# GOVERNMENT COLLEGE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University)
Coimbatore - 641 013

## Curriculum & Syllabi

# B. E. MECHANICAL ENGINEERING

## (Working Professionals)

# 2025

## Regulations

**OFFICE OF THE CONTROLLER OF EXAMINATIONS**
**GOVERNMENT COLLEGE OF TECHNOLOGY**
**THADAGAM ROAD, COIMBATORE - 641 013**
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**GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013**
**B.E.MECHANICAL ENGINEERING - (Working Professionals)**
**2025 REGULATIONS**
**(Candidates admitted during 2025-2026 and onwards)**

**FIRST SEMESTER**

| Sl. No. | Course Code | Course Title | CA Marks | End Sem Marks | Total Marks | Hours/Week | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | L | T | P | C |
| **THEORY** | | | | | | | | | |
| 1 | 25WPM1Z1 | Applied Mathematics I (Common to Civil, EEE & ECE) | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 2 | 25WPM1Z2 | Environmental Science and Engineering (Common to Civil, EEE & ECE) | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 3 | 25WPM103 | Applied Engineering Mechanics | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| 4 | 25WPM104 | Manufacturing Technology | 40 | 60 | 100 | 3 | 0 | 0 | 3 |
| **PRACTICAL** | | | | | | | | | |
| 5 | 25WPM105 | Manufacturing Technology Laboratory | 60 | 40 | 100 | 0 | 0 | 3 | 1.5 |
| **TOTAL** | | | **220** | **280** | **500** | **12** | **0** | **3** | **13.5** |

| 25WPM1Z1 | **APPLIED MATHEMATICS I**<br>*(Common to CIVIL, EEE & ECE Branches)* | **SEMESTER I** |
|---|---|---|

| **PREREQUISITES** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **NIL** | **3** | **0** | **0** | **3** |

| **Course Objectives** | This course mainly deals with topics such as linear algebra, single variable calculus and numerical methods and plays an important role in the understanding of engineering science. | |
|---|---|---|
| **UNIT – I** | **LINEAR ALGEBRA** | **9 Periods** |
| Consistency of System of Linear Equations, Eigen values and eigenvectors, Diagonalization of matrices by orthogonal transformation, Cayley-Hamilton Theorem, Quadratic form to canonical forms. | | |
| **UNIT – II** | **DIFFERENTIAL CALCULUS** | **9 Periods** |
| Radius of curvature, Centre of curvature, Circle of curvature, Evolutes of a curve, Envelopes. | | |
| **UNIT – III** | **INTEGRAL CALCULUS** | **9 Periods** |
| Evaluation of definite and improper integrals, Applications: surface area and volume of revolution (Cartesian coordinates only). | | |
| **UNIT – IV** | **NUMERICAL SOLUTION OF EQUATIONS** | **9 Periods** |
| Algebraic and Transcendental equation: Fixed point iteration method, Bisection method, Newton-Raphson method, Simultaneous equation: Gauss elimination method, Gauss-Jordan method, Gauss Seidal method. | | |
| **UNIT – V** | **NUMERICAL INTERPOLATION** | **9 Periods** |
| Equal interval: Newton's forward and Backward difference interpolation formulae, Gauss forward and Backward difference interpolation formulae, Unequal interval: Lagrange's interpolation, Newton's divided difference interpolation. | | |
| **Contact Periods**:<br>**Lecture: 45 Periods** **Tutorial: 0 Periods** **Practical: 0 Periods** **Total: 45 Periods** | | |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | *Veerarajan T., **"Engineering Mathematics I"**, Tata McGraw-Hill Education(India)Pvt. Ltd, New Delhi, 2015.* |
| 2 | *P. Kandasamy, K. Thilagavathy, K. Gunavathi, **"Numerical Methods"**, S. Chand & Company, 3rd Edition, Reprint 2013.* |

