# GOVT. COLLEGE OF ENGINEERING AURANGABAD

## CURRICULUM

**S. Y. B. Tech. (Mechanical Engineering)**

**Department of Mechanical Engineering**

**2018-2019**

# Structure for Second Year B. Tech. (Mechanical Engineering) (Full Time)
# Choice Based Credit System

| Semester-III | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr. No** | **Code** | **Subject** | **Contact Period (Hrs.)** | | | **Credits** | **Continuous Evaluation in terms of Marks** | | | | | | |
| | | | | | | | **Theory** | | | | **TW** | **Practical /Viva Voce** | **Total** |
| | | | **L** | **T** | **P** | | **Class Test I** | **Class test II** | **TA** | **ESE** | | | |
| **1.** | MA 2001 | Engineering Mathematics – III | 4 | 0 | 0 | 4 | 15 | 15 | 10 | 60 | - | - | 100 |
| **2.** | ME 2001 | Engg Thermodynamics | 2 | 1 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **3.** | ME 2002 | Machine Drawing | 3 | 0 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **4.** | ME2003 | Manufacturing Process | 2 | 0 | 0 | 2 | 10 | 10 | 05 | 25 | - | - | 50 |
| **5.** | # | **Professional Elective I** | 3 | 0 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **6.** | * | **Open Elective I** | 3 | 0 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **7.** | HS 2001 | Environment Studies | 4 | 0 | 0 | 4 | 15 | 15 | 10 | 60 | - | - | 100 |
| **8.** | ME 2006 | Lab-Engg Thermodynamics | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **9.** | ME 2007 | Lab- Machine Drawing | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **10.** | ME 2008 | Lab-Workshop III | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **11.** | $ | **Audit Course I** | 0 | 0 | 2 | 0 | - | - | - | - | - | - | - |
| | | **Total** | **21** | **1** | **8** | **25** | **100** | **100** | **65** | **385** | **75** | **75** | **800** |

| Semester-IV | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr.No** | **Code** | **Subject** | **Contact Period (Hrs.)** | | | **Credits** | **Continuous Evaluation in terms of Marks** | | | | | | |
| | | | | | | | **Theory** | | | | **TW** | **Practical / Viva Voce** | **Total** |
| | | | **L** | **T** | **P** | | **Class Test I** | **Class test II** | **TA** | **ESE** | | | |
| **1.** | ME 2009 | Electrical Machines | 2 | 0 | 0 | 2 | 10 | 10 | 5 | 25 | - | - | 50 |
| **2.** | ME 2010 | Mechanisms of Machines | 2 | 1 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **3.** | ME 2011 | Applied Thermodynamics | 3 | 0 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **4.** | ME 2012 | Strength Of Materials | 2 | 0 | 0 | 2 | 10 | 10 | 5 | 25 | - | | 50 |
| **5.** | # | **Professional Elective II** | 3 | 0 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **6.** | $ | **Audit Course II** | 0 | 0 | 2 | 0 | - | - | - | - | - | - | - |
| **7.** | ME 2016 | Lab - Electrical Machines | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **8.** | ME 2017 | Lab- Mechanisms of Machines | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **9.** | ME 2018 | lab - Applied Thermodynamics | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **10.** | ME 2019 | Lab – Strength Of Materials | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **11.** | ME 2020 | Lab- CAME I | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **12.** | ME 2021 | Lab- Workshop IV | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| | | **Total** | **12** | **2** | **14** | **19** | **65** | **65** | **40** | **230** | **150** | **150** | **700** |
| | | **Grand Total** | **33** | **2** | **22** | **44** | **165** | **165** | **105** | **615** | **225** | **225** | **1500** |

**L** = Lecture, **T** = Tutorial, **P** = Practical, **TA** = Teacher Assessment, **ESE** = End Semester Examination

**#Professional Elective I**

ME 2004 Engg Materials
ME 2005 Biomechanical Engineering

***Open Elective I**

ME 2022 - Total Quality Management
ME2023- Entrepreneurship Development Programme

**$ Audit Course I**

AC 2001 NSS
AC 2002 Group Discussion
AC 2003Yoga

**#Professional Elective II**

ME 2013 Machine Tools
ME2014 - Material Handling
ME2015 Surface Coating

$ **Audit Course II**

AC 2004 Professional Communication
AC2005 Social innovation

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# Structure for Second Year B. Tech. (Mechanical Engineering) (Part Time)
# Choice Based Credit System

| Sr. No | Code | Subject | Contact Period (Hrs.) | | | Credits | Continuous Evaluation in terms of Marks | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Theory | | | | TW | Practical /Viva Voce | Total |
| | | | L | T | P | | Class Test I | Class test II | TA | ESE | | | |
| **Semester I** | | | | | | | | | | | | | |
| **1.** | MA 2001 | Engineering Mathematics - III | 4 | 0 | 0 | 4 | 15 | 15 | 10 | 60 | - | - | 100 |
| **2.** | ME 2001 | Engg Thermodynamics | 2 | 1 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **3.** | ME 2002 | Machine Drawing | 3 | 0 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **4.** | ME 2003 | Manufacturing Process | 2 | 0 | 0 | 2 | 10 | 10 | 05 | 25 | - | - | 50 |
| **5.** | ME 2006 | Lab-Engg Thermodynamics | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **6.** | ME 2007 | Lab- Machine Drawing | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **7.** | ME 2008 | Lab-Workshop III | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **8.** | $ | **Audit Course I** | 0 | 0 | 2 | 0 | - | - | - | - | - | - | - |
| | | **Total** | **11** | **1** | **8** | **15** | **55** | **55** | **35** | **205** | **75** | **75** | **500** |

| Sr. No | Code | Subject | Contact Period (Hrs.) | | | Credits | Continuous Evaluation in terms of Marks | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Semester II** | | | | | | | | | | | | | |
| | | | | | | | Theory | | | | TW | Practical /Viva Voce | Total |
| | | | L | T | P | | Class Test I | Class test II | TA | ESE | | | |
| **1*** | # | **Professional Elective I** | 3 | 0 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **2.** | HS 2001 | Environment Studies | 4 | 0 | 0 | 4 | 15 | 15 | 10 | 60 | - | - | 100 |
| **3.** | ME 2009 | Electrical Machines | 2 | 0 | 0 | 2 | 10 | 10 | 5 | 25 | - | - | 50 |
| **4.** | ME 2010 | Mechanisms of Machines | 2 | 1 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **5.** | ME 2016 | Lab - Electrical Machines | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **6.** | ME 2017 | Lab- Mechanisms of Machines | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **7.** | ME 2021 | Lab- Workshop IV | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| | | **Total** | **11** | **1** | **6** | **15** | **55** | **55** | **35** | **205** | **75** | **75** | **500** |

| Semester III | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr. No** | **Code** | **Subject** | **Contact Period (Hrs.)** | | | **Credits** | **Continuous Evaluation in terms of Marks** | | | | | | |
| | | | | | | | **Theory** | | | | **TW** | **Practical /Viva Voce** | **Total** |
| | | | **L** | T | P | | **Class Test I** | **Class test II** | **TA** | **ESE** | | | |
| **1.** | ME2011 | Applied Thermodynamics | 3 | 0 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **2.** | ME2012 | Strength Of Materials | 2 | 0 | 0 | 2 | 10 | 10 | 5 | 25 | - | | 50 |
| **3.** | # | **Professional Elective II** | 3 | 0 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **4*** | # | **Open Elective** | 3 | 0 | 0 | 3 | 15 | 15 | 10 | 60 | - | - | 100 |
| **5.** | $ | **Audit Course II** | 0 | 0 | 2 | 0 | - | - | - | - | - | - | - |
| **6.** | ME 2017 | Lab - Applied Thermodynamics | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **7.** | ME 2018 | Lab – Strength Of Materials | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **8.** | ME 2020 | Lab- CAME I | 0 | 0 | 2 | 1 | - | - | - | - | 25 | 25 | 50 |
| **Total** | | | **11** | **0** | **8** | **14** | **55** | **55** | **35** | **205** | **75** | **75** | **500** |
| **Grand Total** | | | **33** | **2** | **22** | **44** | **165** | **165** | **105** | **615** | **225** | **225** | **1500** |

**#Professional Elective I**

ME 2004 Engg Materials

ME 2005 Biomechanical Engineering

**#Professional Elective II**

ME 2013 Machine Tools

ME2014 - Material Handling

ME2015 Surface Coating

***Open Elective**

ME 2022 - Total Quality Management

ME2023- Entrepreneurship Development Programme

**$ Audit Course**

AC 2001 NSS

AC 2002 Group Discussion

AC 2003Yoga

**$ Audit Course II**

AC 2004 Professional Communication

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| MA 2001: Engineering Mathematics-III | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 4 Hrs/Week**<br>**Total Credits : 04** | **Examination Scheme**<br>**Class Test-I : 15 Marks**<br>**Class Test-II : 15 Marks**<br>**Teachers Assessment: 10Marks**<br>**End Semester Exam : 60 Marks** |

**Course description**:

Engineering Mathematics-III (MA 2001) is a compulsory course to all second year engineering students of the institute in the Semester –III and is a continuation of previous year courses viz. Engineering Mathematics-I (MA1001) and Engineering Mathematics-II (MA1002). This course intends to provide engineering students a coherent and balanced account of major mathematical techniques and tools.

**Course Objective:**

This course intends to provide an overview of analytical and numerical techniques to solve ordinary and partial differential equations, which we apply to solve many engineering problems of mechanical, civil electrical Engineering.

