pvt. Ltd, 2005 Edition. ISBN: 8120327748, 9788120327740.

| Module No | Module Contents   | Hrs | COs                                  |
|-----------|---|-----|--------------------------------------|
| 1         | <b>Introduction to Environment, Ecosystem and biodiversity:</b> Environment - Components of Environment, Scope and importance of Environmental studies, Ecosystem: Types & Structure of Ecosystem, Energyflow in the ecosystem, Food chains – food webs & ecological pyramids.<br>Biodiversity – Definition, Hot-spots of biodiversity, Threats to biodiversity, Conservation of biodiversity.                    | 5   | 20HSS323A/423A.1                     |
| 2         | <b>Natural Resources:</b> Renewable and non-renewable resources – Natural resources and associated problems. Role of an individual in conservation of natural resources. Water conservation, rain water harvesting. Balanced use of resources for sustainable lifestyle – strategies.   | 4   | 20HSS323A/423A.2                     |
| 3         | <b>Environmental Pollution:</b> Definition, Causes, effects and control measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise pollution, Thermal Pollution and Nuclear hazards. Role of an individual in prevention of pollution - Waste management – urban and industrial wastes.  | 4   | 20HSS323A/423A.3                     |
| 4         | <b>Social Issues and Environment:</b> Environmental ethics – issues and possible solutions. Environment protection act – Air (prevention and Control of pollution) act & Water (prevention and Control of pollution) act. Role of government: Swatch BharatAbhiyan, National Mission for Clean Ganga (NMCG), River rejuvenation, Role of Non-governmental Organizations (NGOs), Global warming and climatechange. | 4   | 20HSS323A/423A.3<br>20HSS323A/423A.4 |
| 5         | <b>Human Population and Environment:</b> Population growth & explosion, Family welfare programme. Environment and human health, Human rights, Value education. Role of Technology in protecting environment and human health.   | 5   | 20HSS323A/423A.4                     |

#### Assessment Pattern

CIE (50 Marks – Theory)

| Bloom's Category | Tests     | Assignments | Quizzes   |
|------------------|-----------|-------------|-----------|
| <b>Marks</b>     | <b>15</b> | <b>05</b>   | <b>05</b> |
| Remember         | 2         |             |           |
| Understand       | 5         |             | 2         |
| Apply            | 4         | 2           | 3         |
| Analyze          | 4         | 3           |           |
| Evaluate         |           |             |           |
| Create           |           |             |           |

SEE (50 Marks – Theory)

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 5              |
| Understand       | 10             |
| Apply            | 5              |
| Analyze          | 5              |
| Evaluate         |                |
| Create           |                |

## COMPUTER AIDED MACHINE DRAWING

|                    |                     |
|--------------------|---------------------|
| <b>Course Code</b> | <b>19MEE331/431</b> |
| <b>L: T: P:S</b>   | <b>2:0:2:0</b>      |
| <b>Exams Hours</b> | <b>03</b>           |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>04</b> |
| <b>CIE Marks</b> | <b>50</b> |
| <b>SEE Marks</b> | <b>50</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                       |   |
|-----------------------|---|
| <b>19MEE331/431.1</b> | Apply the principle of first angle projection system to the engineering components  |
| <b>19MEE331/431.2</b> | Analyze the dimensions of mating parts for developing assembly drawings   |
| <b>19MEE331/431.3</b> | Develop the 3D assembly drawing with the use of modern tools  |
| <b>19MEE331/431.4</b> | Communicate through 2D/3D assembly drawings for effective design and drawing documentation with GD&T support                |
| <b>19MEE331/431.5</b> | Investigate the complex, combinations of rotary and reciprocating component assemblies and develop 2D model of the same     |
| <b>19MEE331/431.6</b> | Apply the knowledge of temporary joints in the complex engineering assemblies and document the same using modern tool usage |

Mapping of Course Outcomes to Program Outcomes:

|                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PSO2 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19MEE331/431.1</b> | 3   |     |     |     |     |     |     |     |     |      |      |      |      |      |
| <b>19MEE331/431.2</b> | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    | 3    |      |
| <b>19MEE331/431.3</b> |     | 3   | 2   |     | 2   |     |     |     |     |      |      |      |      | 2    |
| <b>19MEE331/431.4</b> | 3   | 3   |     |     |     |     |     |     |     | 1    |      |      |      |      |
| <b>19MEE331/431.5</b> | 3   | 3   | 2   |     | 2   |     |     |     |     |      |      |      | 3    |      |
| <b>19MEE331/431.6</b> | 3   | 3   |     |     | 2   |     |     |     |     |      |      |      | 3    | 2    |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) Machine Drawing- K.R. Gopala Krishna, Subhash publications. ISBN-13 9789383214235
- 2) Machine Drawing- Dhawan, S.Chand Publications, 2nd Ed, ISBN 9788121908245.

### **REFERENCE BOOKS:**

- 1) Machine Drawing, ND Bhat, Charotar publication house, 49th Ed, ISBN-13: 978-9380358888
- 2) Theory of Machines, S S Rattan, Tata McGraw – Hill Publishing Company Limited, 4th Edition, 2014, ISBN: 9789351343479
- 3) Machine Drawing- K.L. Narayana, P.Kannaiah & K.Venkata Reddy, New Age Publishers,4th Ed, 2017, ISBN-13: 978-8122440546

| Module No  | Module Contents  | Hrs | COs                              |
|--|--|-----|----------------------------------|
| 1  | <b>Sections of Solids:</b> Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on axis inclinations, spheres and hollow solids), True shape of sections<br><b>Orthographic Views:</b> Conversion of pictorial views into orthographic projections of simple machine parts with or without section. (BIS conventions are to be followed for the drawings) Hidden line conventions, Precedence of lines (Only Sketching) | 8   | 19MEE331/431.1<br>19MEE331/431.2 |
| 2  | <b>Thread Forms &amp; Fasteners:</b> Thread terminology, Popular forms of screw threads, simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw<br>Riveted joints: Forms and proportions of rivet heads, Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets)(Software Drafting)              | 8   | 19MEE331/431.6                   |
| 3  | <b>Limits, Fits and Tolerances:</b> General aspects, Nominal size and basic dimensions, Definitions, Basis of fit or limit system, Systems of specifying tolerances, Designation of holes, Shafts and fits, Need of Geometrical Tolerance, Geometrical characteristics of symbols, Indication of Geometrical Tolerance, Surface finish representation (Theory/Numerical Question)  | 8   | 19MEE331/431.3                   |
| 4  | <b>Cams &amp; Followers:</b> Types of cams and followers, follower motions of SHM, Uniform acceleration & retardation, uniform velocity and cycloidal motion. Disc cams with reciprocating follower having knife edge and roller (only inline).  | 8   | 19MEE331/431.5                   |
| 5  | <b>Assembly Drawings:</b> Screw jack, Plummer block, Machine vice, Tailstock of lathe, Tool head of a shaper, I.C. Engine connecting rod, Rams Bottom Safety Valve, Drilling jig (Sketching + Software Drafting)   | 12  | 19MEE331/431.4                   |
| <b>NOTE:</b> In the Semester End Examination, the examiner will set ONE question from each module 1 to 4 and TWO questions from Module 5. The students will be required to attempt first FOUR questions compulsory and any ONE question from module-5. |  |     |                                  |

#### Assessment Pattern

CIE (50 Marks – Theory)

| Bloom's Category | Tests | Assignments | Report |
|------------------|-------|-------------|--------|
| Marks            | 25    | 10          | 15     |
| Remember         |       |             |        |
| Understand       | 5     |             | 5      |
| Apply            | 5     | 5           |        |
| Analyze          | 5     | 5           | 5      |
| Evaluate         | 5     |             |        |
| Create           | 5     | 5           |        |

SEE (50 Marks – Theory)

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 10             |
| Understand       | 10             |
| Apply            | 10             |
| Analyze          | 10             |
| Evaluate         | 10             |
| Create           |                |

## CASTING, FORGING & JOINING TECHNOLOGY

|                    |                     |
|--------------------|---------------------|
| <b>Course Code</b> | <b>19MEE341/441</b> |
| <b>L: T: P:S</b>   | <b>3:0:0:0</b>      |
| <b>Exams Hours</b> | <b>03</b>           |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>03</b> |
| <b>CIE Marks</b> | <b>50</b> |
| <b>SEE Marks</b> | <b>50</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                       |   |
|-----------------------|---|
| <b>19MEE341/441.1</b> | Understand various manufacturing processes relevant to casting, forging and joining techniques.   |
| <b>19MEE341/441.2</b> | Determine the affect of gates, riser and runners in foundry operations for suitable applications. |
| <b>19MEE341/441.3</b> | Select the suitable moulding and casting processes  |
| <b>19MEE341/441.4</b> | Recommend the suitable type of melting furnaces.  |
| <b>19MEE341/441.5</b> | Empathize various concepts of forging and joining techniques for required materials.              |
| <b>19MEE341/441.6</b> | Identify various defects in casting, forging and joining process through NDT methods.             |

Mapping of Course Outcomes to Program Outcomes:

|                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PS02 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19MEE341/441.1</b> | 3   |     |     |     |     |     |     |     |     |      |      |      | 3    |      |
| <b>19MEE341/441.2</b> | 3   |     |     |     |     |     |     |     |     |      |      |      | 3    |      |
| <b>19MEE341/441.3</b> | 3   |     |     |     |     |     |     |     |     |      |      |      | 3    |      |
| <b>19MEE341/441.4</b> | 3   |     |     |     |     |     |     |     |     |      |      |      | 3    |      |
| <b>19MEE341/441.5</b> | 3   | 2   | 2   |     |     |     |     |     |     |      |      |      | 3    | 2    |
| <b>19MEE341/441.6</b> | 3   |     |     |     |     |     |     |     |     |      |      |      | 3    |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) Manufacturing Process-I, Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2013. ISBN:978-8128002076
- 2) Manufacturing & Technology: Foundry Forming and Welding”, P.N.Rao,Volume1.Tata McGraw Hill Education Private Limited, 2013, ISBN 13:978-9383286614
- 3) Principles of metal casting, R.W Heine, C.R. Loyer, McGraw Hills Pvt limited ,2017 ISBN:978-0070993488

### **REFERENCE BOOKS:**

- 1) Process and Materials of Manufacturing, Roy A Lindberg, Pearson Edu, 4thEd. 2006, ISBN-13:978-0205118175.
- 2) Manufacturing Technology, SeropeKalpakjian, Steuen. R. Sechmid, Pearson Education Asia, 7th Ed. 2013, ISBN -13:978-9810694067.
- 3) Manufacturing Process-III, Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2013, ISBN:9788128010439



| Module No | Module Contents   | Hrs | COs  |
|-----------|---|-----|--|
| 1         | <p><b>Introduction:</b> Concept of Manufacturing process, its importance Classification of Manufacturing processes. Introduction to Casting process &amp; steps involved. Components produced by casting process. Advantages &amp; Limitations of casting process.</p> <p><b>Patterns:</b> Definition, functions, Materials used for pattern, various pattern allowances and their importance. Classification of patterns, BIS color coding of Patterns. Binder: Definition, Types of binder used in moulding sand. Additives: Need, Types of additives used and their properties</p>   | 10  | 19MEE341/441.1                                     |
| 2         | <p><b>Moulding sand:</b> mixture ingredients for different sand mixtures. Method used for sand moulding, such as Greensand, dry sand and skin dried moulds.</p> <p><b>Cores:</b> Definition, Need, Types. Method of making cores, Binders used, core sand moulding. Concept of Gating &amp; Risers: Principle and types.</p> <p><b>Fettling and cleaning of castings:</b> Basic steps, Casting defects, Causes, features and remedies. Inspection Methods – Methods used for Inspection of casting and welding. Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography, Eddy current, Holography methods of Inspection.</p> | 10  | 19MEE341/441.2<br>19MEE341/441.4<br>19MEE341/441.6 |
| 3         | <p><b>Special moulding Process:</b> Study of important moulding processes, No bake moulds, Flask less moulds, Sweep mould, CO2 mould, Shell mould, Investment mould. Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Squeeze Casting, Slush casting, Thixo-casting and Continuous Casting Processes. Moulding Machines: Jolt type, Squeeze type, Jolt &amp; Squeeze type and Sand slinger, classifications of Melting Furnaces.</p>   | 10  | 19MEE341/441.3                                     |
| 4         | <p><b>Welding process:</b> Principle of welding, classification, application advantages and disadvantages, welding terminology, edge preparation.</p> <p><b>Arc welding:</b> Arc welding process, Metal arc welding(MAW) or Flux shielded metal arc welding(FSAW), Tungsten inert gas welding(TIG), Metal inert gas welding(MIG), Submerged arc welding(SAW), Atomic hydrogen welding(AHW).</p> <p><b>Soldering and Brazing:</b> Surface cleaning and soldering flux, Types of soldering, advantages and disadvantages, types of brazing, advantages and disadvantages.</p>   | 8   | 19MEE341/441.4<br>19MEE341/441.5<br>19MEE341/441.6 |
| 5         | <p><b>Forging:</b> Introduction, Classification of forging processes. Forging machines &amp; equipment. Forging pressure and load in open die forging and closed die forging, concepts of friction hill and factors affecting it. Die- design parameters. Material flow lines in forging. Forging defects, Residual stresses in forging. Advantages and disadvantages of forging. Simple problems.</p>  | 6   | 19MEE341/441.3                                     |

**Assessment Pattern**

CIE (50 Marks – Theory)

| <b>Bloom's Category</b> | <b>Tests</b> | <b>Assignments</b> | <b>Quizzes</b> |
|-------------------------|--------------|--------------------|----------------|
| <b>Marks</b>            | <b>25</b>    | <b>15</b>          | <b>10</b>      |
| Remember                | 2            |                    |                |
| Understand              | 3            |                    |                |
| Apply                   | 8            | 5                  | 5              |
| Analyze                 | 8            | 5                  | 5              |
| Evaluate                | 4            | 5                  |                |
| Create                  |              |                    |                |