**REFERENCES:**

| | |
|---|---|
| 1 | *B.S.Grewal, **Higher Engineering Mathematics**, Khanna Publishers, 44th Edition, 2021.* |
| 2 | *David C.Lay, **"Linear Algebra and Its Application"**, Pearson Publishers, 6th Edition, 2021.* |
| 3 | *Howard Anton, **"Elementry Linear Algebra"**, 11th Edition, Wiley Publications, 2013.* |
| 4 | *Narayanan.S and Manicavachagom Pillai. T.K., **"Calculas Vol I and Vol II"**, S.chand & Co, 6th Edition, 2014.* |
| 5 | *S.S. Sastry, "**Introductory methods of numerical analysis"**, PHI, New Delhi, 5th Edition, 2015.* |
| 6 | *Ward Cheney, David Kincaid, **Numerical Methods and Computing,** Cengage Learning**,** Delhi, 7th Edition 2013.* |
| 7 | *Jain R.K. and Iyengar S.R.K., **"Advanced Engineering Mathematics"**, Narosa Publications, 8th Edition, 2012.* |

| **COURSE OUTCOMES:**<br><br>Upon completion of the course, the students will be able to: | | **Bloom's Taxonomy Mapped** |
|---|---|---|
| CO1 | Use the essential tool of matrices and linear algebra in a comprehensive manner. | K3 |
| CO2 | Explain the fallouts of circle of curvature, evolute and envelops that is fundamental to application of analysis to Engineering problems. | K3 |
| CO3 | Interpret the integral calculus to notions of definite and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions. | K3 |
| CO4 | Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to polynomial and transcendental equations. | K3 |
| CO5 | Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations. | K3 |

| 25WPM1Z2 | ENVIRONMENTAL SCIENCE AND ENGINEEREING<br>*(Common to CIVIL, EEE & ECE Branches)* | SEMESTER I |
|---|---|---|

| PREREQUISITES | L | T | P | C |
|---|---|---|---|---|
| NIL | 3 | 0 | 0 | 3 |

| Course Objectives | The course is aimed at creating awareness among the students and also inseminates the critical ideas of preserving environment. | |
|---|---|---|
| **UNIT – I** | **ENVIRONMENTAL ENERGY RESOURCES** | **9 Periods** |
| Food-effects of modern agriculture, fertilizers, pesticides, eutrophication & biomagnifications-Energy resources: renewable resources - Hydro Energy, Solar & Wind. Non-renewable resources – Coal and Petroleum - harnessing methods. | | |
| **UNIT – II** | **ECO SYSTEM AND BIODIVERSITY** | **9 Periods** |
| Eco system and its components - biotic and abiotic components. Biodiversity: types and values of biodiversity, hot spots of biodiversity, endangered and endemic species, conservation of biodiversity: In situ and ex situ conservation. Threats to biodiversity-destruction of habitat, habit fragmentation, hunting, over exploitation and man-wildlife conflicts. The IUCN red list categories. | | |
| **UNIT – III** | **ENVIRONMENTAL POLLUTION** | **9 Periods** |
| Air pollution, classification of air pollutants – sources, effects and control of gaseous pollutants $SO_2$, $NO_2$, $H_2S$, CO, $CO_2$ and particulates. Water pollution - classification of water pollutants, organic and inorganic pollutants, sources, effects and control of water pollution. Noise pollution - decibel scale, sources, effects and control. | | |
| **UNIT – IV** | **ENVIRONMENTAL THREATS** | **9 Periods** |
| Global warming-measure to check global warming - impacts of enhanced Greenhouse effect, Acid rain- effects and control of acid rain, ozone layer depletion- effects of ozone depletion, disaster management - flood, drought, earthquake and tsunami. | | |
| **UNIT – V** | **SOCIAL ISSUES AND ENVIRONMENT** | **9 Periods** |
| Water conservation, rain water harvesting, e-waste management, Pollution Control Act, Wild life Protection Act. Population growth- exponential and logistic growth, variation in population among nations, population policy. Women and Child welfare programs. Role of information technology in human and health, COVID-19 - effects and preventive measures. | | |
| **Contact Periods**:<br>**Lecture:45 Periods** **Tutorial: 0 Periods** **Practical: 0 Periods** **Total:45 Periods** | | |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | *Sharma J.P., **"Environmental Studies"**, 4th Edition, University Science Press, New Delhi, 2016.* |
| 2 | *Anubha Kaushik and C.P.Kaushik, **"Environmental Science and Engineering"**, 7th Edition, New age international publishers, New Delhi, 2021.* |