**Course Outcomes:**

After completing the course, students will be able to:

| | |
|---|---|
| CO1 | Determine the solution of second and higher order linear differential equation and apply knowledge of LDE to solve the problems in Engineering |
| CO2 | Classify, formulate and solve the first order and second order linear, non-linear partial differential equations and apply the knowledge of partial differential equations to solve the problems in Engineering |
| CO3 | Find approximate solution of ordinary differential equations of first order and find the convergence and stability of the approximate solutions |

**Detailed syllabus:**

| | |
|---|---|
| **Unit-I** | **Linear Differential Equations (LDE):**<br>Linear Differential Equations **(LDE)** with constant coefficients, Differential equations reducible to LDE with constant coefficients, Simultaneous LDE with constant coefficients |
| **Unit-II** | **Applications of Linear Differential Equations (LDE):**<br>L-C-R Circuit, Coupled Electrical Circuits, Bending of beams, Spring-Mass system |
| **Unit-III** | **Partial Differential Equations (PDE):**<br>First order linear/ nonlinear Partial Differential Equation Formation **(PDE)**, Lagrange's equation, Linear Partial Differential Equations **(PDE)** of second and higher order with constant coefficients, Linear non-homogeneous PDE. |
| **Unit-IV** | **Applications of Partial Differential Equations:**<br>Solutions of one-dimensional wave equation, one-dimensional heat equation, Steady state solution of two-dimensional heat equation, Fourier series solutions in Cartesian coordinates. |

| | |
|---|---|
| **Unit-V** | **The approximation for the solution of first order Ordinary Differential Equations:** Taylor series method, Euler's method, Euler's modified Method, Runge-Kutta Fourth order Method, Milne's Predictor-Corrector Method, and Solution of system of ordinary differential equations by Runge-Kutta methods. |

**Text and Reference Books**


1. A Text Book of engineering Mathematics (Vol.1 &2) 6th Edition by P.N.Wartikar& J.N.Wartikar Vidhyarthi Griha Prakashan, Pune.
2. Advanced Engineering Mathematics by Erwin Kreyszig, 10th Edition, Willey Eastern Ltd. Mumbai, 2000.
3. Engineering Mathematics-A Tutorial Approach by Ravish R Singh, Mukul Bhatt, 2009.
4. Higher Engineering Mathematics by B. S. Grewal, Khanna publication, New Delhi, 2007.
5. Advanced Engineering Mathematics by H. K. Dass, S. Chand and Sons, 2004.
6. Calculus by G. B. Thomas and R. L. Finney, Addison- Wesley, 1996
7. Elements of Partial Differential Equations by I.N. Sneddon, Dover Publications Inc. 2006.


**Mapping of Course outcome with Program Outcomes (Mechanical Engineering)**

| Course Outcome | PO 1 | PO2 | PO 3 | PO4 | PO5 | PO 6 | PO7 | PO8 | PO9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | | 1 | | 2 | 3 | | | | | | | 2 | |
| CO2 | 1 | | 2 | | 2 | 3 | | | | | | | 2 | |
| CO3 | 1 | | 3 | | 3 | 3 | | | | | | | | |

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| ME2001: ENGINEERING THERMODYNAMICS | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 2 Hrs/Week**<br>**Tutorial: 1 Hr/Week**<br>**Total Credits : 03** | **Examination Scheme**<br>**Class Test-I : 15 Marks**<br>**Class Test-II : 15 Marks**<br>**Teachers Assessment: 10Marks**<br>**End Semester Exam : 60 Marks** |

**Prerequisites:** BS1001 Engineering physics, BS 1003 Engineering Chemistry, MA 1001 Engineering Mathematics

**Course description**: This course consists of basic understanding and application of laws of engineering thermodynamics to the various practical engineering applications like engines, power plants, heat exchangers, pumps etc. Basic understanding of steam formation, steam properties and use of steam tables and Mollier diagram is included in this course. Theoretical analysis of various air standard cycles is covered in this course. Also this course includes theoretical and practical analysis of fuels and products of combustion process.

**Course Objectives:**

- Understand various types of energies and its applications in thermodynamic systems
- Applying thermodynamic concepts to thermodynamic systems
- Know various laws of thermodynamics and applications to thermodynamic system
- Application of ideal gas processes to thermodynamic systems
- Study steam properties, Interpret steam tables and Mollier charts with numerical applications
- Understand and analyze (numerical analysis) various types of air standard cycles
- To know various types of fuels their properties and applications
- To know the chemical analysis (Numerical treatment) of fuels and exhaust gases

**Course Outcome**

After completing the course, students will be able to:

| | |
|---|---|
| CO1 | Study thermodynamic systems by applying laws of thermodynamics |
| CO2 | Define state of steam and perform steam property calculations |
| CO3 | Analyze thermodynamic cycle performance |
| CO4 | Analyze combustion of fuels and product of combustion |

**Detailed Syllabus:**

| | |
|---|---|
| Unit1 | **First Law applied to Steady Flow Processes**<br>Conservation of energy, steady flow processes, SFEE, modification of SFEE for different |

| | |
|---|---|
| | engineering devices such as nozzles, blowers, I.C. Engines, Compressors, Pumps, Turbines, throttling devices (Numerical Treatment) |
| Unit2 | **Second Law of Thermodynamics**<br>Limitations of first law of thermodynamics, thermodynamic temperature scale, Entropy, entropy as a property, available and unavailable energy, Quality of energy, reversible process and irreversible process, thermodynamic relations, Clausius- clapeyron Equations and their engineering applications, Carnot Theorem (Descriptive Treatment) |
| Unit3 | **Properties of steam and pure substances**<br>Pure substance, phase, , p-v phase diagram, critical point, Triple point, Entropy of steam, steam tables, processes of steam, Enthalpy- Entropy diagram, steady flow process and determination of dryness fraction of steam (Numerical Treatment) |
| Unit4 | **Power cycles**<br>Definition of cycles, power producing cycles and power consuming cycles, Air standard cycles, air standard efficiency, Carnot cycle, Otto cycles, Diesel cycles, Dual combustion cycles, Comparison of Otto, Diesel and dual combustion cycles, Efficiency versus compression ratio for the same heat input, for constant maximum pressure and heat supplied. Fuel air cycle, Brayton cycles, Atkinson cycle, Ericsson cycle (Numerical Treatment) |
| Unit5 | **Fuels and Combustion**<br>Introduction, classification of fuels, calorific heating value of fuels, Determination of C.V. of fuels, Solid fuels, liquid fuels, gaseous fuels, Orsat apparatus and determination of minimum air required for combustion. Conversion of volumetric analysis to mass analysis, Combustion of gaseous fuels, conversion of volumetric analysis of gas into mass analysis (Numerical Treatment) |

**Tutorial hours will be distributed equally to each unit**

**Text and Reference Books**


1. Nag P.K., "Engineering Thermodynamics", Fourth Edition, TMH Publishing Co. New Delhi, 2008.
2. Rajput R.K., "A Text Book of Engineering Thermodynamics", Third Edition, Laxmi Publication, New Delhi 2007.
3. Ballaney P.L., "Thermal Engineering", Khanna Publications, New Delhi, 2014.
4. Domkundwar S, Kothandaraman C. P. & Domkundwar A., "A Course in Thermal Engineering", Dhanpat Rai and Co. publication, New Delhi, 2004.
5. Rao Y. V. C., "Engineering Thermodynamics", Universities Press, Hyderabad 2014
6. Ven Violin, " Classical Thermodynamics", Wiley publication, 2014

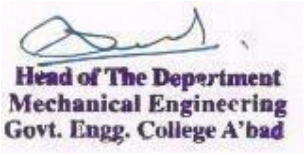

**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | | 1 | 2 | 1 | | | | | | | |
| CO2 | 3 | 1 | 1 | 1 | 2 | 1 | | | | | | | 1 | |
| CO3 | 3 | 2 | 2 | 1 | 1 | 2 | | | | | | | | |
| CO4 | 3 | 2 | 3 | | 1 | 1 | | | | | | | 1 | |
| CO5 | 3 | 2 | 1 | | | | 1 | | | | | | 2 | |
| CO6 | 3 | 2 | 1 | | | | | | | | | | | |

**1 – High 2 – Medium 3 - Low**

**Teacher's Assessment:** Teachers Assessment of 20 marks is based on one of the / or combination of few of following

1) Question & answer / Numerical solution
2) Presentation of case studies of thermodynamic system
3) Test consisting of multiple choice questions



| ME 2002 : MACHINE DRAWING | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 3Hrs/Week**<br>**Tutorial: -- Hr/Week**<br>**Credits: 3** | **Examination Scheme**<br>**Class Test I : 15Marks**<br>**Class Test II : 15 Marks**<br>**Teachers Assessment : 10Marks**<br>**End Semester Exam : 60 Marks** |

**Prerequisites:** ME 1003 Engineering graphics

**Course description**: After completing this course, students will have a broad and fundamental concept of intersection curves in sheet metal work, Apply concept of curves in manufacturing; apply the knowledge of developed surfaces in sheet metal product manufacturing, Assembly and Details

**Course Objectives:**

- To understand the intersection curves for joining the surfaces
- To apply fundamental concepts of various curves and its use in manufacturing
- To understand various developed surfaces in sheet metal product manufacturing
- To Understand Assembly drawings and details, concept of Bill of materials

**Course Outcome**

After completing the course, students will able to:

| | |
|---|---|
| CO1 | Draw curves of intersection of solids. |
| CO2 | Construct a set of working drawings of a machine assembly including assembly drawings, detail drawings, bill of materials. |
| CO3 | Applying the knowledge of sheet metal of manufacturing, draw the corresponding developed surfaces |
| CO4 | Draw the engineering curves used in product design and mentioned in unit 2. |