SEE (50 Marks – Theory)

| <b>Bloom's Category</b> | <b>Tests (theory)</b> |
|-------------------------|-----------------------|
| Remember                | 5                     |
| Understand              | 5                     |
| Apply                   | 15                    |
| Analyze                 | 15                    |
| Evaluate                | 10                    |
| Create                  |                       |

## MECHANICS OF MATERIALS

|             |              |
|-------------|--------------|
| Course Code | 19MEE351/451 |
| L: T: P:S   | 2:1:0:0      |
| Exams Hours | 03           |

|           |    |
|-----------|----|
| Credits   | 03 |
| CIE Marks | 50 |
| SEE Marks | 50 |

Course Outcomes: At the end of the Course, the student will be able to:

|                |  |
|----------------|--|
| 19MEE351/451.1 | Analyze the simple stresses and strains induced in various bars of different cross sections. Also understand the various mechanical properties of materials in the design of structural members. |
| 19MEE351/451.2 | Determine the shear force, bending moment and draw the shear force and bending moment diagrams so as to identify the behavior of beams under various lateral loads.                              |
| 19MEE351/451.3 | Analyze the structural members subjected to bending and shear loads.   |
| 19MEE351/451.4 | Develop an understanding of analytic methods used in connection with the structural design of columns.   |
| 19MEE351/451.5 | Design of circular shafts subjected to torsional loads and also elucidate the stresses and strains in thick and thin cylindrical pressure vessels.   |
| 19MEE351/451.6 | Apply structural mechanics of deformable bodies to solve engineering problems.   |

Mapping of Course Outcomes to Program Outcomes:

|                | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| 19MEE351/451.1 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      |      | 3    |
| 19MEE351/451.2 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      |      | 3    |
| 19MEE351/451.3 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      |      | 3    |
| 19MEE351/451.4 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      |      | 3    |
| 19MEE351/451.5 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      |      | 3    |
| 19MEE351/451.6 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      |      | 3    |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) Ferdinand Beer & Russell Johnston., 'Mechanics of Materials', McGraw Hill India, 7th Edition, 2016, ISBN- (13 digits): 9789339217624.
- 2) Ramamrutham S., 'Strength of Materials', Dhanpat Rai Publishing Co Pvt Ltd, 6th Edition, 2017, ISBN-(13 digits): 978-9352164387; ISBN-(10 digits): 9352164385

### **REFERENCE BOOKS:**

- 1) R C Hibbeler., 'Mechanics of Materials', Pearson Education, 9th Edition, 2018, ISBN-(13 digits): 978- 9332584037; ISBN-(10 digits): 9332584036.
- 2) James M. Gere, Barry J. Goodno., 'Mechanics of Materials', Cengage Learning, 8th Edition, 2014, ISBN-(13 digits): 9788131524749.
- 3) S S Rattan., 'Strength of Materials', McGraw Hill India, 2nd Edition, 2011, ISBN-(13 digits): 978-0071072564; ISBN-(10 digits): 007107256X

| Module No | Module Contents   | Hrs | COs  |
|-----------|---|-----|--|
| 1         | <b>Simple Stress and Strain:</b> Assumptions in MOM, stress, strain, mechanical properties of materials, Linear elasticity, Hooke's Law and Poisson's ratio, Stress-Strain curve for Mild steel, cast iron and Aluminum. Extension /Shortening of a bar, bars with cross section varying in steps, bars with continuously varying cross sections (circular and rectangular), Elongation due to self weight, Principle of super position, Thermal Stresses(No Numericals),elastic constants(only definition).  | 7   | 19MEE351/451.1<br>19MEE351/451.6                   |
| 2         | <b>Bending Moment and Shear Force Diagrams:</b> Introduction, Types of beams, loads and reactions, shear forces and bending moments, Rate of loading, sign conventions, relationship between shear force and bending moments. Shear force and bending moment diagrams for different beams subjected to concentrated loads, uniformly distributed load, (UDL) uniformly varying load (UVL) and couple for different types of beams.  | 6   | 19MEE351/451.2<br>19MEE351/451.6                   |
| 3         | <b>Bending and Shear Stresses in Beams:</b> Introduction, Theory of simple bending, assumptions in simple bending. Bending stress equation, relationship between bending stress and radius of curvature, relationship between bending moment and radius of curvature. Moment carrying capacity of a section. Shearing stresses in beams, shear stress across rectangular, circular, symmetrical I and T sections  | 7   | 19MEE351/451.3<br>19MEE351/451.6                   |
| 4         | <b>Deflection of Beams:</b> Introduction, Differential equation for deflection. Equations for deflection, slope and bending moment. Double integration method for cantilever and simply supported beams for point load, UDL, UVL and Couple, Macaulay's method.<br><b>Elastic Stability of Columns:</b> Introduction, Columns and struts, slenderness ratio, Classification of columns, buckling load or critical load, Sign conventions, Euler's theory of buckling, Effective length for various boundary conditions, Limitations of Euler's theory, Rankine formula, numericals. | 7   | 19MEE351/451.3<br>19MEE351/451.4<br>19MEE351/451.6 |
| 5         | <b>Torsion of Circular Shafts:</b> Introduction, Pure torsion, assumptions, derivation of torsional equations, polar modulus, Torsional rigidity / stiffness of shafts. Power transmitted by solid and hollow circular shafts Thick and Thin Cylinder: Stresses in thin cylinders, changes in dimensions of cylinder (diameter, length and volume). Thick cylinders - Lamé's equation, Problems on Lamé's equation.   | 6   | 19MEE351/451.5<br>19MEE351/451.6                   |

#### Assessment Pattern

CIE (50 Marks – Theory)

| Bloom's Category | Tests     | Assignments | Quizzes   |
|------------------|-----------|-------------|-----------|
| <b>Marks</b>     | <b>25</b> | <b>15</b>   | <b>10</b> |
| Remember         | 4         |             |           |
| Understand       | 4         |             |           |
| Apply            | 6         | 3           | 5         |
| Analyze          | 8         | 7           | 5         |

SEE (50 Marks – Theory)

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 8              |
| Understand       | 7              |
| Apply            | 15             |
| Analyze          | 15             |

|          |   |   |  |
|----------|---|---|--|
| Evaluate | 3 | 5 |  |
| Create   |   |   |  |

|          |   |
|----------|---|
| Evaluate | 5 |
| Create   |   |

**MATERIAL SCIENCE AND METALLURGY**

|                    |                     |
|--------------------|---------------------|
| <b>Course Code</b> | <b>19MEE361/461</b> |
| <b>L: T: P:S</b>   | <b>3:0:0:0</b>      |
| <b>Exams Hours</b> | <b>03</b>           |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>03</b> |
| <b>CIE Marks</b> | <b>50</b> |
| <b>SEE Marks</b> | <b>50</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                       |   |
|-----------------------|---|
| <b>19MEE361/461.1</b> | Distinguish and identify the different materials, defects, their processing techniques and heat treatments methods  |
| <b>19MEE361/461.2</b> | Analyze material structure-property relationship; carry out modifications of engineering materials to perform in a specific applications                          |
| <b>19MEE361/461.3</b> | Apply the suitable processing technology in manufacturing of ceramics   |
| <b>19MEE361/461.4</b> | Recommend the suitable type of Heat treatment which helps in various applications such as tools and dies, crankshafts, connecting rods, fabrications, springs etc |
| <b>19MEE361/461.5</b> | Select different ferrous and nonferrous metals, alloys, non metal for specific applications   |
| <b>19MEE361/461.6</b> | Apply the concept of powder metallurgy based on its characteristics   |

Mapping of Course Outcomes to Program Outcomes:

|                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PSO2 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19MEE361/461.1</b> | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    |      |      |
| <b>19MEE361/461.2</b> | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    |      |      |
| <b>19MEE361/461.3</b> | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    | 2    |      |
| <b>19MEE361/461.4</b> | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    |      |      |
| <b>19MEE361/461.5</b> | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    |      |      |
| <b>19MEE361/461.6</b> | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    | 2    |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

**TEXT BOOKS:**

- 1) "Introduction to Physical Metallurgy" Sidney H Avner, McGraw Hill Education, 1997, ISBN 13: 9780074630068.
- 2) Fundamentals of Material Science and Engineering" David G Rethwisch William D Callister Jr. Rethwisch Callister, John Wiley & Sons Publishers, 4th Edition, 2012, ISBN13: 978111806160

**REFERENCE BOOKS:**

- 1) "Materials Science and Engineering", V.RAGHAVAN, PHI Learning, 2004, ISBN: 9788120324558
- 2) "Engineering Materials", Kenneth G. Budinski, Michael K. Budinski, Prentice Hall, 9 edition, 2010, ISBN: 9780137128426

| Module No | Module Contents  | Hrs | COs  |
|-----------|--|-----|--|
| 1         | <b>Crystal Structure:</b> BCC, FCC and HCP Structures, coordination number and atomic packing factors, Derivation of APF for BCC, FCC & HCP structures, crystal imperfections - point line and surface imperfections. Simple problems.<br><b>Atomic Diffusion:</b> Phenomenon, Ficks laws of diffusion, factors affecting diffusion. Simple problems.  | 7   | <b>19MEE361/461.1</b><br><b>19MEE361/461.2</b> |
| 2         | <b>Phase Diagram I:</b> Solid solutions, Hume Rothary rule, substitutional, and interstitial solid solutions, intermediate phases, Gibbs phase rule.<br><b>Phase Diagram II</b> Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Different types invariant reactions – Eutectic, Eutectoid, Peritectic, Peritectoid reactions   | 7   | <b>19MEE361/461.2</b>                          |
| 3         | <b>Iron carbon equilibrium diagram</b> : Description of phases, solidification of steels and cast irons, invariant reactions.<br>Heat treating of metals TTT curves, continuous cooling curves, description of the following heat treatment processes with industrial applications: annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, Flame hardening, induction hardening. | 7   | <b>19MEE361/461.5</b>                          |
| 4         | <b>Engineering materials:</b> Properties, Composition and Applications of Grey cast iron, White cast Iron, malleable iron, SG iron and steels, Copper & Aluminium alloys. Titanium and Magnesium alloys.   | 6   | <b>19MEE361/461.3</b><br><b>19MEE361/461.5</b> |
| 5         | <b>Ceramics:</b> Introduction to ceramics, nature of ceramics, types of ceramics, properties of ceramics materials, ceramic forming techniques, applications of ceramics.<br><b>Powder Metallurgy:</b> Definition and concept, applications, powder metallurgy process, Production of metal powders, characteristics of metal powders, compacting, pre sintering and sintering.  | 6   | <b>19MEE361/461.6</b>                          |

#### Assessment Pattern

CIE (50 Marks – Theory)

| Bloom's Category | Tests     | Assignments | Quizzes   |
|------------------|-----------|-------------|-----------|
| <b>Marks</b>     | <b>25</b> | <b>15</b>   | <b>10</b> |
| Remember         | 3         |             |           |
| Understand       | 3         |             |           |
| Apply            | 7         | 5           | 5         |
| Analyze          | 7         | 5           | 5         |
| Evaluate         | 3         | 5           |           |
| Create           | 2         |             |           |

SEE (50 Marks – Theory)

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 5              |
| Understand       | 5              |
| Apply            | 15             |
| Analyze          | 10             |
| Evaluate         | 10             |
| Create           | 5              |

## CASTING, FORGING & JOINING TECHNOLOGY LAB

|                    |                     |
|--------------------|---------------------|
| <b>Course Code</b> | <b>19MEL341/441</b> |
| <b>L: T: P:S</b>   | <b>0:0:2:0</b>      |
| <b>Exams Hours</b> | <b>03</b>           |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>02</b> |
| <b>CIE Marks</b> | <b>25</b> |
| <b>SEE Marks</b> | <b>25</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                       |   |
|-----------------------|---|
| <b>19MEL341/441.1</b> | Comprehend the significance of essential properties of sand towards mold preparation.                                 |
| <b>19MEL341/441.2</b> | Utilize the patterns of different geometrical shapes for mold making and volumetric calculation in forging processes. |
| <b>19MEL341/441.3</b> | Analyze the properties of sand by determining the permeability test and hardness test.                                |
| <b>19MEL341/441.4</b> | Develop the skill towards metal joining techniques.   |

Mapping of Course Outcomes to Program Outcomes:

|                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19MEL341/441.1</b> | 3   |     |     |     |     |     |     |     |     |      |      |      | 3    |      |
| <b>19MEL341/441.2</b> | 3   |     |     |     |     |     |     |     |     |      |      |      | 3    |      |
| <b>19MEL341/441.3</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      | 3    |      |
| <b>19MEL341/441.4</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      | 3    |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) Manufacturing Process-I, Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2013.ISBN:978-8128002076
- 2) Manufacturing & Technology, Foundry Forming and Welding”, P.N.Rao,Volume1.Tata McGraw Hill Education Private Limited, 2013, ISBN 13:978-9383286614
- 3) Principles of metal casting, R.W Heine, C.R. Loyer, McGraw Hills Pvt limited ,2017 ISBN:978- 0070993488