**REFERENCES:**

| | |
|---|---|
| 1 | *A k de, **"Environmental Chemistry"**, 8th edition, New age international publishers, 2017.* |
| 2 | *G. Tyler miller and scott e. Spoolman, **"Environmental Science"**, cengage learning india pvt. Ltd., delhi, 2014.* |
| 3 | *Erach Bharucha, **"Textbook of Environmental Studies"**, Universities press (I) pvt, Ltd., Hydrabad, 2015.* |
| 4 | *Gilbert M. Masters, **"Introduction to Environmental Engineering and Science"**, 3rd Edition, Pearson Education, 2015.* |

| **COURSE OUTCOMES:**<br><br>Upon completion of the course, the students will be able to: | | **Bloom's Taxonomy Mapped** |
|---|---|---|
| CO1 | Recognize and understand about the various environmental energy resources and the effective utility of modern agriculture. | K2 |
| CO2 | Acquire knowledge about the interaction of biosphere with environment and conservation methods of bio diversity. | K2 |
| CO3 | Be aware of the sources of various types of pollution, their ill effects and<br>preventive methods. | K2 |
| CO4 | Identify and take the preventive measures to control the environmental threats and effects of Global warming, Ozone depletion, Acid rain, and natural disasters. | K2 |
| CO5 | Demonstrate an idea to save water and other issues like COVID -19. | K2 |

| 25WPM103 | APPLIED ENGINEERING MECHANICS | SEMESTER I |
|---|---|---|

| PREREQUISITES | L | T | P | C |
|---|---|---|---|---|
| NIL | 3 | 0 | 0 | 3 |

| | | |
|---|---|---|
| **Course Objectives** | To study the forces and moments in various types of mechanical systems and to enable students to understand the relationship between processes, kinetics and kinematics. | |
| **UNIT – I** | **INTRODUCTION TO MECHANICS AND FORCE CONCEPTS** | **9 Periods** |
| Principles and Concepts – Laws of Mechanics – system of forces – resultant of a force system – resolution and composition of forces – Lami's theorem – moment of a force – physical significance of moment-Varignon's theorem – resolution of a force into force and couple – forces in space – addition of concurrent forces in space – equilibrium of a particle in space, Classification of beams based on supports. | | |
| **UNIT – II** | **FRICTION** | **9 Periods** |
| Frictional resistance – classification of friction- laws of friction – coefficient of friction-angle of friction – angle of repose — cone of friction – free body diagram-advantages-equilibrium of a body on a rough inclined plane – non-concurrent force system - ladder friction – rope friction – wedge friction. | | |
| **UNIT – III** | **GEOMETRICAL PROPERTIES OF SECTION** | **9 Periods** |
| Centroids – Determination by integration – centroid of an area – simple figures - composite sections – bodies with cut parts - moment of inertia – theorems of moment of inertia – moment of inertia of composite sections – principal moment of inertia of plane areas - radius of gyration. | | |
| **UNIT – IV** | **BASICS OF DYNAMICS** | **9 Periods** |
| Kinematics and kinetics – displacements, velocity and acceleration - Equations of motion – Rectilinear motion of a particle with uniform velocity, uniform acceleration, varying acceleration – motion curves – motion under gravity – relative motion – curvilinear motion of particles – projectiles – angle of projection – range – time of flight and maximum height. Newton's second law of motion – linear momentum – D'Alembert's principle, Dynamics equilibrium — work energy equation of particles– law of conservation of energy – principle of work and energy. | | |
| **UNIT – V** | **IMPULSE MOMENTUM AND IMPACT OF ELASTIC BODIES** | **9 Periods** |
| Principle of impulse and momentum – Equations of momentum – Laws of conservation of momentum. Impact – Time of compression, restitution, collision – Co-efficient of restitution – types of impact – collision of elastic bodies by direct central impact and oblique impact – collision of small body with a massive body – Kinetic energy of a particle. | | |
| **Contact Periods**:<br>**Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods** | | |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | *S.S. Bhavikatti and K.G. Rajasekarappa, **"Engineering Mechanics"**, New age international (P) ltd, 1999.* |
| 2 | *S.C. Natesan, **"Engineering Mechanics"** Umesh Publications, 2005.* |