**Detailed Syllabus:**

| | |
|---|---|
| Unit 1 | **Intersection of Surfaces** Line or Curve of intersection of two solids, Methods: Line method, Cutting-plane method. Intersection of vertical prism with prism, cylinder, cone (Horizontal or Inclined), Intersection of vertical Cylinder with cylinder, cone, prism (Horizontal or Inclined), Intersection of vertical cone with cone, prism, cylinder (Horizontal or Inclined), Intersection of Sphere with cylinder, prism (Horizontal or Inclined). |
| Unit 2 | **Engineering Curves & Gearing** Introduction: Conics section, Cycloidal curves, Involute curves, and spirals Directrix, focus, eccentricity, Normal & Tangents, Construction of ellipse by directrix focus method, concentric circle method, arcs of circle method, oblong method, Construction of Parabola / hyperbola by directrix focus method, Rectangle method, Tangent method, Cycloid- Epicycloids & hypocycloid, Trochoid - Epitrochoid & Hypotrochoid (Theoretical treatment only) Gears: construction of spur gear tooth profile by accurate / approximate method |
| Unit 3 | **Development of Surfaces** Introduction: Methods of Development, Development of lateral surfaces of right solids- Cube, Prism, Cylinders, Pyramids, Cone, Development of Transition Pieces, Spheres |

| | |
|---|---|
| Unit 4 | **Assembly and Details**<br>**Production Drawing**: Introduction, Types of production drawings, Detailing or Part Drawings, Working Assembly Drawings,<br>Assembly and detail Drawings of various component<br>**Shaft joints**: Cotter joint and Knuckle joint.<br>**Keys & Shaft coupling**: Muff, Flanged, Flexible, Universal and Oldham's coupling.<br>**Shaft bearing**: Solid and bush bearing, Plummer block, Footstep bearing.<br>**Pipe joint**: Flanged joint, Socket and Spigot joint, Hydraulic joint, Union joint, Gland & Stuffing Box, Expansion joint.<br>**Pulley**: Belt pulley, V belt pulley, Fast and loose pulley, Speed cone pulley, Built up pulley.<br>**Engine Parts**: Piston, Stuffing box, cross head, Vertical & Horizontal engine, Connecting rod, Crank, Eccentric.<br>**Valves**: Steam stop valves, Feed check valve, Safety valves, Blow off cock.<br>Lathe Tail stock, Machine vice, Drill jigs and Milling fixture, Screw jack. |

**Reference Books**


1. Bhatt N. D., Panchal V. M., "Engineering Drawing", Charotar Publishing House, 2010.
2. Dhabhade M. L., "Engineering Graphics", Vol. - I and Vol.-II, Vision Publications, Pune, 2003.
3. Gill P. S., "Engineering Drawing", S. K. Katariya & Sons, Delhi, 2013.
4. Bhatt N. D., Panchal V. M., "Machine Drawing", Charotar Publishing House, 2014.
5. Siddheswar, Kannaiyah, and Shastry VVS, "Machine Drawing", TMH
6. Dhawan, "A Text Book of Machine Drawing," S. Chand publications 2014


**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | 1 | 1 | | 1 | | | | | | | | 2 | |
| CO2 | | 2 | 2 | | | | | | | | | | 1 | |
| CO3 | | 2 | 3 | | 1 | | | | | | | | | |
| CO4 | | 2 | 2 | 1 | 1 | | 2 | | | | | | 2 | |

**1 – High 2 – Medium 3 – Low**

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| ME 2003 : MANUFACTURING PROCESSES | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 2Hrs/Week**<br>**Credits: 2** | **Examination Scheme**<br>**Class Test I : 10 Marks**<br>**Class Test II : 10Marks**<br>**Teachers Assessment : 05 Marks**<br>**End Semester Exam : 25 Marks** |

**Prerequisites:** ME 1001 Basics of Mechanical Engineering

**Course description**: After completing this course, students will have a broad and fundamental understanding of the concepts of moulding in practice, knowledge of pattern making and related concepts, concept of plastic processing, knowledge of forging operation, concept of sheet metal and joining process.

**Course Objectives:**

- To know various moulding processes and tools
- Understand various pattern making tools and processes
- Understand fundamental concept of plastic manufacturing processes
- Understand various forging processes and its tools and heat treatment

**Course Outcome**

After completing the course, students will able to:

| | |
|---|---|
| CO1 | Understand fundamental concept of pattern making and moulding in practice |
| CO2 | Understand concept of plastic processing |
| CO3 | Enhance the knowledge of Mechanical working operation |
| CO4 | Understand new technologies in metal joining process |

**Detailed Syllabus:**

| | |
|---|---|
| Unit 1 | **Pattern Making and Mould Making**<br>Introduction, pattern making tools, sawing tools, making and layout tools, pattern materials, factors affecting selection of pattern materials, master patterns, pattern allowance, types of pattern, core print, core boxes.<br>Moulding tools and equipments, moulding sands, types of moulding sand, grain shape and size of sand, sand additives, properties of moulding sand preparatory, sand testing, moulding processes, moulding processes based on sand used, making a green sand mould, typical moulding problems, machine moulding, core and core making, cleaning of casting. |
| Unit 2 | **Plastics and Their Processing**<br>Introduction, polymers, classification, polymer additives, cellulose derivatives, synthetic resins, elastomer, plastic processing methods, forming methods, lamination of plastics, joining of plastics |

| | |
|---|---|
| Unit 3 | **Mechanical Working of Metals**<br>Introduction, hot working, hot rolling, piercing of seamless tubing, drawing, deep drawing, hot spinning, cold working, cold rolling, cold drawing, cold bending, cold spinning<br>Introduction, forging materials, heating devices, forging temperatures, hand tools and appliances smith forging operations, forging processes, hand forging, power forging, impression die forging, drop hammers, press forging, roll die forging press verses hammer forging, machine or upset forging, high energy rate forging, effects of forging, defects in forging, heat treatment of forging, advantages and disadvantages |
| Unit 4 | **Metal Joining Processes**<br>Welding processes- Introduction, weldability, Manual Metal Arc Welding (MMAW), Plasma Arc, Submerged Gas welding Electron beam welding, Friction stir welding, Ultrasonic welding |

**Text and Reference Books**


1. DeGarmo, Black Konser, "Materials and Processes in Manufacturing", PHI, New Delhi
2. Schey J. A., "Introduction to Manufacturing processes", Mc Graw Hill, New Delhi
3. Lindberg A., "Processes and Materials of Manufacturing", Lindberg
4. Raghuvanshi B.S., "Workshop Technology", Vol I, Asia Publishing House
5. Hazra Choudhary, "Elements of Workshop Technology", Vol. I, Khanna Publishers
6. Bawa H.S., "Workshop Technology", Vol. I Mc Graw Hill, New Delhi
7. Chapman W A J, "Workshop Technology", Taylor and Francis pub,Vol.1 and Vol. 2, Ed.5th, 2015


**Mapping of Course outcome with Program Outcomes**

| Course Outcom e | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 1 | 2 | 3 | | | | | | | 1 | |
| CO2 | | 1 | 1 | 2 | 2 | | | | | | | | 2 | |
| CO3 | | 2 | 2 | 1 | 2 | 3 | | | | | | | 1 | |
| CO4 | 3 | 1 | 2 | 1 | 2 | | | | | | | | | |

**1 – High 2 – Medium 3 - Low**

Head of The Department
Mechanical Engineering
Govt. Engg. College A'bad

| ME 2004: ENGINEERING MATERIALS | |
|---|---|
| **Teaching Scheme**<br>**Lectures : 3 Hrs/ Week**<br>**Credits : 3** | **Examination Scheme**<br>**Class Test I : 15 Marks**<br>**Class Test II : 15 Marks**<br>**Teachers Assessment : 10 Marks**<br>**End Semester Exam : 60 Marks** |

**Prerequisites**: Nil

**Course Description**: After completion of the course, students will have understanding of various modern engineering materials. They will be able to analyze the performance of various composite materials.

**Course Objectives**

- To understand the selection of composite materials for specific Application.
- To know the fabrication methods and structural applications of different types of composite materials.
- To understand mechanical properties of Plastic Materials.
- To know the process of Particle Reinforced Composites.
- To know Different types of Composite Materials.

**Course Outcome**

After completing the course, students will be able to:

| | |
|---|---|
| CO1 | Analyze Fracture Behavior and Strengthening Principles of various types of Composites. |
| CO2 | Evaluate the various types of Composite Materials. |
| CO3 | Analyze the Fabrication Methods and Structural Applications of different types of Composite Materials. |

**Detailed Syllabus**

| | |
|---|---|
| Unit 1 | Composite Materials: Introduction, Reinforcement, Natural Fibers, Synthetic Fibers, Particulate and Whiskers Reinforcement, Reinforcement- Matrix Interface. |
| Unit 2 | Classification of Composite materials, Dispersion Strengthened particle reinforced composite laminates, Properties of Matrix and reinforcement Materials. |
| Unit 3 | Micromechanics and principles of strengthening, Elastic properties, Stress –strain relations, fracture behavior, Fabrication methods and structural Applications of Different types of Composite Materials. |
| Unit 4 | Deformation and strengthening of plastic materials, mechanical properties, Creep and Fracture of Polymeric Materials, Visco-elasticity, Stress Relaxation and Glass transition Temperature. |
| Unit 5 | Particle reinforced Composites: Large particle Composites, Dispersion strengthened Composites, Fiber reinforced composites: Influence of Fiber length, Orientation and Concentration, Fiber Phase. |

**Text And Reference Books**


1. Chula K.K, "Composite Material Science and Engineering", Pub. Springer, 2015.
2. Raghavan V., "Physical Metallurgy Principles and Practice", Pub. PHI, Learning, 2nd Edition, 2011
3. Callister William," Material Science and Engineering- An Introduction, " 6th Edition John Wiley & Sons, 2015


**Mapping of Course Outcome with Program Outcomes**

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

**1- High 2- Medium 3- Low**

Head of The Department
Mechanical Engineering
Govt. Engg. College A'bad

| ME 2005 : BIO-MECHANICAL ENGINEERING | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 3 Hrs/Week**<br>**Total Credits : 03** | **Examination Scheme**<br>**Class Test-I : 15 Marks**<br>**Class Test-II : 15 Marks**<br>**Teachers Assessment: 10Marks**<br>**End Semester Exam : 60 Marks** |

**Prerequisites: BS1005: Biology**

**Course description**: After completion of the course, students will have understanding of fundamentals of Bio-medical Engineering. They will have knowledge of various tissues, their anatomy and physiology. They will be able to understand bio material used for artificial organs. Their creativity will be addressed in mini project as a part of Teachers' assessment. They will know artificial replacement for natural organs. They will know CT, MRI, CATE, and Bio-CAD. Students will acquire skill to be entrepreneur in the field of Bio medical Engineering.