### **REFERENCE BOOKS:**

- 4) Process and Materials of Manufacturing, Roy A Lindberg, Pearson Edu, 4thEd. 2006,ISBN-13:978-0205118175.
- 5) Manufacturing Technology, Serope Kalpakjian, Steuen.R.Sechmid, Pearson Education Asia, 7th Ed. 2013, ISBN -13:978-9810694067.
- 6) Manufacturing Process-III, Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2013, ISBN:9788128010439

| Exp. No. | Contents of Experiment  | Hrs | COs            |
|----------|---|-----|----------------|
| 1        | <b>Foundry Models:</b><br>Model 1- Preparation of moulds using two moulding boxes with pattern      | 2   | 19MEL341/441.1 |
| 2        | Model 2- Preparation of moulds using two moulding boxes without pattern                             | 2   | 19MEL341/441.2 |
| 3        | Model 3- Preparation of moulds using two moulding boxes without pattern                             | 2   | 19MEL341/441.2 |
| 4        | <b>Sand Testing:</b><br>Compression, shear and tensile tests using Universal sand testing machine   | 1   | 19MEL341/441.3 |
| 5        | Permeability test and Core hardness   | 2   | 19MEL341/441.3 |
| 6        | Sieve analysis test and Mould hardness test   | 2   | 19MEL341/441.3 |
| 7        | Clay content test and Moisture content test   | 1   | 19MEL341/441.3 |
| 8        | <b>Joining Models:</b><br>Model 1- Soldering, Model 2- Brazing, Model 3- Electric Arc & gas welding | 2   | 19MEL341/441.4 |
| 9        | <b>Forging Models:</b><br>Model 1- Converting round rod to square rod                               | 2   | 19MEL341/441.4 |
| 10       | Model 2 - Converting square rod to Nail, Model 3- L -bending  | 2   | 19MEL341/441.4 |
| 11       | Demonstration of melting and pouring for casting.   | 2   | 19MEL341/441.4 |

#### Assessment Pattern

CIE (25 Marks – Lab)

| Bloom's Category | Experiments / Tests | Record | Viva |
|------------------|---------------------|--------|------|
| Marks            | 10                  | 10     | 5    |
| Remember         |                     |        | 1    |
| Understand       |                     | 2      | 1    |
| Apply            |                     | 2      | 1    |
| Analyze          | 5                   | 2      | 1    |
| Evaluate         | 5                   | 4      | 1    |
| Create           |                     |        |      |

SEE (25 Marks – Lab)

| Bloom's Category | Test |
|------------------|------|
| Remember         | 5    |
| Understand       | 5    |
| Apply            | 5    |
| Analyze          | 5    |
| Evaluate         | 5    |
| Create           |      |



## MECHANICS OF MATERIALS LAB

|             |              |
|-------------|--------------|
| Course Code | 19MEL351/451 |
| L: T: P:S   | 0:0:1:0      |
| Exams Hours | 03           |

|           |    |
|-----------|----|
| Credits   | 01 |
| CIE Marks | 25 |
| SEE Marks | 25 |

Course Outcomes: At the end of the Course, the student will be able to:

|                |   |
|----------------|---|
| 19MEL351/451.1 | Apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.  |
| 19MEL351/451.2 | Understand the function on multi-disciplinary teams in the area of materials testing stresses and strains in the members subjected to axial, bending and torsional loads. |
| 19MEL351/451.3 | Use the techniques, skills and modern engineering tools necessary for engineering toward effectively communicate the mechanical properties of materials.                  |
| 19MEL351/451.4 | Understanding of professional and ethical responsibility in the areas of material testing.  |

Mapping of Course Outcomes to Program Outcomes:

|                | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| 19MEL351/451.1 | 3   | 3   | 3   |     |     |     |     |     |     |      |      |      | 3    |      |
| 19MEL351/451.2 | 3   | 3   | 3   |     |     |     |     |     | 1   |      |      |      | 3    | 3    |
| 19MEL351/451.3 | 3   | 3   | 3   |     | 2   |     |     |     |     | 2    |      |      | 3    | 3    |
| 19MEL351/451.4 | 3   | 3   | 3   |     |     | 2   |     | 2   |     |      |      |      | 3    |      |

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

### TEXT BOOKS:

- 1) Ferdinand Beer & Russell Johnston., 'Mechanics of Materials', McGraw Hill India, 7th Edition, 2016, ISBN-(13 digits): 9789339217624.
- 2) Ramamrutham S., 'Strength of Materials', Dhanpat Rai Publishing Co Pvt Ltd, 6th Edition, 2017, ISBN-(13 digits): 978-9352164387; ISBN-(10 digits): 9352164385.

### REFERENCE BOOKS:

- 3) R C Hibbeler., 'Mechanics of Materials', Pearson Education, 9th Edition, 2018, ISBN-(13 digits): 978-9332584037; ISBN-(10 digits): 9332584036.
- 4) James M. Gere, Barry J. Goodno., 'Mechanics of Materials', Cengage Learning, 8th Edition, 2014, ISBN-(13 digits): 9788131524749.
- 5) S S Rattan., 'Strength of Materials', McGraw Hill India, 2nd Edition, 2011, ISBN-(13 digits): 978-0071072564; ISBN-(10 digits): 007107256X.

| Exp. No. | Contents of Experiment   | Hrs | COs            |
|----------|--|-----|----------------|
| 1        | Determining the hardness number of aluminum specimen using Brinell hardness test   | 2   | 19MEL351/451.1 |
| 2        | Evaluating the hardness number of hardened steel specimen using Vickers' hardness test   | 2   | 19MEL351/451.1 |
| 3        | To determine the hardness number of mild steel/cast iron specimen using Rockwell hardness test.  | 2   | 19MEL351/451.2 |
| 4        | To determine the ultimate shear strength of the given specimen in single and double shear using UTM  | 3   | 19MEL351/451.2 |
| 5        | To determine the moment of inertia, modulus of elasticity and maximum bending stress of wood specimen by conducting bending test.  | 2   | 19MEL351/451.3 |
| 6        | To determine the compressive strength, modulus of elasticity, % reduction in length and % increase in area of mild steel specimen by conducting compression test on universal testing machine. | 3   | 19MEL351/451.3 |
| 7        | To determine the impact energy and strength of notched specimen using Izod test  | 2   | 19MEL351/451.3 |
| 8        | To determine the impact energy and strength of notched specimen using Charpy test  | 2   | 19MEL351/451.4 |
| 9        | To determine the modulus of rigidity, Torsional strength and modulus of toughness of mild steel specimen using torsion test  | 2   | 19MEL351/451.4 |
| 10       | To determine the elastic strength, ultimate tensile strength, modulus of toughness and young's modulus of mild steel specimen by conducting tensile test on universal testing machine.         | 2   | 19MEL351/451.4 |

#### Assessment Pattern

CIE (25 Marks – Lab)

| Bloom's Category | Experiments / Tests | Record | Viva |
|------------------|---------------------|--------|------|
| Marks            | 10                  | 10     | 5    |
| Remember         |                     |        | 1    |
| Understand       |                     |        | 1    |
| Apply            |                     |        | 1    |
| Analyze          | 5                   | 4      | 1    |
| Evaluate         | 5                   | 4      | 1    |
| Create           |                     | 2      |      |

SEE (25 Marks – Lab)

| Bloom's Category | Test |
|------------------|------|
| Remember         | 2    |
| Understand       | 2    |
| Apply            | 1    |
| Analyze          | 10   |
| Evaluate         | 10   |
| Create           |      |

## MATERIAL SCIENCE AND METALLURGY LAB

|             |              |
|-------------|--------------|
| Course Code | 19MEL361/461 |
| L: T: P:S   | 0:0:1:0      |
| Exams Hours | 03           |

|           |    |
|-----------|----|
| Credits   | 01 |
| CIE Marks | 25 |
| SEE Marks | 25 |

Course Outcomes: At the end of the Course, the student will be able to:

|                |   |
|----------------|---|
| 19MEL361/461.1 | Prepare ferrous and nonferrous specimens for microstructure analysis and Identify the grain boundaries and crystal structure of materials |
| 19MEL361/461.2 | Observe and examine the microstructure details of Ferrous and nonferrous materials before and after heat treatment                        |
| 19MEL361/461.3 | Identify the surface defects through NDT techniques for ferrous and nonferrous materials  |
| 19MEL361/461.4 | Determine the Coating thickness of ferrous and non-ferrous materials and Scratch hardness number of ferrous and non-ferrous materials     |

Mapping of Course Outcomes to Program Outcomes:

|                | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| 19MEL361/461.1 | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    | 2    |      |
| 19MEL361/461.2 | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    | 2    |      |
| 19MEL361/461.3 | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    | 2    |      |
| 19MEL361/461.4 | 3   | 3   | 2   |     |     |     |     |     |     |      |      | 2    | 2    |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### TEXT BOOKS:

- 1) "Introduction to Physical Metallurgy" Sidney H Avner, Mcgraw Hill Education, 1997,ISBN 13: 9780074630068.
- 2) Fundamentals of Material Science and Engineering" David G Rethwisch William D Callister Jr. Rethwisch Callister , John Wiley & Sons Publishers, 4th Edition, 2012, ISBN13: 978111806160

### REFERENCE BOOKS:

- 1) "Materials Science and Engineering", V.RAGHAVAN, PHI Learning, 2004, ISBN: 9788120324558
- 2) "Engineering Materials", Kenneth G. Budinski, Michael K. Budinski, Prentice Hall, 9 edition, 2010, ISBN: 9780137128426

| Exp. No. | Contents of Experiment  | Hrs | COs            |
|----------|---|-----|----------------|
| 1        | Preparation of specimen for metallographic examination and identification of microstructures of ferrous materials.                  | 2   | 19MEL361/461.1 |
| 2        | Preparation of specimen for metallographic examination and identification of microstructures of non-ferrous materials.              | 2   | 19MEL361/461.1 |
| 3        | Preparation of heat treated specimen for metallographic examination and identification of microstructures of ferrous materials.     | 2   | 19MEL361/461.2 |
| 4        | Preparation of heat treated specimen for metallographic examination and identification of microstructures of non-ferrous materials. | 2   | 19MEL361/461.2 |
| 5        | Determination of defects in given material using magnetic crackdetector.  | 2   | 19MEL361/461.3 |
| 6        | Determination of cracks in given material using dye penetrant test.   | 2   | 19MEL361/461.3 |
| 7        | Determination of coating thickness for ferrous Materials.   | 2   | 19MEL361/461.3 |
| 8        | Determination of coating thickness for non- ferrous materials.  | 2   | 19MEL361/461.4 |
| 9        | Scratch testing of Ferrous materials using scratch hardness tester.   | 3   | 19MEL361/461.4 |
| 10       | Scratch testing of Non-ferrous materials using scratch hardnesstester.  | 2   | 19MEL361/461.4 |

#### Assessment Pattern

CIE (25 Marks – Lab)

| Bloom's Category | Experiments / Tests | Record    | Viva     |
|------------------|---------------------|-----------|----------|
| <b>Marks</b>     | <b>10</b>           | <b>10</b> | <b>5</b> |
| Remember         | 2                   |           |          |
| Understand       | 1                   | 1         |          |
| Apply            | 3                   | 4         | 3        |
| Analyze          | 3                   | 4         | 1        |
| Evaluate         | 1                   | 1         | 1        |
| Create           |                     |           |          |

SEE (25 Marks – Lab)

| Bloom's Category | Test |
|------------------|------|
| Remember         | 5    |
| Understand       | 3    |
| Apply            | 7    |
| Analyze          | 7    |
| Evaluate         | 3    |
| Create           |      |

# **FOURTH SEMESTER SYLLABUS**

### APPLIED MATHEMATICS – III

|                    |                 |
|--------------------|-----------------|
| <b>Course Code</b> | <b>20MEE41A</b> |
| <b>L: T: P:S</b>   | <b>2:1:0:0</b>  |
| <b>Exams Hours</b> | <b>03</b>       |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>03</b> |
| <b>CIE Marks</b> | <b>50</b> |
| <b>SEE Marks</b> | <b>50</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                   |   |
|-------------------|---|
| <b>20MEE41A.1</b> | Solve initial value problems using appropriate numerical methods  |
| <b>20MEE41A.2</b> | Learn the concepts of Complex variables and transformation for solving Engineering Problems                     |
| <b>20MEE41A.3</b> | Know the concepts of complex integration and its applications in the stability analysis of engineering problems |
| <b>20MEE41A.4</b> | Gain ability to use probability distributions to analyze and solve real time problems                           |
| <b>20MEE41A.5</b> | Apply the concept of sampling distribution to solve engineering problems  |
| <b>20MEE41A.6</b> | Use the concepts to analyze the data to make decision about the hypothesis                                      |

Mapping of Course Outcomes to Program Outcomes:

|                   | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PS02 |
|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>20MEE41A.1</b> | 3   | 3   | 3   | 3   | 3   |     | 1   |     |     |      | 3    | 3    |      | 2    |
| <b>20MEE41A.2</b> |     | 3   |     |     | 3   |     |     |     |     |      | 3    | 3    |      | 2    |
| <b>20MEE41A.3</b> |     | 3   |     |     | 3   |     |     |     |     |      | 3    | 3    |      | 2    |
| <b>20MEE41A.4</b> | 3   | 3   | 3   | 3   | 3   | 2   |     |     | 3   | 3    | 3    | 3    |      | 2    |
| <b>20MEE41A.5</b> | 3   | 3   | 3   | 3   | 3   |     |     |     |     | 3    | 3    | 3    |      | 2    |
| <b>20MEE41A.6</b> | 3   | 3   | 3   | 3   | 3   |     |     |     |     | 3    | 3    | 3    |      | 2    |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

#### **TEXT BOOKS:**

- 1) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
- 2) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014, ISBN: 978-81-7409-195-5.