**REFERENCES:**

| | |
|---|---|
| 1 | *F.B. Beer and E.R. Johnson, **"Vector Mechanics for Engineers"**, Tata McGraw Hill Pvt. Ltd, 10th Edition, 2013.* |
| 2 | *S. Timoshenko, D.H.Young, J.V.Rao and Sukumar Pati, **"Engineering Mechanics"**, McGraw Hill Education, 5th Edition, 2017.* |

| | |
|---|---|
| 3 | *Irving Shames and Krishna Mohana Rao,* ***"Engineering Mechanics"****, Prentice Hall of India Ltd, Delhi, 2006.* |
| 4 | *R.C. Hibbeller,* ***"Engineering Mechanics"****, Prentice Hall of India Ltd, 13th Edition, 2013.* |
| 5 | *Vela Murali,* ***"Engineering Mechanics",*** *Oxford university Press, 1st Edition, 2010.* |

| **COURSE OUTCOMES:**<br><br>Upon completion of the course, the students will be able to: | | **Bloom's Taxonomy Mapped** |
|---|---|---|
| CO1 | Know the concept of mechanics and system of forces and moments. | K5 |
| CO2 | Calculate the frictional properties at different bodies. | K5 |
| CO3 | Identify the locations of centre of gravity and moment of inertia for different sections. | K5 |
| CO4 | Understand the basics of dynamics of particles | K5 |
| CO5 | Know the impulse and momentum principle and impact of elastic bodies. | K5 |

| 25WPM104 | MANUFACTURING TECHNOLOGY | SEMESTER I |
|---|---|---|

| PREREQUISITES | L | T | P | C |
|---|---|---|---|---|
| NIL | 3 | 0 | 0 | 3 |

| | | |
|---|---|---|
| **Course Objectives** | To acquire knowledge about various types of manufacturing processes this includes casting, joining, forming and conventional machining to produce a product for competitive industrial applications. | |
| **UNIT – I** | **METAL CASTING AND JOINING PROCESSES** | **9 Periods** |
| Introduction to Concepts of Manufacturing Process -Sand casting – Sand moulds - Type of patterns – Pattern materials – Pattern allowances – Core making – Special casting processes: Investment casting, die casting. Fusion welding – Types – Gas welding - Shielded metal arc welding - Gas metal arc welding - Gas tungsten arc welding - Submerged arc welding – Electro slag welding - Principles of resistance welding – Spot, butt, seam, projection and percussion welding. | | |
| **UNIT – II** | **BULK DEFORMATION AND SHEET METAL FORMING** | **9 Periods** |
| Hot working and cold working of metals – Forging processes – Open and close die forging – Types of forging machines - Forging operations – Mechanism of rolling – Types of Rolling mills – Principles of Extrusion – Typical shearing operations, bending and drawing operations - Metal spinning. | | |
| **UNIT – III** | **THEORY OF METAL CUTTING** | **9 Periods** |
| Mechanics of chip formation – forces in machining – types of chips – cutting tools – single point cutting tool nomenclature – orthogonal and oblique metal cutting – thermal aspects – cutting tool materials – tool wears – tool life – surface finish – cutting fluids and machinability. | | |
| **UNIT – IV** | **LATHE, SHAPING, PLANING AND DRILLING MACHINES** | **9 Periods** |
| Lathe – construction – types – operations – working principle of single and multi - spindle automats – shaping and planning machines – principle – types – construction - mechanism – different shaping operations – work holding devices - Drilling machines – types, operations – drill tool nomenclature. | | |
| **UNIT – V** | **GRINDING AND MILLING MACHINES** | **9 Periods** |
| Grinding – types of grinding machines – grinding wheels, specifications – bonds – mounting and reconditioning of grinding wheels - Milling – types - cutter nomenclature – types of cutters – milling processes – indexing – gear generation - gear shaping and gear hobbing – gear finishing methods. | | |
| **Contact Periods**:<br>**Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods** | | |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | *P. N. Rao,* ***"Manufacturing Technology: Foundry, Forming and Welding"****, McGraw Hill, 5th Edition, 2018.* |
| 2 | *P.N. Rao,* ***"Manufacturing Technology Vol II: Metal Cutting and Machine Tools"****, McGraw Hill Education, 4thEdition, 2018.* |