**Course Objectives:**

- To provide a fundamentals of bio-medical engineering, tissue engineering
- To accustom with various bio materials
- To impart knowledge about applications of bio medical engineering
- To familiarize with practical protocols regulations in the field

**Course Outcome**

After completing the course, students will be able to:

| | |
|---|---|
| **CO1** | Understand the principles and applications of bio medical engineering |
| **CO2** | Understand different forms of bio mechanics (mentioned in unit 2). |
| **CO3** | Explain the bio compatibility and toxicological screening of materials |
| **CO4** | Study the definition, structure and organization of tissues, comparison of imaging modes. |
| **CO5** | Understanding testing and measurement of specimen |
| **CO6** | Create capacity to practically understand use of artificial organs |

**Detailed Syllabus:**

| | |
|---|---|
| **Unit 1** | Introduction, Engineering perspectives of biological sciences: Where engineering meets biology and where biology meets engineering. Biology as an integrated Science; Case studies on integrating biology with engineering. The modern health care system, Biomedical engineering introduction, roles played by biomedical engineers, morality & ethical issues introduction to anatomy and physiology, cellular organization, tissues, major organ systems, homeostasis. |
| **Unit 2** | Introduction to basic mechanics, heart tissues, soft tissues, testing and measurement of specimen, bio mechanics of joints, locomotion, cardiovascular mechanics, fluid mechanics |
| **Unit 3** | Definition of bio materials, requirement and properties of bio materials, metallic implant materials, polymeric implant materials, ceramic implant materials, composite implant materials, bio compatibility and toxicological screening of biomaterials. |
| **Unit 4** | Introduction to tissue engineering, definition, structure & organization of tissues, cell culture, molecular biology aspects, scaffold & transplant medical imaging, diagnostic |

| | |
|---|---|
| | ultra sound imaging, CT & MRI, comparison of imaging modes, computer aided tissue engineering (CATE) scope of CATE, Bio CAD & human body modeling |
| **Unit 5** | Introduction to artificial organs, prosthesis & orthotics, bio material used for artificial organs, artificial kidney, artificial heart lung machine, audiometry, rehabilitation engineering, impairment, disabilities & handicaps measurement & assessment, characterizing engineering concepts in sensory and motor rehabilitation engineering. |

**Text and Reference Books**


1.Park J. B., "Biomaterials- science & engineering plenum", press 1984
2.Bhatt S. V., "Biomaterials", Narosa publishing house 2002
3.Alexander R Mc Neill, "Biomechanics", Chapman and Hall, 1975
4.Ghista D. N., "Biomechanics of Medical devices", macek Dekker1982
5.Lodish H, Berk A, Zipursky SL, et al. (2000) Molecular Cell Biology. W. H. Freeman.
6.Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2000). Lehninger principles of biochemistry. New York: Worth Publishers.
7. Lewin B. (2000) Genes VII. Oxford University Press..
8.Rao CNR, et.al. Chemistryof Nanomaterials: Synthesis, Properties and Applications.
9.Eggins BR. (1006) Biosensors: An Introduction. John Wiley & Sons Publishers.
10. Palsson B.O. and Bhatia S.N. (2009) Tissue Engineering. Pearson.


**Mapping of Course Outcomes with program Outcomes**

| Course | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | 2 | | | | | | | | | | | 2 | |
| **CO2** | 2 | | 1 | | | | | | | | | | | |
| **CO3** | | 3 | 2 | | | | | | | | | | 1 | |
| **CO4** | | | 1 | | | | | | | | | | | |
| **CO5** | 1 | | | 2 | | | | | | | | | 2 | |
| **CO6** | | 3 | 1 | | | | | | | | | | 1 | |

**1 – High 2 – Medium 3 - Low**

Head of The Department
Mechanical Engineering
Govt. Engg. College A'bad

| HS 2001 : ENVIRONMENTAL SCIENCE | |
|---|---|
| **Teaching Scheme**<br>**Lectures : 4Hrs/Week**<br>**Total Credits : 4** | **Examination Scheme**<br>**Class Test I : 15 Marks**<br>**Class Test II : 15 Marks**<br>**Teachers' Assessment : 10Marks**<br>**End -Semester Exam : 60 Marks** |

**Prerequisites:** Nil

**Course Objectives:**

- Become aware of the importance of soil, water and air for humans and other life forms on earth.
- Become aware of species extinction and loss of biodiversity.
- Become of aware of various nation and international efforts that are in place for conserving the environment
- Get acquainted with national laws and global environment conservation guidelines

**Course Outcomes:-**

After completing the course, students will be able to:

| | |
|---|---|
| CO1 | Understand and appreciate the physical and chemical foundation of earth and its environment |
| CO2 | Understand the origin and definition of life |
| CO3 | Understand the origin and evolution of human societies and major transformation brought by industrialization |
| CO4 | Learn about basics of environmental economics |

**Detailed Syllabus:**

| | |
|---|---|
| Unit 1 | Natural Resources, Water Resources: Use and over utilization of surface and ground water, Floods ,Drought .conflict over water ,dams : benefits and problem ,Energy resources growing energy needs ,renewable and non-renewable energy sources use of alternate sources .Land resources : land degradation , soil erosion and desertification .Role of an individual in conversation of natural resources . |
| Unit 2 | Global level effort towards environment conservation & pollution control. Role of India at global level pollution, conservation & policies of Govt of India towards the control of river pollution. Policy of Govt of Maharashtra towards the control of various pollution. environment protection act, vehicular emission standard, noise pollution (regulation & control)rules, concept of ISO 14000 |
| Unit 3 | Biodiversity & its conservation, biogeographically classification of India, biodiversity at global, National & local levels. India as mega diversity nation, hot spots of biodiversity, Endangered & endemic species of India, conservation of biodiversity, In-situ & Ex-situ conservation of biodiversity, forest conservation act. |
| Unit 4 | Environmental pollution: definition, cause, effects& control measure of air pollution, water pollution, noise pollution, thermal pollution, nuclear hazards ,electronic waste, Solid waste management: cause, effect & control measure of urban & industrial waste. Municipal solid waste (management & handling) rules. |

| | |
|---|---|
| Unit 5 | Urban problem related to water & energy, water conservation, rain water harvesting & water shed management, climate change, and nuclear accident. Role if individual in prevention of pollution. Disaster management-flood, earthquake, cyclone & landslides |

**Text and Reference Books**


1. Erach Bharucha, "Textbook of Environmental studies for undergraduate course", University Grants Commission, New Delhi, 2014.
2. Rajgopalan R.," Environmental studies", Oxford university press, 2013
3. Enviroment Protection Act 1986


**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | | | | | | | | | | | | | |
| CO2 | 1 | | | | | | | | | | | | 2 | |
| CO3 | 1 | | | | | | | | | | | | 3 | |
| CO4 | | | | | | | 2 | | | | | | | |

**1 – High 2 – Medium 3 - Low**

Head of The Department
Mechanical Engineering
Govt. Engg. College A'bad

| ME 2006: Lab- ENGINEERING THERMODYNAMICS | |
|---|---|
| **Teaching Scheme** | **Examination Scheme** |
| **Practical: 2 Hrs/Week** | **Term Work : 25 Marks** |
| **Credit: 1** | **Practical Examination & Viva Voce :25 Marks** |

**Course Outcome**

As an outcome of completing the Laboratory course, students will able to:

| | |
|---|---|
| CO1 | Understand the function of boiler and its mountings and accessories |
| CO2 | Experimentally measure the calorific value using ORSAT apparatus |
| CO3 | Experimentally measure the dryness fraction of steam using calorimeter |
| CO4 | Communicate effectively by preparing laboratory and industry visit report |

**List of Experiments**

| Sr. No. | Details |
|---|---|
| 1 | Study of any two boilers:<br>a) Babcock and Wilcox boiler and<br>b) Any high-pressure boiler |
| 2 | Study of mountings and accessories of boilers. |
| 3 | Study and determination of C.V. of solid / liquid fuel using Bomb Calorimeter. |
| 4 | Study and determination of C.V. of gaseous fuels using Boy's Gas calorimeter |
| 5 | Analysis of exhaust gases using Orsat apparatus. |
| 6 | Determination of dryness fraction of steam using tank calorimeter. |
| 7 | Determination of dryness fraction of steam using separating and throttling calorimeter. |
| 8 | Visit to industry related to thermodynamics (e.g. power plant, dairy, cold storage) |

**Term work**

The term work will consist of submitting a file for all the experiments with neatly written records of the study and diagrams.

The term work will be assessed by the course coordinator

**Practical Examination**

The Practical Examination will comprise of performing the experiment and viva voce on the syllabus

The practical will be assessed by two examiners, one will be the course coordinator and other will be examiner appointed by DSB

**Mapping of Course outcome with Program Outcomes**

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

**1 – High 2 – Medium 3 – Low**

| ME 2007: Lab- MACHINE DRAWING | |
|---|---|
| **Teaching Scheme**<br>**Practical: 2 Hrs/Week**<br>**Credit: 1** | **Examination Scheme**<br>**Term Work : 25 Marks**<br>**Practical Examination & Viva Voce :25 Marks** |

**Course Objectives:**

Acquiring knowledge of understanding and drawing machine component

**Course Outcomes:**

| | |
|---|---|
| CO1 | Enhance the knowledge of drawing machine components |

| Sr. No. | Details |
|---|---|
| 1) | One half imperial sheet on Problems on Unit I Intersection of Surfaces |
| 2) | One half imperial sheet on Problems on Unit II Engineering Curves & Gearing |
| 3) | One half imperial sheet on Problems on Unit III Development of Surfaces |
| 4) | One half imperial sheet on Problems on Assembly Drawing |
| 5) | One half imperial sheet on Problems on Detail Drawing |
| 6) | One half imperial sheet on Problems on Detail Drawing |
| 7) | **Two** half imperial sheet on Problems on Detail Drawing<br>**Machine Elements** Screwed Fastenings-Screw Thread Nomenclature, Form of the Screw Threads, Thread Series, Designation, Thread Profiles, Multistart Threads, Right Hand and Left Hand Threads, Representation of Threads, Bolted Joints, Studded Joint, Eye Bolt, Machine Screws and Cap Screws, Set Screws, Locking Devices for Nuts. Riveted Joints-Introduction, Classification of Riveted Joints, Terminology of Riveted Joints, Processes for Producing Airtight Joints, Rivet Heads**.** |

**Term Work**

Students have to submit all the drawing sheets duly checked by the course coordinator and bound in the folder. The course coordinator will assess the term work.

**Practical / Oral Examinations**

Viva – voce based on the drawing sheets submitted as Term work, syllabus, and Assignment submitted.