#### **REFERENCE BOOKS:**

- 1) Glyn James, Modern Engineering Mathematics, Prentice Hall, 4th Edition, 2015, ISBN: 978-0-273-73409-3
- 2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4th Edition, 2016, ISBN: 978-0-07-063419-0.
- 3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28th Edition, 2012, ISBN: 81-219-0345-9.
- 4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.

| Module No | Module Contents   | Hrs | COs                      |
|-----------|---|-----|--------------------------|
| 1         | <b>Numerical Methods:</b> Numerical solution of ordinary differential equations of first order and of first degree: Modified Euler's method and Runge-Kutta method of fourth-order-Problems. Milne's predictor and corrector methods-Problems.<br>Numerical Solutions of second order ordinary differential equations by Runge-Kutta method of fourth-order-Problems. | 9   | 20MEE41A.1               |
| 2         | <b>Complex Variables:</b> Functions of complex variables, Analytical functions, Cauchy-Riemann Equations in Cartesian and Polar forms, Harmonic functions and Construction of analytic functions-Problems using Milne-Thompson's method.<br><b>Applications:</b> Flow problems-Velocity potential, Stream functions and complex potential functions.                  | 9   | 20MEE41A.2               |
| 3         | <b>Conformal Transformations and Complex Integrations:</b> $w = z^2$ , $w = e^z$ and $w = z + (1/z)$ . Cauchy's Theorem (with proof). Singularities, Poles and Residues, Residue theorem (without proof)-Problems.  | 9   | 20MEE41A.3               |
| 4         | <b>Probability distributions:</b> Random variables (discrete and continuous), probability density functions. Discrete Probability distributions: Binomial and Poisson distributions-Problems. Continuous Probability distributions: Exponential and Normal distributions-Problems.  | 9   | 20MEE41A..4              |
| 5         | <b>Sampling Theory:</b> Sampling, Sampling distributions, standard error, test of hypothesis of large samples for means and proportions, Central limit theorem (without proof), Confidence limits for means, Student's t-distribution, F-distribution and Chi-square distribution for test of goodness of fit for small samples.                                      | 9   | 20MEE41A.5<br>20MEE41A.6 |

#### Assessment Pattern

CIE (50 Marks – Theory)

| Bloom's Category | Tests     | Assignments | Quizzes   |
|------------------|-----------|-------------|-----------|
| <b>Marks</b>     | <b>25</b> | <b>15</b>   | <b>10</b> |
| Remember         | 5         | 5           |           |
| Understand       | 5         | 5           |           |
| Apply            | 10        | 5           | 10        |
| Analyze          | 2.5       |             |           |
| Evaluate         | 2.5       |             |           |
| Create           |           |             |           |

SEE (50 Marks – Theory)

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 10             |
| Understand       | 10             |
| Apply            | 20             |
| Analyze          | 5              |
| Evaluate         | 5              |
| Create           |                |

## ECONOMICS FOR ENGINEERS

|             |                |
|-------------|----------------|
| Course Code | 20HSS321A/421A |
| L: T: P:S   | 2:0:0:0        |
| Exams Hours | 02             |

|           |    |
|-----------|----|
| Credits   | 02 |
| CIE Marks | 25 |
| SEE Marks | 25 |

Course Outcomes: At the end of the Course, the student will be able to:

|                  |  |
|------------------|--|
| 20HSS321A/421A.1 | Summarize the knowledge of economics and its importance in business decision making. |
| 20HSS321A/421A.2 | Make use of economic concepts in business.   |
| 20HSS321A/421A.3 | Examine the impact of market forces on business.                                     |
| 20HSS321A/421A.4 | Interpret the role of market structure in the economic development of a country.     |
| 20HSS321A/421A.5 | Evaluate the role of budgeting in business decisions.                                |

Mapping of Course Outcomes to Program Outcomes:

|                  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PSO2 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| 20HSS321A/421A.1 |     | 1   |     | 1   | 1   | 3   | 3   | 3   | 3   | 1    | 2    | 3    |      |      |
| 20HSS321A/421A.2 | 1   | 1   | 1   | 1   | 2   | 2   | 1   | 2   | 2   | 2    | 3    | 3    |      |      |
| 20HSS321A/421A.3 | 3   | 2   | 3   | 1   | 1   | 2   | 2   | 3   | 1   | 1    | 2    | 2    |      |      |
| 20HSS321A/421A.4 | 1   | 2   | 1   | 2   | 1   | 3   | 1   | 2   | 2   | 2    | 2    | 2    |      |      |
| 20HSS321A/421A.5 | 3   | 2   | 3   | 2   | 2   | 1   | 1   | 2   | 1   | 1    | 3    | 1    |      |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### TEXT BOOKS:

- 1) Riggs J.L, Engineering Economy, TMH, 2012 edition
- 2) Jain T.R., Economics for Engineers, VK Publications,2008 Edition
- 3) IM PANDEY, Financial Management, Vikas Pub. House, 2018 Edition
- 4) D N Dwivedi, Managerial Economics , Vikas Pub. House, 2018 Edition
- 5) Dr.A.R Sainath, Sasikala Devi, Engineering Economics and Financial Accounting, Charulatha Publications,2015 edition

### REFERENCE BOOKS:

- 1) Thuesen H.G, Engineering Economy. PHI,1984
- 2) Prasanna Chandra, Financial Mangement, TMH,2007
- 3) Singh Seema, Economics for Engineers, IK International,2014
- 4) Chopra P. N, Principle of Economics, Kalyani Publishers,2012
- 5) Dewett K K, Modern Economic Theory, S. Chand,2006



| Module No | Module Contents  | Hrs | COs                                  |
|-----------|--|-----|--------------------------------------|
| 1         | <b>Introduction to Economics:</b> Role of Engineer as an Economist, Types and problem of economies, Basics of economics (GDP, National income, inflation, business cycle, fiscal and monetary policies, balance of payment).   | 4   | 20HSS321A/421A.1<br>20HSS321A/421A.4 |
| 2         | <b>Basic concepts of Microeconomics:</b> concept of Demand & Elasticity of Demand. Concept of Supply & Elasticity of Supply, Meaning of Production and factors of production, Production Possibility Curve, Law of variable proportions and returns to scale. Relevance of Depreciation towards industry, Depreciation computing methods.  | 4   | 20HSS321A/421A.2<br>20HSS321A/421A.3 |
| 3         | <b>Concepts of cost of production:</b> different types of cost; accounting cost, sunk cost, marginal cost and opportunity cost. Break even analysis, Make or Buy decision. Cost estimation, Elements of cost as Direct Material Costs, Direct Labor Costs, Fixed Over-Heads, Factory cost, Administrative Over-Heads.                      | 4   | 20HSS321A/421A.3                     |
| 4         | <b>Market structure:</b> Perfect Competition: Features, Determination of Price under Perfect Competition - Monopoly: Features, Pricing under Monopoly,<br><b>Oligopoly:</b> Features, Kinked Demand Curve, Cartel, Price Leadership – Monopolistic Competition: Features, Pricing under Monopolistic Competition, Product Differentiation. | 5   | 20HSS321A/421A.1<br>20HSS321A/421A.4 |
| 5         | <b>Capital budgeting:</b> Traditional and modern methods, Payback period method, IRR, ARR, NPV, PI. . Interest and Interest factors: Interest rate, Simple interest, Compound interest, Cash - flow diagrams, Personal loans and EMI Payment. Present worth, Future worth.   | 7   | 20HSS321A/421A.3<br>20HSS321A/421A.5 |

#### Assessment Pattern

##### CIE (25 Marks – Theory)

| Bloom's Category | Tests     | Assignments |
|------------------|-----------|-------------|
| <b>Marks</b>     | <b>15</b> | <b>10</b>   |
| Remember         | 5         |             |
| Understand       | 5         |             |
| Apply            | 5         |             |
| Analyze          |           | 5           |
| Evaluate         |           | 5           |
| Create           |           |             |

##### SEE (25 Marks – Theory)

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 5              |
| Understand       | 5              |
| Apply            | 5              |
| Analyze          | 5              |
| Evaluate         | 5              |
| Create           |                |

## ಆಡಳಿತ / ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

(ಕನ್ನಡಿಗರಿಗಾಗಿ for Kannadigas common to all branches)

|                            |                |
|----------------------------|----------------|
| Course code : 20HSS324/424 | Credits : 01   |
| L:T:PS : 1:0:0:0           | CIE Marks : 25 |
| Exam Hours : 2             | SEE Marks : 25 |

**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಅಧ್ಯಯನದ ಕಲಿಕಾಂಶಗಳು:**

- C01 ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಹಾಗೂ ಭಾಷಾ ರಚನೆ ನಿಯಮಗಳನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುತ್ತಾರೆ.
- C02 ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿನ ದೋಷಗಳು, ನಿವಾರಣೆ ಮತ್ತು ಲೇಖನ ಚರ್ಚೆಗಳನ್ನು ಅರಿತುಕೊಳ್ಳುವರು.
- C03 ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ತಿಳುವಳಿಕೆ ಪಡೆಯುವರು .
- C04 ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಅಸಕ್ತವಹಿಸಿಕೊಳ್ಳುವರು.

### CO-PO Mapping :

|     | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 | P011 | P012 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| C01 | -   | -   | -   | -   | -   | -   | -   | -   | -   | 3    | -    | -    |
| C02 | -   | -   | -   | -   | -   | -   | -   | -   | -   | 3    | -    | -    |
| C03 | -   | -   | -   | -   | -   | -   | -   | -   | -   | 3    | -    | -    |
| C04 | -   | -   | -   | -   | -   | -   | -   | -   | -   | 3    | -    | -    |

**ಪರಿವಿಡಿ (ಪಠ್ಯ ಪುಸ್ತಕದಲ್ಲಿರುವ ವಿಷಯಗಳ ಪಟ್ಟಿ)**

- ಭಾಗ-1 ಲೇಖನಗಳು : ಕನ್ನಡ ನಾಡು ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿಗೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನಗಳು
- ಭಾಗ-2 ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ ಪೂರ್ವ)
- ಭಾಗ-3 ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ)
- ಭಾಗ-4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ
- ಭಾಗ-5 ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ

**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಪುಸ್ತಕದ ಲೇಖಕರು**

ಡಾ.ಎಲ್.ತಿಮ್ಮೇಶ, ಪ್ರೊ.ವಿ. ಕೇಶವಮೂರ್ತಿ, ಪ್ರಕಟಣೆ: ಪ್ರಸಾರಾಂಗ,ವಿ.ತಾ.ವಿ ಬೆಳಗಾವಿ

**ಪರೀಕ್ಷೆಯ ವಿಧಾನ:**

- ನಿರಂತರ ಅಂತರೀಕ ಮೌಲ್ಯ ಮಾಪನ (Continuous Internal Evaluation) : 25
- ಸೆಮಿಸ್ಟರ್ ಎಂಡ್ ಪರೀಕ್ಷೆ (Semester End Examination) : 25

| Bloom's Category | CIE (25) | SEE(25) |
|------------------|----------|---------|
| Remember         | 12       | 12      |
| Understand       | 13       | 13      |

# ವ್ಯವಹಾರಿಕ/ ಬಳಕೆ ಕನ್ನಡ

Vyavaharika / Balake Kannada  
(Kannada for usage - common to all branches)

|                            |                |
|----------------------------|----------------|
| Course code : 20HSS325/425 | Credits : 01   |
| L:T:P:S : 1:0:0:0          | CIE Marks : 25 |
| Exam Hours : 2             | SEE Marks : 25 |

## Course Outcome: On completion of the course student will be able to:

- CO1 Understand Kannada Language.
- CO2 Communicate in Kannada Language
- CO3 Read simple Kannada words
- CO4 Pronounce Kannada words

## CO – PO Mapping:

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | -   | -   | -   | -   | -   | -   | -   | -   | -   | 3    | -    | -    |
| CO2 | -   | -   | -   | -   | -   | -   | -   | -   | -   | 3    | -    | -    |
| CO3 | -   | -   | -   | -   | -   | -   | -   | -   | -   | 3    | -    | -    |
| CO4 | -   | -   | -   | -   | -   | -   | -   | -   | -   | 3    | -    | -    |

## Syllabus

- Chapter -1 Abbreviations
- Chapter -2 Key to Transcription
- Chapter -3 Easy learning of a Kannada Language: A few tips
- Chapter -4 Necessity of learning a local Language
- Chapter -5 Tips to learn the language with easy methods.
- Chapter -6 Hints for correct and polite conversation
- Chapter -7 About Kannada Language (Kannada Bhashe)
- Chapter -8 Eight Kannada authors who have won 'Jnanpith Award'
- Chapter -9 Information about Karnataka State

## Text Book:

Balake Kannada by Dr. L. Thimmesha, Prof. V. Keshavamurthy, published by: VTU, Belagavi  
Continuous internal evaluation & semester end examination (25 Marks each)

| Bloom's Category | CIE (25) | SEE(25) |
|------------------|----------|---------|
| Remember         | 12       | 12      |
| Understand       | 13       | 13      |

## BASIC THERMODYNAMICS

|                    |                     |
|--------------------|---------------------|
| <b>Course Code</b> | <b>19MEE332/432</b> |
| <b>L: T: P:S</b>   | <b>3:0:0:0</b>      |
| <b>Exams Hours</b> | <b>03</b>           |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>03</b> |
| <b>CIE Marks</b> | <b>50</b> |
| <b>SEE Marks</b> | <b>50</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                       |  |
|-----------------------|--|
| <b>19MEE332/432.1</b> | Empathize with the basic concepts of thermodynamics like systems, equilibrium, process etc. and its applications                     |
| <b>19MEE332/432.2</b> | Realize the laws of thermodynamics and apply to solve engineering, problems.   |
| <b>19MEE332/432.3</b> | Identify the different types of work and heat transfer mechanisms.   |
| <b>19MEE332/432.4</b> | Differentiate reversible and irreversible process using second law and entropy concepts  |
| <b>19MEE332/432.5</b> | Classify the quantities used to describe the composition of a gas mixture, such as mass fraction, mole fraction, and volume fraction |
| <b>19MEE332/432.6</b> | Understand the behavior of real gases at various conditions  |

Mapping of Course Outcomes to Program Outcomes:

|                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PS02 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19MEE332/432.1</b> | 3   | 3   | 3   |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE332/432.2</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE332/432.3</b> | 3   | 3   | 3   |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE332/432.4</b> | 3   | 3   | 3   | 2   |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE332/432.5</b> | 3   | 3   | 3   |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE332/432.6</b> | 3   | 3   | 3   |     |     |     |     |     |     |      |      |      |      | 3    |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) Basic and Applied Thermodynamics, P.K.Nag, Tata McGraw Hill Publication, 2nd edition, 2006, ISBN: 9780070151314.
- 2) Basic Thermodynamics, B.K Venkanna, Swati B. Wadavadagi, PHI Learning Private Limited, 2010, ISBN 13 – 9788120341128.