**REFERENCES:**


| | |
|---|---|
| 1 | *Serope Kalpakjian and Steven R. Schmid, **"Manufacturing Engineering and Technology"**, Pearson Education, 7th Edition, 2018.* |
| 2 | *P. C. Sharma, **"A Text book of Production Technology"**, S. Chand and Co. Ltd., 2021.* |
| 3 | *S. K. Hajra Choudhry, and Nirjhar Roy and A. K. Hajra Choudhury,**"Elements of Workshop Technology Vol II: Machine Tools"**, Media Promoters and Publishers Pvt. Ltd., 2018.* |
| 4 | *R.K. Rajput, **"Manufacturing Technology"**, Laxmi Publication Pvt Ltd, 2nd Edition, 2007.* |
| 5 | *Mikell P. Groover, **"Fundamentals of Modern Manufacturing: Materials, Processes, and System"**, John Wiley and Sons, 2010.* |


| **COURSE OUTCOMES:**<br><br>Upon completion of the course, the students will be able to: | | **Bloom's Taxonomy Mapped** |
|---|---|---|
| CO1 | Apply the principle of metal casting and welding processes for engineering applications. | K3 |
| CO2 | Identify the suitable forging, rolling and metal forming processes. | K3 |
| CO3 | Apply the theory of metal cutting to solve the problems in industries. | K3 |
| CO4 | Understand the operating mechanism of lathe, shaping, planning and drilling machines. | K3 |
| CO5 | Familiarize the grinding, milling and gear generation process and its uses in industries. | K3 |

| 25PTM105 | MANUFACTURING TECHNOLOGY LABORATORY | SEMESTER I |
|---|---|---|

| PREREQUISITES | L | T | P | C |
|---|---|---|---|---|
| NIL | 0 | 0 | 3 | 1.5 |

| Course Objectives | To provide an understanding of advanced manufacturing methods with idea of the dimensional and form accuracy of products. |
|---|---|

**LIST OF EXPERIMENTS**

1. Facing, Step Turning, Taper Turning using Lathe.
2. External Thread Cutting. Groove Cutting, Knurling and Chamfering using Lathe.
3. Drilling and Counter Sinking using Lathe.
4. Drilling, Reaming, Tapping and Surface Grinding using Surface Grinder and Radial Drilling Machine.
5. External Cylindrical Grinding of Shaft.
6. V-Groove Cutting in Shaping Machine.
7. Spur Gear Milling.
8. Helical Gear Milling in Universal Milling Machine.
9. Gear Shaping.
10. Gear Hobbing.
11. Making Hexagonal Hole using Slotting Machine.
12. Letter Cutting in Vertical Milling Machine.
13. CNC Part Programming for Machining of Facing, Step Turning, Taper Turning, Milling in CNC machine.

**Contact Periods**:
**Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods**

| **COURSE OUTCOMES:** Upon completion of the course, the students will be able to: | | **Bloom's Taxonomy Mapped** |
|---|---|---|
| CO1 | Have the capability of selecting suitable manufacturing processes to manufacture the products optimally. | K2 |
| CO2 | Maintain the accuracy and tolerance of components produced. | K4 |
| CO3 | Set up machines like lathe, shaper, grinding and milling machine for various applications. | K2 |
| CO4 | Prepare gears using forming and generating methods of gear manufacturing. | K3 |
| CO5 | Write the part programming and perform machining in CNC Machines. | K4 |