**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | 1 | | | | | | | | | | 1 | |

**1 – High 2 – Medium 3 – Low**

Head of The Department
Mechanical Engineering
Govt. Engg. College A'bad

| ME 2008: WORKSHOP PRACTICE- III | |
|---|---|
| **Teaching Scheme**<br>**Practical: 2Hrs/Week**<br>**Credit : 1** | **Examination Scheme**<br>**Term Work: 25Marks**<br>**Practical Examination & Viva Voce: 25Marks** |

**Course Objectives:** To acquire the hands on experience and skills for various turning operations, milling operations, welding, forging and black smithy methods

**Course Outcome**

As an outcome of completing the Laboratory course, students will able to:

| | |
|---|---|
| CO1 | Acquaring the skills in machining operations like turning, milling, welding and blacksmithy. |

**List of Experiments**

| Sr. No. | Details |
|---|---|
| 1 | **Turning Shop:** Study of different operations to be carried on the lathe machine, Machining time calculations, taper turning methods (calculations), single point cutting tool operations, external threading, facing, finishing cuts, internal threading, safety precautions etc.<br>**Job:** preparing a job on lathe machine performing the above operations |
| 2 | **Machine shop:** study of different operations to be carried on the milling machine, the use indexing, gear cutting, slot cutting, spline cutting, and safety precautions etc<br>**Job:** preparing at least one job involving indexing operations, spur gear cutting |
| 3 | **Welding Shop:** Different welding machines and equipments, types of welding and welded joints, used in fabrication, preparation for weld joints, joint finishing, different tools, types of electrodes, angle cutters, portable grinder, drills, safety precautions etc.<br>**Job:** Preparing a job individually or in a group of students of any useful item of daily use using various welding operations. |
| 4 | **Forging and Black smithy shop:** Study of different forging operations, hand forging, power forging, heating devices, forging temperatures, different forging tools, safety precautions etc.<br>**Job:** preparing a useful job involving upsetting, elongation, bending, tapering, and changing cross sections, job to be done by hand forging performing the above operations |

**Term Work**

The term work will consist of submitting a file for all the shops with neatly written records of the study and diagrams. A workshop diary should be maintained by the students to record the progress of the jobs done.

The term work will be assessed by the course coordinator

**Practical Examination**

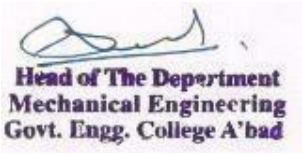
The Practical Examination will comprise of two jobs in any two shops. The jobs should involve all the operations studied during the semester. Duration will be three hours for each job.

The jobs will be assessed by two examiners, one will be the course coordinator and other will be examiner appointed by DSB.

**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO 1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | 2 | | 3 | | | | | | | | 2 | |

**1 – High 2 – Medium 3 - Low**



| ME 2009 : ELECTRICAL MACHINES | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 2 Hrs/Week**<br>**Credit : 2** | **Examination Scheme**<br>**Class Test I : 10 Marks**<br>**Class Test II :10 Marks**<br>**Teachers Assessment : 05 Marks**<br>**End Semester Exam : 25 Marks** |

**Prerequisites:** Nil

**Course description**: After completing this course, students will have a broad and fundamental understanding of the concepts of electrical machines. Students will be able to find the applications of different electrical machines in mechanical industries

**Course Objectives:**

To understand fundamental concepts and principles of electrical machines. This course aims to provide basic knowledge and to develop practical skills to solve engineering problems of all electrically operated machines

**Course Outcome**

After completing the course, students will able to:

| | |
|---|---|
| CO1 | Understand basic concepts of DC and AC machines |
| CO2 | Apply theoretical concepts to the applications of AC and DC machines |

**Detailed Syllabus:**

| | |
|---|---|
| Unit 1 | **a) Electromagnetic Induction:** Faraday's laws, statically and dynamically induced emf, self and mutual inductance, coefficients of coupling, dot convention, inductance in series and parallel.<br><br>**b) Electric Wiring installations:** Types of insulated wires & wiring systems, concept of fuses, MCBs, ELCBs, etc. in wiring installations, concept of earthing, energy bill calculations, study of different lamps |
| Unit 2 | **a) DC Generator**<br>Constructional features, basic principle of working, EMF equation, type of DC generators, applications of different types of generators<br><br>**b) DC Motor**<br>Principle, Significance of back EMF, torque & speed equation and characteristics, separately & self excited motors, speed control, applications of motors |

| | |
|---|---|
| Unit 3 | **a) Induction Motor**<br>Construction of 3-phase squirrel cage and phase wound rotor, Operation, types, production of rotating magnetic fields, principle of operation, torque equation under starting & running condition, condition for maximum torque, torque – slip characteristics, applications of induction motor, star and delta connections and their comparison<br><br>**b) Single Phase Induction Motors**<br>Principle of operation, construction, types and application, types of single phase induction motors |
| Unit 4 | **Alternators and Synchronous Machines**<br>Alternators: Principle of operation, construction, types, EMF equation, applications of types of alternators, Synchronous machines – principle of operation, applications |
| Unit 5 | **Special purpose motors**<br>Construction, basic principle of working, applications of servomotor, permanent magnet DC Motor, Stepper motor. |

**Text and Reference Books**


1. Fitzgerald A. E., Kingsley C & Umans S. D., "Electric Machinery", Tata McGraw Hill, New Delhi,2010
2. Clayton A.E. & Nancock N. N, "The performance & Design of DC Machines"' CBC Publications & Distributors, Delhi,2014
3. Nagrath I. J., Kothari D. P. , 'Electric Machines', Tata McGraw-Hill, New Delhi,2015
4. Ashfaq Husain, 'Electrical Machines', 2nd Edition Dhanpat Rai & Co, 2007.


**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | | | | | | | | | | | 2 | |
| CO2 | 1 | 2 | 3 | | | | | | | | | | 2 | |

**1 – High 2 – Medium 3 - Low**

Head of The Department
Mechanical Engineering
Govt. Engg. College A'bad

| ME 2010 : MECHANISMS OF MACHINES | |
|---|---|
| **Teaching Scheme** | **Examination Scheme** |
| **Lectures: 2 Hrs/Week** | **Class Test I : 15 Marks** |
| **Tutorial: 1 Hr/Week** | **Class Test II : 15 Marks** |
| **Credits: 3** | **Teachers' Assessment : 10Marks** |
| | **End -Semester Exam : 60 Marks** |

**Pre-requisites:** MA1001: Engineering Mathematics I, ME1001: BME, MA1002: Engineering Mathematics II.

**Course Description:**

The course is aimed at giving the fundamentals and application of kinematics in the analysis and synthesis of linkages, cams and gear trains. The design process is introduced and used to solve unstructured design problems in linkage, cam design and gear trains. Algebraic and graphical techniques to analyze the displacement, velocity and acceleration of linkages and cams are developed. Design considerations in mechanism synthesis.

**Course Objectives:**

- Develop concepts of kinematic, kinematics links and its applications in various mechanisms use in practice and knowledge of different relative motions of machine components
- Understand and develop concept of relative and instantaneous velocity, develop mathematical ability of solving practical problem with selecting appropriate method for analysis
- Understand concept of radial and tangential acceleration and its analysis
- Recognize the use of various cam mechanisms, motions and accelerations, identify, formulate and solve problems based on cam
- Understand the terminology of gears and its concepts, identify, formulate and solve problems based for various parameters of gears

**Course outcomes:** At the end of the course, the student will be able to:

| | |
|---|---|
| CO1 | Understand the fundamental concepts of kinematic, kinematics links and its applications in various mechanisms used in practice. |
| CO2 | Apply the knowledge of velocity and acceleration analysis to formulate, analyze and solve practical problem. |
| CO3 | Understand the cam mechanism, its motions and accelerations and develop analytical ability to solve engineering problems related to use of cam mechanism. |
| CO4 | Apply knowledge of gears, gearing action in practice for developing the gear train and profile. |

**Detailed Syllabus:**

| | |
|---|---|
| **Unit 1** | **Kinematics:** Science of Mechanics, Kinematic links, Kinematic pairs, classification of pairs, Kinematic chains, planar, spherical, and spatial mechanisms, mobility, kutzbach criteria, Grubler criteria, problems based on above criteria, classification of mechanism , straight line generators, inversion of basic kinematic chain, Grashof's law. |
| **Unit 2** | **Velocity Analysis:** Arnold Kennedy's theorem, method of determining linear velocity of a point on a link, angular velocity of a link: link to link method, line of centers method. Linear and angular velocities using Relative velocity method, rubbing velocity at a pin joint. |
| **Unit 3** | **Acceleration Analysis:** Centripetal or radial acceleration, tangential acceleration, total acceleration of a point on link, method to obtain acceleration polygon for a mechanism, angular acceleration of link, acceleration of intermediate and offset points, slider crank mechanism, Coriolis acceleration component, crank and slotted lever mechanism<br>Short cut methods for kinematic analysis of mechanism: Klein's construction, Ritterhaus's construction, Bennett's construction modified Kleins construction for four bar mechanism. |
| **Unit 4** | **Cams:** Classification of cams and follower, terminology, Analysis of follower motion: constant/uniform velocity, SHM, constant/uniform acceleration & deceleration/retardation, cycloidal, polynomial motion, & derivation, graphical synthesis of plate cams using knife edge, roller follower, radial / off-set follower, translating / oscillating motion of follower, determination of velocity & acceleration for these motion. |
| **Unit 5** | **Gears:** Gear terminology, types, field of application, Spur gear: condition for correct gearing, conjugate profiles, cycloidal, Involute, interference and undercutting, methods of eliminating interference, determination of length of path of path of contact, length of path and arc of approach and recess<br>Spiral gear: spiral angles, normal pitch, and center-to-center distance, efficiency of power transmission, force analysis<br>Helical and Herringbone gears, their relative merits and demerits over spur gear. |

**Reference Books**


1. Shigley J. E. and Uicker J. J., "Theory of Machines and Mechanisms", 3rd Edition, McGraw Hill Intl,2010
2. Hartenberg and Denavit, "Kinematic Synthesis of Linkages", McGraw Hill International,1964
3. Rao J. S. & Dukkipati R. V., "Mechanism and Machine Theory", 2nd Edition, New Age Intl. Publishers, 2012.
4. Ratan S. S., "Theory of Machines", 2nd Edition, Tata McGraw Hill Publishing Company Ltd, 2005.
5. Sharma C. S. and P. Kamlesh, "Theory of Mechanisms and Machines", Printice Hall of India Pvt. Ltd, 2006.
6. Waldron K. J., and Kinzel G. L., "Kinematics, Dynamics, and Design of Machinery", John Wiley & Sons, Inc, 2003.
7. Myszka D. H., "Machines & Mechanisms: Applied Kinematic Analysis", 2nd Edition, Pearson Education, 2012.