### **REFERENCE BOOKS:**

- 1) Fundamentals of Engineering Thermodynamics, Moran J Shapiro., John wiley Pub.2006, ISBN – 9780470032091.
- 2) Thermodynamics, An Engineering Approach, YunusA.Cenegal and Michael A.Boles, Tata McGraw Hill publications, 2007, ISBN - 9780073305370
- 3) Fundamentals of Thermodynamics, Claus Borgnakke, Richard Edwin Sonntag, 8th Edition,WILEY, ISBN – 9781306947732

| Module No | Module Contents  | Hrs | COs   |
|-----------|--|-----|---|
| 1         | <p><b>Fundamental Concepts &amp; Definitions:</b> Thermodynamics: definition cyclic and non-cyclic processes</p> <p><b>Thermodynamic equilibrium:</b> definition and conditions, Zeroth law of thermodynamics: Statement, and significance. Temperature: concept, two point scales and one point scale, International fixed points. Temperature measurements: Constant volume gas thermometer, Electrical resistance thermometer, thermocouple. Numerical on temperature scales.</p>   | 9   | <p>19MEE332/432.1</p> <p>19MEE332/432.2</p>                       |
| 2         | <p><b>Work and Heat:</b> Mechanics definition of work and its limitations. Thermodynamic definition of work; examples, sign convention. Displacement work explanation, expressions for displacement work in various processes through p-V diagrams, Problems on work transfer and heat transfer.</p> <p><b>First Law of Thermodynamics:</b> Joules experiment, equivalence of heat and work. Statement of the First law of thermodynamics, extension of the First law to non - cyclic processes, Internal energy, To prove energy is a property of the system, modes of energy, Specific heat at constant volume, enthalpy, specific heat at constant pressure. Heat transfer for various quasi-static process. Extension of the First law to control volume; steady state-steady flow energy equation, Assumptions for SFEE and some important applications. Numerical on open and closed systems</p> | 9   | <p>19MEE332/432.1</p> <p>19MEE332/432.2</p> <p>19MEE332/432.3</p> |
| 3         | <p><b>Second Law of Thermodynamics:</b> Thermal reservoirs. Direct heat engine; schematic representation and efficiency. Reversed heat engine, schematic representation, coefficients of performance. Kelvin - Planck and Clausius statement: of the Second law of Thermodynamics; PMM I and PMM II, Equivalence of the two statements; Reversible and irreversible processes; factors that make a process irreversible, reversible heat engines, Carnot cycle, Numerical</p>  | 9   | <p>19MEE332/432.2</p> <p>19MEE332/432.4</p>                       |
| 4         | <p><b>Entropy:</b> Clausius theorem, Clausius inequality; Statement, proof, application to a reversible cycle. Entropy; definition, a property, change of entropy for irreversible process, principle of increase in entropy of the universe, entropy as a quantitative test for irreversibility, Numerical</p> <p><b>Pure Substances:</b> P-T and P-V diagrams, triple point and critical points. Sub cooled liquid, saturated liquid, mixture of saturated liquid and vapour, saturated vapour and superheated vapour states of pure substance with water as example. Enthalpy of change of phase (Latent heat). Dryness fraction (quality), T-S and H-S diagrams, Numerical.</p>  | 9   | <p>19MEE332/432.4</p>   |
| 5         | <p><b>Ideal gas mixtures:</b> Ideal gas mixture; Dalton's laws of partial pressures, Amagat's law of additive volumes, evaluation of mass fractions, mole fractions, Expressions for <math>C_p, C_v</math> and Gas constant of the mixture. Numerical on mixtures.</p> <p><b>Real Gases:</b> Introduction. Van-der Waal's Equation of state, Van-der Waal's constants in terms of critical properties, Law of corresponding states, compressibility factor; compressibility chart. Numerical on real gases.</p>  | 9   | <p>19MEE332/432.5</p> <p>19MEE332/432.6</p>                       |

**Assessment Pattern**

CIE (50 Marks – Theory)

| <b>Bloom's Category</b> | <b>Tests</b> | <b>Assignments</b> | <b>Quizzes</b> |
|-------------------------|--------------|--------------------|----------------|
| <b>Marks</b>            | <b>25</b>    | <b>15</b>          | <b>10</b>      |
| Remember                | 5            |                    |                |
| Understand              | 5            | 5                  | 5              |
| Apply                   | 5            | 5                  | 5              |
| Analyze                 | 5            | 5                  |                |
| Evaluate                | 5            |                    |                |
| Create                  |              |                    |                |

SEE (50 Marks – Theory)

| <b>Bloom's Category</b> | <b>Tests (theory)</b> |
|-------------------------|-----------------------|
| Remember                | 10                    |
| Understand              | 20                    |
| Apply                   | 10                    |
| Analyze                 | 5                     |
| Evaluate                | 5                     |
| Create                  |                       |

## MACHINES FOR MANUFACTURING TECHNOLOGY

|                    |                     |
|--------------------|---------------------|
| <b>Course Code</b> | <b>19MEE342/442</b> |
| <b>L: T: P:S</b>   | <b>3:0:0:0</b>      |
| <b>Exams Hours</b> | <b>03</b>           |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>03</b> |
| <b>CIE Marks</b> | <b>50</b> |
| <b>SEE Marks</b> | <b>50</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                       |  |
|-----------------------|--|
| <b>19MEE342/442.1</b> | Characteristics of coolants, lubricants & estimate the machining time during metal cutting by selecting appropriate parameters such as speed, feed and depth of cut. |
| <b>19MEE342/442.2</b> | Analyze the tool life and tool failure during machining process  |
| <b>19MEE342/442.3</b> | Select the appropriate machine tools and machining operations to manufacture the components  |
| <b>19MEE342/442.4</b> | Determine the dimensional tolerances obtained in different finishing and super finishing operations  |
| <b>19MEE342/442.5</b> | Index the number of divisions on the work using various indexing techniques during gear cutting operations   |
| <b>19MEE342/442.6</b> | Study metal forming operation & design the forming dies depending on the shape of the component  |

Mapping of Course Outcomes to Program Outcomes:

|                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PS02 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19MEE342/442.1</b> | 3   | 3   |     | 3   |     |     |     |     |     |      |      |      | 3    |      |
| <b>19MEE342/442.2</b> | 3   | 3   |     | 3   |     |     |     |     |     |      |      | 3    | 3    |      |
| <b>19MEE342/442.3</b> | 3   | 3   | 2   | 3   |     |     |     |     |     |      |      | 3    | 3    |      |
| <b>19MEE342/442.4</b> | 3   | 3   |     | 3   |     |     |     |     |     |      |      |      | 3    |      |
| <b>19MEE342/442.5</b> |     | 3   |     | 3   |     | 1   |     |     |     |      |      |      | 3    |      |
| <b>19MEE342/442.6</b> | 3   | 3   |     | 3   |     |     |     |     |     |      |      |      | 3    |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### TEXT BOOKS:

- 1) Hazara Choudhry, 'Work shop Technology', Vol – II, Media promoters and publishers Pvt. Ltd. 2010 ISBN:9788185099156
- 2) R.K.Jain, 'Production Technology', Khanna Publishers-Delhi, 2010, ISBN:9788174090997

### REFERENCE BOOKS:

- 1) G.Boothroyd, 'Fundamentals of Metal machining and machine tools', McGraw Hill, 2005, ISBN:978-574446593
- 2) HMT, 'Production Technology', HMT, Tata McGraw Hill, 2008. ISBN:978-0070964433
- 3) Hienrich Gerling, Karl H Heller, 'All about machine tools', 2nd Edition, New Age publishers, 2016, ISBN: 8122418260 / 9788122418262
- 4) P. N. Rao, 'Manufacturing Technology', Vol I & II, 4th edition, Tata McGraw Hill publication, New Delhi, 2018, ISBN: 9789353160524

| Module No | Module Contents  | Hrs | COs  |
|-----------|--|-----|--|
| 1         | <p><b>Theory of metal cutting:</b> Single point cutting tool nomenclature ,types of metal cutting, Mechanism of chip formation, types of chips. Merchants circle diagram, tool wear and tool failure, tool life. Effects of cutting parameters on tool life. Tool failure criteria, Taylors tool life equations, measurement of forces in metal cutting, numerical on tool life, Metal removal rate, shear angle, shear energy.</p> <p><b>Cutting tool materials:</b> Desired properties and type of cutting tool materials – HSS, Carbides coated carbides, ceramics. Heat generation in metal cutting, factors affecting heat generation, heat distribution in tool and work piece and chip. Measurement of tool tip temperature.</p> <p><b>Coolants and lubricants:</b> introduction, functions of metal of metal working fluids, type of lubricant, cutting fluids, characteristics of cutting fluids.</p> | 7   | 19MEE342/442.1<br>19MEE342/442.2                   |
| 2         | <p><b>Turning (lathe):</b> classifications, Work holding devices, constructional features of turret and capstan lathe, tool layout.</p> <p><b>Milling machines:</b> classification,, constructional features, milling cutters nomenclature, milling operations, up milling and down milling concept. Various milling operations, Indexing: simple, compound, differential and angular indexing calculations</p>  | 6   | 19MEE342/442.2<br>19MEE342/442.5                   |
| 3         | <p><b>Drilling machine:</b> classification, constructional features, drilling &amp; related operations. Types of drill &amp; drill bit nomenclature, drill materials, reaming, boring, tapping</p> <p><b>Broaching process:</b> Broaching process – principle of broaching. Details of a broach. Types of broaching machine – constructional details. Applications advantages and limitations</p>  | 6   | 19MEE342/442.3                                     |
| 4         | <p><b>Grinding machine:</b> types of abrasives, grain size, bonding process, grade and structure of grinding wheels types. Classification, constructional features of a grinding machine (centerless, cylindrical and surface grinding). Selection of grinding wheel. Grinding process parameters, Dressing and truing of grinding wheels</p> <p><b>Finishing and other process lapping and honing operations:</b> principles, arrangement of set up and application, tolerances in finishing, Super finishing process: polishing, buffing operation and application, tolerances in super finishing</p>  | 7   | 19MEE342/442.3<br>19MEE342/442.4<br>19MEE342/442.5 |
| 5         | <p><b>CNC machines:</b> introduction to CNC machines, principles of operations. Axes of NC machines, coordinate systems.</p> <p><b>Metal Forming:</b> Blanking, Piercing, punching, drawing, draw ratio, drawing force, trimming and shearing, bending, bending dies, bending force, numerical on bending, embossing and coining, Types of dies, compound and combination dies, numerical on die design</p>  | 7   | 19MEE342/442.4<br>19MEE342/442.6                   |

#### Assessment Pattern

CIE (50 Marks – Theory)

| Bloom's Category | Tests     | Assignments | Quizzes   |
|------------------|-----------|-------------|-----------|
| <b>Marks</b>     | <b>25</b> | <b>15</b>   | <b>10</b> |
| Remember         | 5         |             |           |
| Understand       | 5         | 5           | 5         |
| Apply            | 5         | 5           | 5         |
| Analyze          | 5         | 5           |           |
| Evaluate         | 5         |             |           |
| Create           |           |             |           |

SEE (50 Marks – Theory)

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 10             |
| Understand       | 20             |
| Apply            | 10             |
| Analyze          | 5              |
| Evaluate         | 5              |
| Create           |                |



## MECHANICAL MEASUREMENTS & METROLOGY

|                    |                     |
|--------------------|---------------------|
| <b>Course Code</b> | <b>19MEE352/452</b> |
| <b>L: T: P:S</b>   | <b>3:0:0:0</b>      |
| <b>Exams Hours</b> | <b>03</b>           |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>03</b> |
| <b>CIE Marks</b> | <b>50</b> |
| <b>SEE Marks</b> | <b>50</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                       |   |
|-----------------------|---|
| <b>19MEE352/452.1</b> | Apply the concepts of metrology to identify the suitable standards for calibrating the end bars                               |
| <b>19MEE352/452.2</b> | Design the gauges for engineering components using the concepts of Limits, fits, geometric dimensioning and tolerances (GD&T) |
| <b>19MEE352/452.3</b> | Analyze the working principle of various linear and angular measuring instruments   |
| <b>19MEE352/452.4</b> | Analyze the various types of screw threads and gear tooth used in various applications and its measuring instruments          |
| <b>19MEE352/452.5</b> | Assess the surface finish on the components using various methods   |
| <b>19MEE352/452.6</b> | Identify appropriate measuring instruments for measurement of force, torque, pressure, temperature and strain                 |

Mapping of Course Outcomes to Program Outcomes:

|                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PS02 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19MEE352/452.1</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE352/452.2</b> | 3   | 3   | 1   |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE352/452.3</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      | 1    | 3    |
| <b>19MEE352/452.4</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE352/452.5</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE352/452.6</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      |      | 3    |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) R.K. Jain , 'Engineering Metrology', Khanna Publishers, 2017, ISBN-13: 978-8174091536.
- 2) Beckwith Marangoni and Lienhard , 'Mechanical Measurements', Pearson Education, 7th Edition, 2015, ISBN 13: 978-8131717189.
- 3) Dr. T Chandrashekar , 'Metrology and Measurement', Subhas publication, 2017, ISBN: 9789383214198

### **REFERENCE BOOKS:**

- 1) I.C. Gupta , 'Engineering Metrology', Dhanpat Rai Publications, Delhi, 8th Edition, 2018, ISBN 13: 9788189928452
- 2) R.K. Jain , 'Mechanical and Industrial Measurements', Khanna Publishers, 2008, ISBN: 9788174091918
- 3) Anand K. Bewoor & Vinay A. Kulkarni , 'Metrology & Measurement', Tata McGraw Hill Pvt. Ltd., New Delhi, 2009, ISBN: 9781259081323
- 4) N V Raghavendra and Krishnamurthy , 'Engineering Metrology and Measurement', Oxford University Press, 2013, ISBN: 9780198085492

| Module No | Module Contents  | Hrs | COs   |
|-----------|--|-----|---|
| 1         | <p><b>Standards of measurement:</b> Definition and Objectives of metrology, Material standards-International Prototype meter, Imperial standard yard, Airy points, Wave length standard, subdivision of standards, line and end standard, calibration of end bars , Indian Standards (M-87, M-112) of Slip gauges, Wringing phenomena, Numerical problems on building of slip gauges.</p> <p><b>Measurements and measurement systems:</b> Generalized measurement system, basic definitions, Errors in measurement, classification of errors.</p>  | 7   | <p>19MEE352/452.1<br/>19MEE352/452.2<br/>19MEE352/452.3</p> |
| 2         | <p><b>Limits, Fits, Tolerance and Gauge:</b> Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS 919-1963), geometrical tolerance, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges- plain plug gauge, ring gauge, and gauge materials.</p> | 7   | 19MEE352/452.6  |
| 3         | <p><b>Comparators:</b> Introduction to comparators, characteristics, classification of comparators, Johnson's Mikrokator, Sigma comparator, Dial gauge, Ziess ultra-optimizer LVDT, Solex pneumatic gauge.</p> <p><b>Angular measurements:</b> Bevel protractor, sine principle and use of sine bars, sine centre, angle gauges, numerical on building of angles using angle gauges.</p>   | 6   | <p>19MEE352/452.1<br/>19MEE352/452.2</p>                    |
| 4         | <p><b>Surface metrology:</b> Terminology of surface roughness, Methods of measuring surface finish, Analysis of surface traces.</p> <p><b>Form Measurement:</b> Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2-wire and 3-wire methods, best size wire. Tool maker's microscope, gear tooth terminology, gear tooth vernier caliper.</p>   | 6   | 19MEE352/452.4  |
| 5         | <p><b>Measurement of force, torque, pressure:</b> Principle of analytical balance, platform balance, proving ring. Torque measurement-Prony brake, hydraulic dynamometer. Pressure measurements- McLeod gauge, Pirani gauge.</p> <p><b>Measurement of Temperature and strain:</b> Resistance thermometers, thermocouple, law of thermo couple, Strain measurements, electrical strain gauge.</p>   | 7   | 19MEE352/452.5  |

#### Assessment Pattern

CIE (50 Marks – Theory)

| Bloom's Category | Tests | Assignments | Quizzes |
|------------------|-------|-------------|---------|
| Marks            | 25    | 15          | 10      |
| Remember         | 5     | 5           |         |
| Understand       | 5     | 5           | 5       |
| Apply            | 10    | 5           | 5       |
| Analyze          | 5     |             |         |
| Evaluate         |       |             |         |
| Create           |       |             |         |

SEE (50 Marks – Theory)

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 5              |
| Understand       | 5              |
| Apply            | 15             |
| Analyze          | 15             |
| Evaluate         | 10             |
| Create           |                |

## FLUID MECHANICS

|                    |                     |
|--------------------|---------------------|
| <b>Course Code</b> | <b>19MEE362/462</b> |
| <b>L: T: P:S</b>   | <b>3:0:0:0</b>      |
| <b>Exams Hours</b> | <b>03</b>           |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>03</b> |
| <b>CIE Marks</b> | <b>50</b> |
| <b>SEE Marks</b> | <b>50</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                       |  |
|-----------------------|--|
| <b>19MEE362/462.1</b> | Understand the properties of fluids to visualize the phenomena like surface tension, viscosity and capillarity etc.  |
| <b>19MEE362/462.2</b> | Compute the lift, drag and moments acting on simple aerodynamic profiles and shapes in inviscid, steady fluid flows.   |
| <b>19MEE362/462.3</b> | Implement the concepts of fluid statics, fluid kinematics and fluid dynamics in the applications of Aerodynamics, Hydraulics, Marine Engineering and Gas dynamics. |
| <b>19MEE362/462.4</b> | Understand the friction losses and minor losses for fluids flowing through a pipe .  |
| <b>19MEE362/462.5</b> | Apply Continuity and Bernoulli equation to develop the solutions of real time fluid flow problems  |
| <b>19MEE362/462.6</b> | Analyze the types of fluid flow, different flow description and design a flow measuring device to analyze the discharge of fluid.                                  |

Mapping of Course Outcomes to Program Outcomes:

|                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PS02 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19MEE362/462.1</b> | 3   |     |     |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE362/462.2</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE362/462.3</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE362/462.4</b> | 3   | 3   |     |     |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE362/462.5</b> | 3   | 3   |     | 1   |     |     |     |     |     |      |      |      |      | 3    |
| <b>19MEE362/462.6</b> | 3   | 3   | 1   |     |     |     |     |     |     |      |      |      | 1    | 3    |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) Dr R K Bansal., 'A textbook of Fluid Mechanics', Laxmi Publications Pvt. Ltd., 1st Edition, 2016, ISBN-(13 digits): 978-8131802946; ISBN-(10 digits): 9788131802946.
- 2) Er. R K Rajput., 'Fluid Mechanics & Hydraulic Machine', S Chand & Company, 6th Edition, 2015, ISBN-(13 digits): 978-9385401374

### **REFERENCE BOOKS:**

- 3) Yunus A. Cengel and John M. Cimbala., 'Fluid Mechanics', McGraw Hill, 3rd Edition, 2017, ISBN-(13 digits): 978-9385401374.
- 4) Dr D S Kumar., 'Fluid Mechanics', S K Kataria & Sons, 6th Edition, 2012, ISBN-(13 digits): 978-9380027654; ISBN-(10 digits): 9380027656.

| Module No | Module Contents  | Hrs | COs  |
|-----------|--|-----|--|
| 1         | <b>Fluid Properties:</b> Types of fluids, Mass Density, Specific Weight, Specific Gravity, Newton's Law of Viscosity, Dynamic Viscosity, Surface Tension, Capillarity, Compressibility, Vapour pressure, numericals<br><b>Fluid Statics:</b> Pascal's law, Hydrostatic law, pressure variation in a static fluid in 2D.  | 6   | 19MEE362/462.1<br>19MEE362/462.2                   |
| 2         | <b>Buoyancy:</b> Buoyancy, centre of buoyancy, Archimedes' principle, principle of floatation, metacentre and metacentric height, stability of floating and submerged bodies, determination of Metacentric height by experimental method. (Numerical on Meta center and center of Buoyancy)<br><b>Fluid Kinematics:</b> fluid flow description by Lagrangian and Eulerian method, Types of Flow- steady, unsteady, uniform, non-uniform, laminar, turbulent, one, two and three dimensional, compressible, incompressible, rotational, irrotational, stream lines, path lines, streak lines, Continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function (Numerical). | 7   | 19MEE362/462.2<br>19MEE362/462.3<br>19MEE362/462.5 |
| 3         | <b>Fluid Dynamics:</b> Introduction to Navier-Stoke's Equation, derivation of Euler equation of motion along a stream line, and Bernoulli's equation from Euler's equation and first principles (Numerical). Application of Bernoulli's equation to pitot tube, venturimeter, orifice meter (No Derivation of discharge equation). Dimension Analysis concepts.  | 6   | 19MEE362/462.3<br>19MEE362/462.4<br>19MEE362/462.5 |
| 4         | <b>Flow Through Pipes:</b> Energy losses through pipe, Major losses, Darcy-Weisbach equation, Chezy's Equation, Minor losses in pipes-sudden enlargement, sudden contraction, TEL, HGL, pipes in series and parallel, Siphons, Transmission of power. (Numerical).<br><b>Laminar And Turbulent Flow:</b> Definition, Relation between pressure and shear stresses, Laminar flow through circular pipe, Fixed parallel plates, Turbulent flow and velocity distribution. (Numerical)  | 8   | 19MEE362/462.4<br>19MEE362/462.5                   |
| 5         | <b>Flow around Immersed Bodies:</b> -Force exerted by flowing fluid on stationary body, expression for Lift and Drag, Classification of Drag, Flow around circular cylinder and Aerofoil, Development of lift on Aerofoil. (Numerical)<br><b>Boundary Layer Theory:</b> Development of Boundary Layer on a thinplate and its characteristics, boundary layer thickness, boundary condition for velocity profile, Laminar and Turbulent, Boundary Layers, Laminar Sub Layer, Separation of Boundary Layer.  | 6   | 19MEE362/462.5<br>19MEE362/462.6                   |

#### Assessment Pattern

CIE (50 Marks – Theory)

| Bloom's Category | Tests | Assignments | Quizzes |
|------------------|-------|-------------|---------|
| Marks            | 25    | 15          | 10      |
| Remember         | 2     |             |         |
| Understand       | 2     |             |         |
| Apply            | 7     | 5           |         |
| Analyze          | 7     | 5           | 5       |
| Evaluate         | 7     | 5           | 5       |
| Create           |       |             |         |

SEE (50 Marks – Theory)

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 4              |
| Understand       | 4              |
| Apply            | 14             |
| Analyze          | 14             |
| Evaluate         | 14             |
| Create           |                |

## MACHINES FOR MANUFACTURING TECHNOLOGY LAB

|                    |                     |
|--------------------|---------------------|
| <b>Course Code</b> | <b>19MEL342/442</b> |
| <b>L: T: P:S</b>   | <b>0:0:1:0</b>      |
| <b>Exams Hours</b> | <b>03</b>           |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>01</b> |
| <b>CIE Marks</b> | <b>25</b> |
| <b>SEE Marks</b> | <b>25</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                       |   |
|-----------------------|---|
| <b>19MEL342/442.1</b> | Prepare various models of turning, Knurling, facing and step turning operations using lathe, Develop Models to Cut grooves using Shaper Machine |
| <b>19MEL342/442.2</b> | Analyze the methods of taper turning, thread cutting and preparing models using the same.   |
| <b>19MEL342/442.3</b> | Index the number of slots on the work piece by different indexing methods and practicing them for gear cutting                                  |
| <b>19MEL342/442.4</b> | Drill the holes and grind the work pieces into the required contour using drilling and grinding machines  |

Mapping of Course Outcomes to Program Outcomes:

|                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19MEL342/442.1</b> | 3   | 3   | 3   | 2   |     |     |     |     |     |      |      |      | 2    |      |
| <b>19MEL342/442.2</b> | 3   | 3   | 3   | 2   |     |     |     |     |     |      |      |      | 2    |      |
| <b>19MEL342/442.3</b> | 3   | 3   | 3   | 2   |     |     |     |     |     |      |      |      | 2    |      |
| <b>19MEL342/442.4</b> | 3   | 3   | 3   | 2   |     |     |     |     |     |      |      |      | 2    |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) Work shop technology, Hazara Choudhry, Vol – II, Media promoters and publishers Pvt. Ltd. 2010 ISBN 13:9788185099156
- 2) Production technology, R.K.Jain, Khanna Publishers Delhi 6,2010,ISBN13:9788174090997
- 3) Production technology, HMT, Tata MacGraw Hill, 2008. ISBN-13:978-0017964433

### **REFERENCE BOOKS:**

- 1) Manufacturing Science, Amithabha Ghosh and Malik, affiliated east west press, 2010. ISBN-13:978-8176710633
- 2) Fundamentals of metal machining and machine tools, G.Boothroyd, McGraw Hill, 2005, ISBN-13:978-574446593
- 3) Manufacturing Technology, HMT, Tata MacGraw Hill, 2008. ISBN-13:978-0070964433

| Exp. No. | Contents of Experiment   | Hrs | COs             |
|----------|--|-----|-----------------|
| 1        | Preparation of three models on lathe involving facing, plain turning and step turning.         | 6   | 19MEL342/442.1  |
| 2        | Preparation of the three models on lathe involving taper turning and thread cutting.           | 3   | 19MEL342/442.2  |
| 3        | Preparation of three models on lathe involving facing, knurling and eccentric turning.         | 3   | 19MEL342/442.1  |
| 4        | Cutting of v groove/ dovetail/ rectangular groove using a milling.                             | 3   | 19MEL342/442.2  |
| 5        | Problems on simple and compound indexing.  | 3   | 19MEL342/442.3  |
| 6        | Cutting of gear teeth using milling machine.   | 3   | 19MEL342/442.3  |
| 7        | Preparation of three models on drilling involving reaming, boring and internal thread cutting. | 3   | 19MEL342/442.4  |
| 8        | Drilling of a cylindrical hole using a drilling machine.                                       | 3   | 19MEL342/442.4  |
| 9        | Grinding of a surface using a surface grinding machine.  | 3   | 19MEL342-/442.4 |
| 10       | Demonstration of CAN turning and milling centres.  | 3   | 19MEL342/442.2  |

#### Assessment Pattern

CIE (25 Marks – Lab)

| Bloom's Category | Experiments / Tests | Record    | Viva     |
|------------------|---------------------|-----------|----------|
| <b>Marks</b>     | <b>10</b>           | <b>10</b> | <b>5</b> |
| Remember         | 2                   | 2         | 1        |
| Understand       | 2                   | 2         | 1        |
| Apply            | 2                   | 2         |          |
| Analyze          | 2                   | 2         | 1        |
| Evaluate         | 2                   |           | 1        |
| Create           |                     | 2         | 1        |

SEE (25 Marks – Lab)

| Bloom's Category | Test |
|------------------|------|
| Remember         | 6    |
| Understand       | 6    |
| Apply            | 5    |
| Analyze          | 5    |
| Evaluate         | 3    |
| Create           |      |