**Mapping of Course outcome with Program Outcomes**

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

**1 – High 2 – Medium 3 – Low**

| ME 2011: APPLIED THERMODYNAMICS | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 3 Hrs/Week**<br>**Credits: 3** | **Examination Scheme**<br>**Class Test-I : 15 Marks**<br>**Class Test – II : 15 Marks**<br>**Teachers Assessment : 10 Marks**<br>**End Semester Exam : 60 Marks** |

**Prerequisites:** ME 2001: Engineering Thermodynamics

**Course description**: This course consists of understanding the working and analyzing the performance of reciprocating compressors. Basic understanding of internal combustion engines, various systems in IC engines is included in this course. Analysis of vapour power cycles is covered in this course. Also this course includes theoretical understanding of vapour compression refrigeration, non-conventional refrigeration systems, need and working of various types of condensers and cooling towers.

**Course Objectives:**

- To understand and analyze performance of air compressor
- Get familiar with the various systems of IC engines
- To study the VCR and non conventional refrigeration systems
- To understand and analyze vapour power cycles
- To study various types and function of condensers and cooling towers

**Course Outcome**

After completing the course, students will able to:

| | |
|---|---|
| CO1 | Understand working and analyze the performance of air compressor |
| CO2 | Differentiate among different internal combustion engine designs and give an engine design specification |
| CO3 | Identify various parts of refrigeration system and describe their functions. |
| CO4 | Analyze the performance of vapour power cycles |
| CO5 | Select condenser and cooling tower for particular application |

**Detailed Syllabus:**

| | |
|---|---|
| Unit1 | **Gas Compressors**<br>A) Classifications and working principles, Reciprocating compressors. Terminologies used, effect of clearance volume, actual indicated diagram, multistage compression, two stage compressors (Numerical problems on reciprocating compressors)<br>B) Rotary compressors, working principles, Roots blower, Vane type blower, Centrifugal compressor, axial flow compressor, Comparison between reciprocating and rotary compressors, air motor (Descriptive treatment only). |
| Unit2 | **I.C. Engines**<br>Classifications, components, working of 2-Stroke, 4-Stroke, Spark Ignition and Compression |

| | |
|---|---|
| | ignition engines, necessity of cooling of I.C. engines and their types<br>**Flow Through Nozzles:** Velocity and heat drop, mass discharge through a nozzle, critical pressure ratio and its significance, effect of friction and nozzle efficiency, supersaturated flow. |
| Unit3 | **Refrigeration and Air Conditioning**<br>Fundamentals of refrigeration systems, COP, unit of refrigeration, Heat Pump, Vortex tube refrigeration, Non conventional refrigeration systems-Vapour absorption refrigeration system, thermoelectric refrigeration system, Steam jet refrigeration system etc., Introduction to Air conditioning. |
| Unit4 | **Vapour Power Cycles**<br>Carnot cycle using steam, ideal Rankine cycle, modified Rankine cycle, Reheat and Regenerative cycles with bleeding of steam, thermal efficiency, specific steam consumption, work ratio, power output, effect of superheat, inlet pressure and back pressure on performance of Rankine cycle (Numerical Treatment) |
| Unit5 | **Steam Condensers**<br>Classifications, comparison between Jet and Surface condensers, vacuum efficiency, vacuum measurement, mass of circulating water required in a condenser, air removal, capacity of air extraction pumps, introduction to cooling towers |

**Text and Reference Books**


1. Rajput R.K., "A Text Book of Engineering Thermodynamics", Laxmi Publication, New Delhi, 2014.
2. Eastop T D, McConkey A, "Applied Thermodynamics", Pearson education, New Delhi
3. V Ganeshan, "Internal Combustion Engines", 4th Edition McGraw Hill Education India Pvt Ltd, 2012.
4. Rajadurai J S, "Thermodynamics and Thermal Engineering", New Age Publishers, N. Delhi, 2010.
5. Domkundwar & Domkundwar, "Introduction to Thermal Power Engineering", Dhanpatrai and Sons, New Delhi, 2014.
6. Granet, Bluestein, "Thermodynamics and Heat Power", Pearson education, New Delhi, 2010.


**Mapping of Course outcome with Program Outcomes**

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

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**1 – High 2 – Medium 3 - Low**

| ME 2012: STRENGTH OF MATERIALS | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 2 Hrs/Week**<br>**Credits: 2** | **Examination Scheme**<br>**Class Test-I : 10 Marks**<br>**Class Test – II : 10 Marks**<br>**Teachers Assessment : 05 Marks**<br>**End Semester Exam : 25Marks** |

**Course Objectives:**

- To know the behaviour of material at various in compression and tension
- Understand and analyze shear force and bending moment in various loading conditions
- To know the phenomenon of bending of different sections and its analysis and recognize principle stresses
- To understands various columns sections and geometrical analysis
- Concepts of strain energy, torsion and numerical analysis

**Course Outcomes:** After the completion of the course, the student will be able to:

| | |
|---|---|
| CO1 | Apply concepts of stress and strain to solve problems. |
| CO2 | Compute Shear Force and Bending Moment for determinate beams and draw Shear Force and Bending Moment Diagrams for various loading conditions. |
| CO3 | Apply the knowledge of bending and shear concept to determine various stresses and draw stress diagrams. |
| CO4 | Explain theory of column failure with different support conditions, and develop numerical ability to solve numerical problems. |
| CO5 | Apply knowledge of strain energy , torsion and thin cylinders and spherical shells to solve numerical problems |

**Detailed Syllabus:**

| | |
|---|---|
| **Unit – 1** | **Simple Stresses and Strains**<br>Elasticity, Stress, Strain, Hook's Law, Young's Modulus, numerical on stresses in bar of varying sections and composite bars, numerical on statically indeterminate problems, elastic constants, bulk modulus, shear modulus and their relations and numerical. |
| **Unit – II** | **Shear Force and Bending Moment**<br>Definition of shear force and bending moment, relation between SF, BM and intensity of loading, numerical on statically determinate beams (simply supported, cantilever, overhanging). |
| **Unit – III** | **Stress in beams and Principal stresses and Strains**<br><br>a) **Stress in beams:** Theory of simple bending, assumptions, neutral axis, moment of resistance, section modulus, bending stress distribution diagram, numerical on statically determinate beams of rectangular and I section beams, section consisting of different materials, Shear stresses in beams<br>b) **Principal stresses and Strains:** Tangential and normal stresses, Principal Planes, principal stresses, analytical and graphical methods to find stresses on an oblique section, Mohr's Circle. |

| | |
|---|---|
| | |
| **Unit – IV** | **Columns & Struts**<br>Euler's theory and Rankin's theory of column failure with different support conditions, derivations, radius of gyration, slenderness ratio, factor of safety, numerical on single and built up cross sections. |
| **Unit – V** | **Strain Energy, Theory of torsion**<br>a) **Strain Energy:** Definition, resilience, Proof resilience, Modulus of resilience, strain energy stored in the body due to gradually applied loads, suddenly applied loads and impact loads, strain energy due to shear, bending<br>b) **Theory of torsion:** Theory of torsion, assumptions, torsional stresses and strains numerical on solids hollow circular shafts, composite shafts and varying sections. |

**Reference Books:**


1. S. Ramamrutham, Dhanpat Rai and sons, "Strength of Material", Dhanpat Rai Publishing Company (p) Ltd (2011).
2. Paytal and Singer, "Strength of Material", Harper Collins publications, 1987.
3. Ferdinand P. Beer and E. Russell Johnston "Mechanics of Materials" ,7th edition , McGraw Hill, New Delhi Publication,2014.
4. James M. Gere and Stephen P. Timoshenko, "Mechanics Materials", CBS Publishers & Distributors, New Delhi, 2010.


**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | 1 | 1 | 1 | | 1 | | | | | | | | |
| CO2 | | 1 | 2 | 2 | | 2 | | | | | | | 2 | |
| CO3 | | 2 | 1 | 1 | | 1 | | | | | | | 1 | |
| CO4 | | 1 | 2 | 1 | | 2 | | | | | | | | |
| CO5 | | 2 | 1 | 2 | | 1 | | | | | | | 3 | |

**1 – High 2 – Medium 3 - Low**

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| ME 2013 : MACHINE TOOLS | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 3 Hrs/Week**<br>**Credits: 3** | **Examination Scheme**<br>**Class Test I : 15 Marks**<br>**Class Test II : 15 Marks**<br>**Teachers' Assessment : 10Marks**<br>**End -Semester Exam : 60 Marks** |

**Prerequisites:** ME 144 Basics of Mechanical Engineering

**Course description**: After completing this course, students will have a broad and fundamental understanding of the concepts of terminology and geometry of tools and various operations on lathe, various milling operations, drilling, boring and broaching operations, grinding machines and process, non traditional machining processes.