## MECHANICAL MEASUREMENTS AND METROLOGY LAB

|                    |                     |
|--------------------|---------------------|
| <b>Course Code</b> | <b>19MEL352/452</b> |
| <b>L: T: P:S</b>   | <b>0:0:1:0</b>      |
| <b>Exams Hours</b> | <b>03</b>           |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>01</b> |
| <b>CIE Marks</b> | <b>25</b> |
| <b>SEE Marks</b> | <b>25</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                       |  |
|-----------------------|--|
| <b>19MEL352/452.1</b> | Calibrate the measuring instruments such as micrometer, pressure gauge, LVDT, loadcell, thermocouple etc |
| <b>19MEL352/452.2</b> | Determine the taper angle, surface roughness and alignment of  |
| <b>19MEL352/452.3</b> | Measure the screw thread and gear tooth parameters of the specimens                                      |
| <b>19MEL352/452.4</b> | Compute the cutting forces and torque in drilling and turning using dynamometers                         |

Mapping of Course Outcomes to Program Outcomes:

|                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19MEL352/452.1</b> | 3   |     |     |     |     |     |     |     | 2   |      |      |      | 1    |      |
| <b>19MEL352/452.2</b> | 3   | 2   |     |     |     |     |     |     | 2   |      |      |      |      | 2    |
| <b>19MEL352/452.3</b> | 3   | 2   |     |     |     |     |     |     | 2   |      |      |      |      | 2    |
| <b>19MEL352/452.4</b> | 3   | 2   |     |     |     |     |     |     | 2   |      |      |      | 1    | 2    |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### TEXT BOOKS:

- 1) Engineering Metrology, R.K. Jain, Khanna Publishers, 2017, ISBN-13: 978-8174091536.
- 2) Mechanical Measurements, Beckwith Marangoni and Lienhard, Pearson Education, 7th Ed., 2015, ISBN 13: 978-8131717189.
- 3) Metrology and Measurement, Dr. T Chandrashekar, Subhas publication, 2017, ISBN: 9789383214198

### REFERENCE BOOKS:

- 1) Engineering Metrology, I.C. Gupta, Dhanpat Rai Publications, Delhi. 8th Edition, 2018, ISBN 13: 9788189928452
- 2) Mechanical and Industrial Measurements, R.K. Jain, Khanna Publishers, 2008, ISBN: 9788174091918
- 3) Metrology & Measurement, Anand K. Bewoor& Vinay A. Kulkarni, Tata McGraw Hill Pvt. Ltd., New Delhi, 2009, ISBN: 9781259081323
- 4) Engineering Metrology and Measurement, N V Raghavendra and Krishnamurthy, Oxford University Press, 2013, ISBN: 9780198085492

| Exp. No. | Contents of Experiment   | Hrs | COs            |
|----------|--|-----|----------------|
| 1        | Calibration of load cell using standard weights  | 3   | 19MEL352/452.1 |
| 2        | Calibration of micrometer using slip gauge   | 3   | 19MEL352/452.1 |
| 3        | Calibration of LVDT using micrometer   | 3   | 19MEL352/452.1 |
| 4        | Calibration of pressure gauge  | 3   | 19MEL352/452.1 |
| 5        | Measurement of Taper angle using sine bar and slip gauge                                     | 3   | 19MEL352/452.2 |
| 6        | Measurement of surface roughness of a component using mechanical comparator                  | 3   | 19MEL352/452.2 |
| 7        | Measurement of screw thread parameters using Tool makers' microscope                         | 3   | 19MEL352/452.3 |
| 8        | Measurement of a screw thread parameters using floating carriage micrometer by 2-wire method | 3   | 19MEL352/452.3 |
| 9        | Measurement of gear parameters using gear tooth vernier                                      | 3   | 19MEL352/452.3 |
| 10       | Measurement of alignment of surface plate using roller set                                   | 3   | 19MEL352/452.2 |
| 11       | Comparison and measurement of temperature using thermocouple and RTD                         | 3   | 19MEL352/452.4 |
| 12       | Measurement of cutting forces and torque using lathe/ drill tool Dynamometer                 | 3   | 19MEL352/452.4 |
| 13       | Determination of young's modulus using strain gauge.   | 3   | 19MEL352/452.2 |

#### Assessment Pattern

CIE (25 Marks – Lab)

| Bloom's Category | Experiments / Tests | Record    | Viva     |
|------------------|---------------------|-----------|----------|
| <b>Marks</b>     | <b>10</b>           | <b>10</b> | <b>5</b> |
| Remember         |                     |           |          |
| Understand       |                     |           |          |
| Apply            | 5                   | 5         | 3        |
| Analyze          | 5                   | 5         | 2        |
| Evaluate         |                     |           |          |
| Create           |                     |           |          |

SEE (25 Marks – Lab)

| Bloom's Category | Test |
|------------------|------|
| Remember         |      |
| Understand       |      |
| Apply            | 10   |
| Analyze          | 10   |
| Evaluate         | 5    |
| Create           |      |



## FLUID MECHANICS LAB

|             |              |
|-------------|--------------|
| Course Code | 19MEL362/462 |
| L: T: P:S   | 0:0:1:0      |
| Exams Hours | 03           |

|           |    |
|-----------|----|
| Credits   | 01 |
| CIE Marks | 25 |
| SEE Marks | 25 |

Course Outcomes: At the end of the Course, the student will be able to:

|                |   |
|----------------|---|
| 19MEL362/462.1 | Calibrate flow measuring devices such as Venturi meter, orifice meter and Notches and predict the coefficient of discharge for flow through pipes |
| 19MEL362/462.2 | Estimate the friction and measure the frictional losses in fluid flow   |
| 19MEL362/462.3 | understand the fluid properties like viscosity and its measurements using various types of measuring devices                                      |
| 19MEL362/462.4 | Apply the concept of buoyancy to calculate meta centric height.   |
| 19MEL362/462.5 | Analyze different types of fluid flow by using Reynold's apparatus  |
| 19MEL362/462.6 | Understand the basic working principle of vertical axis wind turbine and wind tunnel.   |

Mapping of Course Outcomes to Program Outcomes:

|                | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| 19MEL362/462.1 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      | 3    |      |
| 19MEL362/462.2 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      | 3    |      |
| 19MEL362/462.3 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      | 3    |      |
| 19MEL362/462.4 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      | 3    |      |
| 19MEL362/462.5 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      | 3    |      |
| 19MEL362/462.6 | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      |      | 3    |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) Dr. R K Bansal., 'A textbook of Fluid Mechanics', Laxmi Publications Pvt. Ltd., 1st Edition, 2016, ISBN-(13 digits): 978-8131802946; ISBN-(10 digits): 9788131802946.
- 2) Er. R K Rajput., 'Fluid Mechanics & Hydraulic Machine', S Chand & Company, 6th Edition, 2015, ISBN-(13 digits): 978-9385401374.

### **REFERENCE BOOKS:**

- 1) Yunus A. Cengel and John M. Cimbala., 'Fluid Mechanics', McGraw Hill, 3rd Edition, 2017, ISBN-(13 digits): 978-9385401374.
- 2) Dr D S Kumar., 'Fluid Mechanics', S K Kataria & Sons, 6th Edition, 2012, ISBN-(13 digits): 978-9380027654; ISBN-(10 digits): 9380027656.

| Exp. No. | Contents of Experiment  | Hrs | COs                              |
|----------|---|-----|----------------------------------|
| 1        | Determination of viscosity of given lubricating oil using Saybolt / Redwood / Torsion Viscometer.               | 2   | 19MEL362/462.1<br>19MEL362/462.2 |
| 2        | Calibration of given Venturi meter and plotting the suitable calibration curve                                  | 3   | 19MEL362/462.1<br>19MEL362/462.2 |
| 3        | Calibration of given Orifice meter (Open and Closed) and plotting the suitable calibration curve.               | 2   | 19MEL362/462.2<br>19MEL362/462.3 |
| 4        | To determine the Meta centric Height of a Ship Model.   | 2   | 19MEL362/462.2<br>19MEL362/462.3 |
| 5        | Demonstrate Vertical Axis Wind Turbine setup.   | 2   | 19MEL362/462.3<br>19MEL362/462.6 |
| 6        | Calibration of given V-notch, Rectangular, Trapezoidal Notch and plotting the suitable calibration curve        | 2   | 19MEL362/462.3<br>19MEL362/462.4 |
| 7        | Determination of coefficient of friction and Chezy's constant for Turbulent flow in pipes.                      | 3   | 19MEL362/462.4                   |
| 8        | Determination of minor losses coefficient in flow through pipes due to sudden contraction and sudden expansion. | 2   | 19MEL362/462.4                   |
| 9        | Wind tunnel testing to determine the static pressure on cambered aerofoil.                                      | 2   | 19MEL362/462.3                   |
| 10       | Determination of the Reynolds Number and hence the Type of Flow using the Reynolds apparatus                    | 2   | 19MEL362/462.5                   |

#### Assessment Pattern

CIE (25 Marks – Lab)

| Bloom's Category | Experiments / Tests | Record    | Viva     |
|------------------|---------------------|-----------|----------|
| <b>Marks</b>     | <b>10</b>           | <b>10</b> | <b>5</b> |
| Remember         |                     |           | 1        |
| Understand       |                     |           | 1        |
| Apply            |                     |           | 1        |
| Analyze          | 5                   | 4         | 1        |
| Evaluate         | 5                   | 4         | 1        |
| Create           |                     | 2         |          |

SEE (25 Marks – Lab)

| Bloom's Category | Test |
|------------------|------|
| Remember         | 2    |
| Understand       | 2    |
| Apply            | 1    |
| Analyze          | 10   |
| Evaluate         | 10   |
| Create           |      |

## BASIC APPLIED MATHEMATICS-I

|                    |                  |
|--------------------|------------------|
| <b>Course Code</b> | <b>20DMAT31A</b> |
| <b>L: T: P:S</b>   | <b>0:0:0:0</b>   |
| <b>Exams Hours</b> | <b>02</b>        |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>00</b> |
| <b>CIE Marks</b> | <b>25</b> |
| <b>SEE Marks</b> | <b>25</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                    |   |
|--------------------|---|
| <b>20DMAT31A.1</b> | Know the principles of engineering mathematics through calculus   |
| <b>20DMAT31A.2</b> | Determine the power series expansion of a function  |
| <b>20DMAT31A.3</b> | Find the definite integrals with standard limits and also develop the ability to solve different types of differential equations    |
| <b>20DMAT31A.4</b> | Apply ideas from linear algebra in solving systems of linear equations and determine the Eigen values and Eigen vectors of a matrix |

Mapping of Course Outcomes to Program Outcomes:

|                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PSO2 |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>20DMAT31A.1</b> | 3   | 3   | 3   |     |     |     |     |     |     |      |      | 3    |      |      |
| <b>20DMAT31A.2</b> | 3   | 3   | 3   |     |     |     |     |     |     |      |      | 3    |      |      |
| <b>20DMAT31A.3</b> | 3   | 3   | 3   |     |     |     |     |     |     |      |      | 3    |      |      |
| <b>20DMAT31A.4</b> | 3   | 3   | 3   |     |     |     |     |     |     |      |      | 3    |      |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### TEXT BOOKS:

- 1) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
- 2) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014, ISBN: 978-81-7409-195-5.

### REFERENCE BOOKS:

- 1) Glyn James, Modern Engineering Mathematics, Prentice Hall, 4th Edition, 2015, ISBN: 978-0-273-73409-3
- 2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4th Edition, 2016, ISBN: 978-0-07-063419-0.
- 3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28th Edition, 2012, ISBN: 81-219-0345-9.
- 4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.

| Module No | Module Contents  | Hrs | COs                                |
|-----------|--|-----|------------------------------------|
| 1         | <b>Differential Calculus:</b> Polar curves-Problems on angle between the radius vector and tangent, Angle between two curves-Problems, Pedal equation for polar curves-Problems. Macluren's theorems for function of one variable (statement only)-Problems.   | 5   | <b>20DMAT31A.1<br/>20DMAT31A.2</b> |
| 2         | <b>Partial differentiation:</b> Definition and Simple problems, Euler's theorem for Homogeneous function (NO Derivation and NO extended theorem)-Problems, Partial differentiation of composite functions (chain rule)-Problems, Jacobians of order two - definition and problems.   | 5   | <b>20DMAT31A.1</b>                 |
| 3         | <b>Integral Calculus and Differential Equations:</b> Problems on reduction formulae for functions $\sin^n x$ , $\cos^n x$ , $\tan^n x$ , Problems on evaluation of these integrals with standard limits (0 to $\pi/2$ ). Solution of first order and first degree differential equations-Variable separable Linear and Exact differential equations. | 5   | <b>20DMAT31A.3</b>                 |
| 4         | <b>Linear Algebra-1:</b> Problems on rank of a matrix by elementary transformations, consistency of a system of linear equations and solution (homogeneous and non-homogeneous)-Problems. Solution of system of linear equations by Gauss elimination method-Problems.   | 5   | <b>20DMAT31A.4</b>                 |
| 5         | <b>Linear Algebra-2:</b> Linear transformation, Eigen values and Eigen vectors, diagonalisation of a square matrix-Problems.   | 5   | <b>20DMAT31A.4</b>                 |

SEE (25 Marks – Theory)

| Bloom's Category | Tests     | Assignments |
|------------------|-----------|-------------|
| <b>Marks</b>     | <b>20</b> | <b>5</b>    |
| Remember         | 5         |             |
| Understand       | 5         | 5           |
| Apply            | 5         |             |
| Analyze          | 2.5       |             |
| Evaluate         | 2.5       |             |
| Create           |           |             |

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 5              |
| Understand       | 10             |
| Apply            | 5              |
| Analyze          | 2.5            |
| Evaluate         | 2.5            |
| Create           |                |

## BASIC APPLIED MATHEMATICS-II

|                    |                  |
|--------------------|------------------|
| <b>Course Code</b> | <b>20DMAT41A</b> |
| <b>L: T: P:S</b>   | <b>0:0:0:0</b>   |
| <b>Exams Hours</b> | <b>02</b>        |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>00</b> |
| <b>CIE Marks</b> | <b>25</b> |
| <b>SEE Marks</b> | <b>25</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                    |   |
|--------------------|---|
| <b>20DMAT41A.1</b> | Gain knowledge of basic operations of vectors   |
| <b>20DMAT41A.2</b> | Use curl and divergence of a vector function in three dimensions  |
| <b>20DMAT41A.3</b> | Develop the ability to solve higher order Linear differential equations   |
| <b>20DMAT41A.4</b> | Know the basic concepts of Laplace transform to solve the Periodic and Step functions and also solve initial and boundary value problems using Laplace transform method |

Mapping of Course Outcomes to Program Outcomes:

|                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>20DMAT41A.1</b> | 3   | 3   | 3   | 3   |     |     |     |     |     |      | 3    | 3    |      |      |
| <b>20DMAT41A.2</b> | 3   | 3   | 3   | 3   |     | 1   |     |     |     |      | 3    | 3    |      |      |
| <b>20DMAT41A.3</b> | 3   | 3   | 3   | 3   | 3   |     | 3   |     |     | 3    | 3    | 3    |      |      |
| <b>20DMAT41A.4</b> | 3   | 3   | 3   | 3   | 3   |     | 3   |     |     | 3    | 3    | 3    |      |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### TEXT BOOKS:

- 1) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
- 2) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014, ISBN: 978-81-7409-195-5.

### REFERENCE BOOKS:

- 1) Glyn James, Modern Engineering Mathematics, Prentice Hall, 4th Edition, 2015, ISBN: 978-0-273-73409-3
- 2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4th Edition, 2016, ISBN: 978-0-07-063419-0.
- 3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28th Edition, 2012, ISBN: 81-219-0345-9.
- 4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.

| Module No | Module Contents  | Hrs | COs         |
|-----------|--|-----|-------------|
| 1         | <b>Vectors:</b> Definition of scalar and vector, Vector addition, Subtraction and Multiplication-Dot product, Cross product, Scalar triple product. Orthogonal, Co-planar and Angle between vectors-Problems.                                    | 5   | 20DMAT41A.1 |
| 2         | <b>Vector Differentiation:</b> Velocity and Accelerations, Vector differential operator-Gradient of a scalar function, Divergence of a vector function, Curl of a vector function-Problems. Solenoidal and irrotational vector fields- Problems. | 5   | 20DMAT41A.2 |
| 3         | <b>Linear differential equations with constant coefficients:</b> Solution of initial and boundary value problems, Inverse differential operator technique for the functions, $-e^{ax}$ , $e^{ax} f(x)$ , $\sin(ax+b)$ and $\cos(ax+b)$           | 5   | 20DMAT41A.3 |
| 4         | <b>Laplace Transform:</b> Definition and Laplace transforms of elementary functions-Problems. Properties of Laplace transforms (without proof), Periodic functions(without proof), Heaviside function(without proof) -Problems.                  | 5   | 20DMAT41A.4 |
| 5         | <b>Inverse Laplace Transform:</b> Inverse Laplace Transform by partial fractions, completing the square method-Problems. Solution of linear differential equations using Laplace Transforms-Problems.  | 5   | 20DMAT41A.4 |

SEE (25 Marks – Theory)

| Bloom's Category | Tests     | Assignments |
|------------------|-----------|-------------|
| <b>Marks</b>     | <b>20</b> | <b>5</b>    |
| Remember         | 5         |             |
| Understand       | 5         | 5           |
| Apply            | 5         |             |
| Analyze          | 2.5       |             |
| Evaluate         | 2.5       |             |
| Create           |           |             |

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 5              |
| Understand       | 10             |
| Apply            | 5              |
| Analyze          | 2.5            |
| Evaluate         | 2.5            |
| Create           |                |

## ESSENTIAL ENGLISH

|                    |                 |
|--------------------|-----------------|
| <b>Course Code</b> | <b>19HSS171</b> |
| <b>L: T: P:S</b>   | <b>0:0:0:0</b>  |
| <b>Exams Hours</b> | <b>02</b>       |

|                  |           |
|------------------|-----------|
| <b>Credits</b>   | <b>00</b> |
| <b>CIE Marks</b> | <b>25</b> |
| <b>SEE Marks</b> | <b>25</b> |

Course Outcomes: At the end of the Course, the student will be able to:

|                   |   |
|-------------------|---|
| <b>19HSS171.1</b> | Understand the grammatical forms and structures in English                        |
| <b>19HSS171.2</b> | Develop situational vocabulary and apply the same in basic and routine functions. |
| <b>19HSS171.3</b> | Analyze short texts and paraphrase them   |
| <b>19HSS171.4</b> | Generate and expand ideas both in the oral and written forms                      |

Mapping of Course Outcomes to Program Outcomes:

|                   | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PSO2 |
|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>19HSS171.1</b> |     |     |     |     |     |     |     |     |     | 3    |      | 3    |      |      |
| <b>19HSS171.2</b> |     |     |     |     |     |     |     |     | 3   | 3    |      | 3    |      |      |
| <b>19HSS171.3</b> |     |     |     |     |     |     |     |     |     | 3    |      | 3    |      |      |
| <b>19HSS171.4</b> |     |     |     |     |     |     |     |     |     | 3    |      | 3    |      |      |

*Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.*

### **TEXT BOOKS:**

- 1) Grammar Practice Activities- Penny Ur, Cambridge University Press
- 2) Intermediate English Grammar Raymond Murphy Cambridge University Press

### **REFERENCE BOOKS:**

- 1) Grammar & Composition. New Delhi: S. Chand. ISBN 81-219- 2197-X.
- 2) Wren, P.C.; Martin, H., A Final Course of Grammar & Composition, S Chand.

| Module No | Module Contents  | Hrs | COs                      |
|-----------|--|-----|--------------------------|
| 1         | <b>Speaking activity</b><br>Social graces, Greeting, Self-introduction, introducing others Asking for and Giving Information<br><b>Grammar and Vocabulary in Use:</b> Parts of Speech, Nouns, Pronouns Articles, Asking question. (WH, Aux Verbs)  | 6   | 19HSS171.1<br>19HSS171.2 |
| 2         | <b>Speaking activity</b><br>Speaking about Routine, Hobbies, Likes and Dislikes<br><b>Grammar and Vocabulary in Use:</b> Verb= Main / Assistant, Forms of Verbs, Tense: Simple present tense<br>Writing exercises: Subject Verb Agreement , Positive and Negative sentences, Question tags | 6   | 19HSS171.1<br>19HSS171.2 |
| 3         | <b>Speaking activity</b><br>Describing People & Things, Describing Actions<br><b>Grammar and vocabulary in Use :</b> Adjectives, Adverbs, Articles Tense : Continuous Tenses (Present and Past), Preposition   | 6   | 19HSS171.1<br>19HSS171.2 |
| 4         | Reading Comprehension, Sub Skills of Reading Paraphrasing and Summarizing<br><b>Grammar in use and (situation vocabulary) :</b> Modals, Simple Past tense  | 6   | 19HSS171.3<br>19HSS171.4 |
| 5         | <b>Writing Activity</b><br>Writing Skills: Expansion of Ideas, Dialogue Writing<br><b>Grammar in use (situational vocabulary):</b> Homonyms, Comparing and Contrasting, Common error in English 1  | 6   | 19HSS171.3<br>19HSS171.4 |

| Bloom's Category | Tests     |
|------------------|-----------|
| <b>Marks</b>     | <b>25</b> |
| Remember         | 5         |
| Understand       | 5         |
| Apply            | 5         |
| Analyze          | 5         |
| Evaluate         | 5         |
| Create           |           |

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | -              |
| Understand       | 5              |
| Apply            | 5              |
| Analyze          | 5              |
| Evaluate         | 5              |
| Create           | 5              |



|             |          |
|-------------|----------|
| Course Code | 19HSS272 |
| L: T: P:S   | 0:0:0:0  |
| Exams Hours | 02       |

|           |    |
|-----------|----|
| Credits   | 00 |
| CIE Marks | 25 |
| SEE Marks | 25 |

Course Outcomes: At the end of the Course, the student will be able to:

|            |   |
|------------|---|
| 19HSS272.1 | Gain knowledge of Indian Constitution and be able to solve the legal and societal issues.                 |
| 19HSS272.2 | Acquire the knowledge about Amendment, Electoral Process, Fundamental Duties, Central and State Policies. |
| 19HSS272.3 | Understand Special Provisions in Indian Constitution and also in Human Rights Commission.                 |
| 19HSS272.4 | Understand Engineering Ethics and Responsibilities.   |

Mapping of Course Outcomes to Program Outcomes:

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| 19HSS272.1 |     |     |     |     |     | 1   |     | 3   | 1   |      |      | 3    |      |      |
| 19HSS272.2 |     |     |     |     |     | 1   |     | 3   | 1   |      |      | 3    |      |      |
| 19HSS272.3 |     |     |     |     |     | 1   |     | 3   | 1   |      |      | 3    |      |      |
| 19HSS272.4 |     |     |     |     |     | 1   |     | 3   | 1   |      |      | 3    |      |      |

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

#### **TEXT BOOKS:**

- 1) Durga DasBasu: "Introduction to the constitution" 19th/20th Edn., or 2008, Lexis Nexis; Twentieth edition (2011)
- 2) Shubham Singles, Charles E. Haries: Constitution of India and Professional Ethics. Latest Edition-2018, Cengage Learning India Private Limited (2019)

#### **REFERENCE BOOKS:**

- 1) M. Govindarajan, S. Natarajan, V. S. Senthilkumar, "Engineering Ethics", Prentice Hall India Learning Private Limited (2013)
- 2) Pylee, "An Introduction to Constitution of India", Vikas Publishing 2002.
- 3) Latest Publication of NHRC- Indian Institute of Human Rights, New Delhi.

| Module | Module Contents | Hrs | COs |
|--------|-----------------|-----|-----|
|--------|-----------------|-----|-----|

| No |   |   |                          |
|----|---|---|--------------------------|
| 1  | <b>INTRODUCTION TO CONSTITUTION OF INDIA</b><br>Introduction to Constitution of India. The making and salient features of the constitution. The necessity of the constitution. Preamble to Indian constitution. Fundamental rights and its restrictions and Limitations. Decided case studies. Right to Information Act. Directive principles | 5 | 19HSS272.1               |
| 2  | <b>UNION EXECUTIVE</b><br>President, prime minister, parliament and supreme court of India. Judicial activism and judicial review. Important parliamentary terminology. Center- state relations. Attorney General of India, Comptroller and Auditor General of India. Fundamental Duties.   | 4 | 19HSS272.2<br>19HSS272.3 |
| 3  | <b>STATE EXECUTIVE</b><br>State Executive- Governor, Chief Minister, State Legislature. High Court and Subordinate Court. Advocate General of the State. Controller and Auditor General of State. Electoral process in India. Amendment procedure. Types of amendments- 42, 44, 61, 86, 73, 74, 75, 91, 94, 95,100, 101, 118 amendments.      | 4 | 19HSS272.2<br>19HSS272.3 |
| 4  | <b>SPECIAL PROVISION</b><br>Special provision for SC & ST. Special provision for women, children and backward classes. Emergency provision, citizenship and National Human Rights Commission.   | 4 | 19HSS272.4               |
| 5  | <b>SCOPE &amp; AIM OF ENGINEERING ETHICS</b><br>Scope & aim of engineering ethics. Responsibility of engineers, Impediments to responsibility. Clash of ethics. Risk, safety and liability of Engineers. Trust and reliability in Engineering. IPR (Intellectual Property Right). Corporate Ethics.   | 5 | 19HSS272.4               |

| Bloom's Category | Tests     |
|------------------|-----------|
| <b>Marks</b>     | <b>25</b> |
| Remember         | 15        |
| Understand       | 5         |
| Apply            | 5         |
| Analyze          |           |
| Evaluate         |           |
| Create           |           |

| Bloom's Category | Tests (theory) |
|------------------|----------------|
| Remember         | 15             |
| Understand       | 5              |
| Apply            | 5              |
| Analyze          |                |
| Evaluate         |                |
| Create           |                |

## APPENDIX-A

## Outcome Based Education

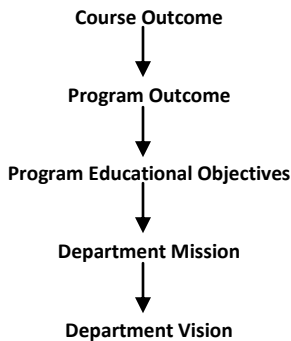
**Outcome-based education (OBE)** is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience each student should have achieved the goal. There is no specified style of teaching or assessment in OBE; instead classes, opportunities, and assessments should all help students achieve the specified outcomes. There are three educational Outcomes as defined by the National Board of Accreditation:

**Program Educational Objectives:** The Educational objectives of an engineering degree program are the statements that describe the expected achievements of graduate in their career and also in particular what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]

**Program Outcomes:** What the student would demonstrate upon graduation. Graduate attributes are separately listed in Appendix C

**Course Outcome:** The specific outcome/s of each course/subject that is a part of the program curriculum. Each subject/course is expected to have a set of Course Outcomes

### Mapping of Outcomes



## APPENDIX-B

## The Graduate Attributes of NBA

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

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

**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.

**Conduct investigations of complex problems:** The problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement (like: cost, power requirement, durability, product life, etc.) which need to be defined (modeled) within appropriate mathematical framework that often require use of modern computational concepts and tools.

**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.

**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.

**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.

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

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

**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.

**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.

**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.

## BLOOM'S TAXONOMY

**Bloom's taxonomy** is a classification system used to define and distinguish different levels of human cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies. [eduglosary.org]