**Course Objectives:**

- To understand terminology and geometry of tools and various operations on lathe
- To understand various milling operations
- To understand operations carried out on drilling, boring and broaching machines
- To understand operations carried out on grinding machines
- To understand various non traditional machining processes

**Course Outcome**

After completing the course, students will able to:

| | |
|---|---|
| CO1 | Select the correct tool for the particular machining operation on lathe. |
| CO2 | Acquire the knowledge of indexing on milling machine for gear cutting. |
| CO3 | Acquire practical knowledge of drilling, boring ,broaching and grinding operations. |
| CO4 | Compare and select suitable Non-Traditional Machining process for particular application. |

**Detailed Syllabus:**

| | |
|---|---|
| Unit 1 | **Metal Cutting and Cutting Tools & Lathe**<br>Introduction, types of cutting tools, orthogonal and oblique cutting, types of chips, chip breakers, cutting tool nomenclature, cutting action of hand tools, cutting feed and speed, friction and heat sources in cutting, tools life and wear, machinability, cutting tool materials, cutting fluids, economics of machining.<br>Lathe- Turning on lathes, traditional lathes, capstan and turret lathes, automatic lathes |
| Unit 2 | **Milling Machine**<br>Types of milling machines, milling cutters, indexing and dividing heads, indexing methods, calculations of indexing, multi-axis milling, Gear cutting methods, gear hobbing. |
| Unit 3 | **Drilling, Boring and Broaching machines**<br>Drilling- Introduction, types of drill, twist drill nomenclature, types of drilling machines, work holding devices, tool holding devices, drilling machine operation, speed, feed and machine time, Boring- Introduction, classification of boring machines, boring bars, boring heads, boring defects, Broaching- Introduction, principle parts of broach, broaching |

| | |
|---|---|
| | machines, application of broach, advantages of broaches, limitations of broaches and broaching tools |
| Unit 4 | **Grinding Machines**<br>Introduction, grinding wheels, manufacturing of artificial abrasives, bonds and bonding processes, grit, grade and structure of grinding wheels, types of wheels, method of specifying grinding wheel, selection of grinding wheels, dressing and truing of grinding wheels, types of grinding machines |
| Unit 5 | **Non Traditional Machining**<br>Introduction, classification of machining processes, abrasive jet machining (AJM), ultra sonic machining (USM), Chemical machining (CHM), electrochemical machining (ECM), Electrochemical grinding (ECG), electro discharge machining (EDM), electron beam machining (EBM), laser beam machining (LBM), plasma arc machining (PAM), ion beam machining |

**Text and Reference Books**


1. H. Gerling, "All about Machine Tools", Wiley Eastern, 2nd edition, 2006.
2. Krar S. F., "Technology of Machine Tools", Mc Graw Hill, 7th edition, 2011.
3. G. Boothroyd, "Fundamentals of Metal Machining and Machine Tools", CRC press, 3rd edition, 2005.
4. Raghuvanshi B.S., "Workshop Technology", Vol. I, Dhanpat Rai & Co., New Delhi, 1991.
5. Hazra Choudhary, "Elements of Workshop Technology", Vol. I, Dhanpat Rai Pub., New Delhi,1994
6. Jain R.K., "Production Technology", Khanna Publications,17th edition NewDelhi,2014.
7. Bawa H.S., "Workshop Technology", Vol. I, Mc Graw Education, New Delhi, 1998.


**Mapping of Course outcome with Program Outcomes**

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

**1 – High 2 – Medium 3 – Low**

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| ME 2014 : MATERIAL HANDLING | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 3 Hrs/Week**<br>**Credits: 3** | **Examination Scheme**<br>**Class Test I : 15 Marks**<br>**Class Test II : 15 Marks**<br>**Teachers' Assessment : 10Marks**<br>**End -Semester Exam : 60 Marks** |

**Course description**: After completing this course, students will have a broad and fundamental understanding of the concepts of material handling system. Students will have knowledge of different material handling equipments. Students will be able to evaluate different engineering and economic factors. Students will be able to understand selection criteria for material handling equipments. Students will understand functioning of trucks, trolleys, tractors, conveyor belts etc.

**Course Objectives:**

- To provide the knowledge of different types of material handling equipment according to types of layout.
- To provide the knowledge of material handling trucks and its arrangements.
- To provide the knowledge of different types of conveyors and its arrangement.
- To provide the knowledge of online material handling equipment like AGV, elevators etc.
- To provide the knowledge of different types of material handling cranes, robots and material stocking methods and dispatch.

**Course Outcome**

After completing the course, students will able to:

| | |
|---|---|
| CO1 | Understand basic concept of material handling and equipment. |
| CO2 | Select material handling equipments for restricted and unrestricted areas. |
| CO3 | Explain working and utilization of trolley, tractor, AGVs, elevators jibs, cranes and industrial robots. |

**Detailed Syllabus:**

| | |
|---|---|
| Unit 1 | **Materials handling:** General introduction, definition of terms i.e. batched goods, charged pallet ratio, general cargo, handling, integrated transport, line load etc. Engineering and economic factors, relationship to plant layout; Selection of material handling equipment; Types of equipments and their maintenance |
| Unit 2 | **Unrestricted Equipment:** General information, counterbalancing of trucks, powered stokers, order pickers, side loader and forwarding trucks, straddle carriers and mobile lifting frame, hand pallet trucks and stokers, air cushion handling frames, carts and trolleys |

| | |
|---|---|
| Unit 3 | **Area restricted:** General information on line restricted material handling equipment; Different type of conveyers like roller, wheel, belt, slat, chain, overhead rail etc |
| Unit 4 | Rail mounted trolleys, trolley and tractors, automatically guided vehicles, lift, elevators, other equipment, sorting installations |
| Unit 5 | **Position restricted:** Jib cranes and other fixed industrial robots. Auxiliary equipment: Load carriers (Pallets, Stillage etc.) warehouse layouts, goods reception and dispatch equipment, equipment for assembling and securing loads. |

**Text and Reference Books**

**Text Books**


1. James M Apple, "Material Handling System Design", Ronald Press Co, 1972.
2. John M. Hill, "Industrial Engineering", Mc Graw Hill publications, 2010.

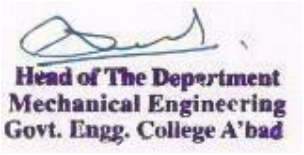

**Reference Books**


1. James Tomkins & John, "Facilities Planning" John wiely and sons, 4th edition, New York, 2010.
2. G. Saliendy, "Hand Book of Industrial Engineering"' John Wiely and sons, New York, 2014.


**Mapping of Course outcome with Program Outcomes**

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

**1 – High 2 – Medium 3 – Low**



| ME 2015: SURFACE COATING | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 3 Hrs/Week**<br>**Credits: 3** | **Examination Scheme**<br>**Class Test I : 15 Marks**<br>**Class Test II : 15 Marks**<br>**Teachers' Assessment : 10Marks**<br>**End -Semester Exam : 60 Marks** |

**Prerequisite**: Engineering chemistry

**Course Description:** After completing this course, students will have a broad and fundamental understanding of Surface Coating principles. The students will understand the impact of nanotechnology based coating and its application in the industries.

**Course Objective:**

- To give an overview of the process of surface coatings, their classification, applications, operation and processes.
- To give complete knowledge of type of special coating techniques and their mechanism
- To understand the performance of hard and soft coatings and their processes
- To understand the surface coating depositions and their preservation (for long life)
- To understand the comparative assessment of surface coatings.

**Course Outcome:**

After learning the course the students should be able to:

| | |
|---|---|
| CO1 | Explain the concept of surface coating. |
| CO2 | Select suitable surface coating technique for particular application. |
| CO3 | Able to assess various properties of surface coating. |

**Detailed Syllabus:-**

| | |
|---|---|
| Unit 1 | **Concept of Coating**<br>Introduction to surface Engineering, Differences between surface and bulk, Properties of surfaces-wear, wet ability |
| Unit 2 | **Special Coating Technique**<br>Electroplating and electroplating, Metallic and non-metallic coatings, Galvanizing, advantages and disadvantages - conventional verses nano coatings |
| Unit 3 | **Hard and Soft Coatings**<br>Caser cladding, laser alloying, Electron beam hardening, ion beam implantation, electrophoretic deposition, DLC and diamond coatings, antifriction and antiscratch coatings |
| Unit 4 | **Surface Coating**<br>Conductive Coatings, Sol-Gel Coatings, Radiation-Cured Coatings, Metal Coating |
| Unit 5 | **Characterization Technique and Application of Nanocoating**<br>Physical Characterization, Assessment of Coating Hardness, Assessment of Friction and Wear of Coating, Assessment of Surface Roughness and Thickness of Coating, Assessment of Adhesion of Coating |

**Reference Books:-**


1. Nanostructured Coatings, Nanostructure Science and Technology by Albano Cavaleiro, Edited by Jeff T. de Hosson, Publisher Springer-Verlag New York Inc, 2010.
2. Nanocoatings: Principles and Practice: by Steven Abbott Nigel Holmes, Publisher DEStech Publications, Inc Lancaster, United States, 2013.
3. Coatings Materials and Surface Coatings, by Arthur A. Tracton, Publisher: CRC Press Taylor and Francis Group, 2010.
4. Crystallography and Surface Structure - an Introduction for Surface Scientists and Non-scientists by Klaus Hermann Publisher: Wiley VCH, 2010.
5. Smart Coatings, by: Theodore Provder, Jamil Baghdachi Publisher ACS Symposium, 2014.


**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | 3 | | | | | | | | | 2 | |
| CO2 | 3 | | | | 2 | | 2 | | 2 | | | | 3 | |
| CO3 | | 2 | | | | 3 | | | | | | | | |

**1 – High 2 – Medium 3 – Low**

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| ME 2022 : TOTAL QUALITY MANAGEMENT | |
|---|---|
| **Teaching Scheme**<br>**Lectures: 3 Hrs/Week**<br>**Credits: 3** | **Examination Scheme**<br>**Class Test I : 15 Marks**<br>**Class Test II : 15 Marks**<br>**Teachers' Assessment : 10Marks**<br>**End -Semester Exam : 60 Marks** |

**Course description**: After completing this course, students will have a broad and fundamental understanding of Quality. Students will have knowledge of different definitions of quality. Students will understand different quality control tools. Students will be able to understand concepts quality circles, kaizen, 5s etc. Students will understand and acquire knowledge of different ISO standardization series Students will be able to understand concepts of Just In Time (JIT) and Business Process Reengineering(BPR).

**Course Objectives:**

- To know the basics and philosophies of TQM
- To illustrate the use of total quality control tools
- To understand the concepts quality circles and kaizen
- To understand the techniques of JIT
- Concepts of re-engineering, BPR

**Course Outcome**

After completing the course, students will able to:

| | |
|---|---|
| CO1 | Explain concept and philosophy of Total Quality Management |
| CO2 | Select and apply suitable quality control tools. |
| CO3 | Implement concept of quality circle, Kaizen and JIT in organization. |

**Detailed Syllabus:**

| | |
|---|---|
| Unit 1 | **TQM Premises**<br>Concept of Quality, Different definitions of Quality by various thinkers, Concept of Brand, Different Parameters for ascertaining quality, Dimensions of product and service in quality, Customer orientation, continuous improvement, Cost of Quality, Productivity and flexibility, approaches and philosophies of TQM, |
| Unit 2 | **Tools of TQM**<br>Basic Analytical tools-check sheets, Histograms, Pareto charts, Cause and Effect diagrams, flow charts, scatter diagrams, run charts, Cost of Quality; Quality cost measurement, Reliability and failure analysis |
| Unit 3 | **Quality Circles**<br>Introduction, implementation, formation, intangible impact of quality circle, inhibiting factors, Kaizen: Introduction, the Japanese style of management & Kaizen implementation, |

| | |
|---|---|
| | modeling kaizen process and benefit |
| Unit 4 | **Just in Time concept and TQM**<br>Introduction and Concept of JIT, Relevance & advantages, approach to quality, importance of KANBAN in JIT, Introduction to ISO series of Quality Standard, Certification Requirements, Evolving Standards |
| Unit 5 | **Latest Trends**<br>Concept of six sigma, and Japanese 5S principle, Implementation in manufacturing and service sector, Leadership issues, Quality, vision mission and policy statements |

**Text and Reference Books**


1. Deming W. Edward, 'Out of crisis', MIT publishing, 1982.
2. Ishikawa & Lu, 'What is Total Quality Control? The Japanese way', Prentice Hall,1988
3. Tally D. J., 'Total Quality Management', ASQC Quality Press A. V. Feigenbaum, 'Total Quality Control', McGraw Hill International, 6th Editions, USA,2009.
4. Juran J. M., 'Quality Control Handbook', McGraw Hill Book Company 5th edition, USA, 2009.
5. Masaaki Imai, 'Kaizen: The key to Japan's Competitive Success', McGraw Hill International Editions, and USA, 1986.
6. Implementing Juran's Road Map for Quality Leadership: Benchmarks and Results by Al Endres, Wiley, 2000.


**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | 3 | | | | | | | | | 2 | |
| CO2 | 3 | | | | 2 | | 2 | | 2 | | | | 1 | |
| CO3 | | 2 | | | | 3 | | | | | | | 3 | |
| CO4 | | | | | 3 | | | | | | | | 1 | |
| CO 5 | | 3 | | | | | | | | | | | | |

**1 – High 2 – Medium 3 – Low**

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| AC 2004 : Lab -PROFESSIONAL COMMUNICATION | |
|---|---|
| **Teaching Scheme:**<br>**Practicals: 2hr/week**<br>**Credits: Nil** | |

**Course Objectives**

After completion of course, student will be able to

- To Increase their knowledge and skill in composing various types of business communication and their confidence in Professional writing.
- To Analyze and adapt to the constraints of specific rhetorical situations, including audiences, purposes, and uses.
- To Develop strategies for addressing multiple audiences in any given document, including accommodations for expert and lay audiences
- To Structure sentences, paragraphs, and documents for maximum impact
- To demonstrate document design skills and integrate graphics into document production.
- To refine writing style for clarity, concision, coherence, cohesion, and emphasis.
- To Critique and revise your own documents to ensure they fulfill their purposes.

**Detailed Syllabus:**

| | |
|---|---|
| Tutorial 1 | Communicating in Business Environments and Rhetorical Considerations Lesson Business Communication at Work Place ,Memorandum ,Meeting Brochure |
| Tutorial 2 | Writing Reports ,Writing Resumes and Cover Letters Lesson, Preparing Progress Reports Lesson |
| Tutorial 3 | Summaries and Abstracts ,Technical Definitions |
| Tutorial 4 | Audio Video Aids and Effective Presentation |
| Tutorial 5 | Mechanics of Writing<br>Transitions, Spelling Rules, Hyphenation, Transcribing Numbers, Abbreviating Technical and Non Technical Terms, Proof Reading |

**Reference Books**


1. "Business Communication" By Urmila Rai & S. M. Rai, Himalayan Books, 2009.
2. "Communication Skills" By Leena Sen, PHI Learning Pvt. Ltd., 2007.
3. "Technical communication" By William Sanborn, Pearson publications.8th edition, 2012.
4. "Presentation Skills for Managers", McGraw Hills brief case books, 2nd edition, 2016.
5. Professional Communication Skill, Pravil S.R. Bhatia, S.Bhatia, 2001.
6. Technical Report Writing Today: Daniel G. Riordan, Steven E. Pauley, Houghton Mifflin College Div; 7th edition, 1999.


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| ME 2016 : Lab - ELECTRICAL MACHINES | |
|---|---|
| **Teaching Scheme**<br>**Practical: 2 Hrs/Week**<br>**Credit: 1** | **Examination Scheme**<br>**Term Work : 25 Marks**<br>**Practical : 25 Marks** |

**Course Objective:** Acquiring practical knowledge of electrical machines

**Course Outcome:** Hands on experience of various electrical machines
As an outcome of completing the Laboratory course, students will able to:

| | |
|---|---|
| CO1 | Conduct tests on electrical machines. |
| CO2 | Control the speed of electrical motors |
| CO3 | Select the electrical motors for specific applications. |

**List of Experiments (Any Eight)**

| Sr. No. | Details |
|---|---|
| 1 | Speed Control of DC Shunt Motor |
| 2 | Magnetization Characteristics of DC Generator |
| 3 | Load Characteristics of DC Generator |
| 4 | Load Test on 3-phase Induction Motor |
| 5 | Determination of regulation of 3-phase alternator by synchronous Impedance method and MMF method |
| 6 | Determination of regulation of 3-phase alternator by direct loading |
| 7 | Plotting of V and inverted V curves of synchronous motor |
| 8 | Study of alternator in different power station |
| 9 | Effect of variation of applied voltage on performance of IM and torque slip characteristics |
| 10 | Load test on three phase induction motor |
| 11 | Circle diagram & determination of various parameters of equivalent circuit of 3-phase IM |
| 12 | Determination of equivalent circuit parameters of single phase induction motor |
| 13 | Study of Stepper Motor |
| 14 | Study of Servomotor |
| 15 | Study of permanent magnet DC motor |
| 16 | Study and report submission by industrial visit to power stations. |

**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | | 3 | | | | | | | | | | 3 | |
| CO2 | 1 | 2 | 3 | 2 | | 2 | | | | | | | 3 | |
| CO3 | 1 | 1 | 3 | 2 | | 2 | | | | | | | 3 | |

**1 – High 2 – Medium 3 – Low**

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| ME 2017 : Lab – MECHANISMS OF MACHINES | |
|---|---|
| **Teaching Scheme**<br>**Practical: 2 Hrs/Week**<br>**Credit: 1** | **Examination Scheme**<br>**Term Work : 25 Marks**<br>**Practical Examination & Viva Voce :25 Marks** |

**Course Objective:** To understand the practical application of various principles of kinematics of machines

**Course Outcome**

As an outcome of completing the Laboratory course, students will able to:

| | |
|---|---|
| CO1 | Develop conceptual knowledge and appropriate application about mechanisms |
| CO2 | Draw velocity and acceleration analysis diagrams |
| CO3 | Draw cam profiles |
| CO4 | Generate gear tooth profiles |

**List of Experiments**

| Sr. No. | Details |
|---|---|
| 1 | Demonstration of Kinematics of Mechanisms and Machines |
| 2 | Demonstration of Lower Pair Mechanism, such as Straight line generators, Pantograph, Steering Mechanism, Hooks joint |
| 3 | Draw sheets based on Velocity analysis problems (Three or four Problems) |
| 4 | Draw sheets based on Acceleration analysis (Three or four Problems) |
| 5 | Draw sheets based on Kinematic analysis – Short cut methods (Three or four Problems) |
| 6 | Draw sheet based on Graphical synthesis of cams, theory, classification, application, terminology etc |
| 7 | Draw sheet to generate Involute tooth profile with the help of a rack on gear blank |
| 8 | Demonstration of interference and undercutting for gear |

**Mapping of Course outcome with Program Outcomes**

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

**1 – High 2 – Medium 3 - Low**

| ME 2018 : Lab-APPLIED THERMODYNAMICS | |
|---|---|
| **Teaching Scheme**<br>**Practical: 2 Hrs/Week**<br>**Credit: 1** | **Examination Scheme**<br>**Term Work : 25 Marks**<br>**Practical Examination & Viva Voce :25 Marks** |

**Course Outcome**

As an outcome of completing the Laboratory course, students will be able to:

| | |
|---|---|
| CO1 | Hands on experience with reciprocating compressor and its performance analysis. |
| CO2 | Hands on experience with centrifugal blower and its efficiency calculation |
| CO3 | Understand about working of various IC engine systems, refrigerator and cooling tower |
| CO4 | Communicate effectively by preparing laboratory report |

**List of Experiments:**

| Sr. No. | Details |
|---|---|
| 1 | Trial on two stage Reciprocating air Compressors |
| 2 | Determination of efficiency of blower. |
| 3 | Drawing up heat balance sheet for Internal combustion engine |
| 4 | Performance Evaluation of Vapour Compression Refrigeration system |
| 5 | Study of domestic refrigerator. |
| 6 | Study of surface condenser. |
| 7 | Study of cooling towers |
| 8 | Visit to industry related to applied thermal systems |

**Term work**

The term work will consist of submitting a file for all the experiments with neatly written records of the study and diagrams.

The term work will be assessed by the course coordinator

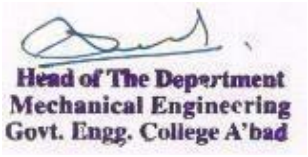
**Practical Examination**

The Practical Examination will comprise of performing the experiment and viva voce on the syllabus. The practical will be assessed by two examiners, one will be the course coordinator and other will be examiner appointed by DSB.

**Mapping of Course outcome with Program Outcomes**

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

**1 – High 2 – Medium 3 - Low**



| ME 2019: Lab – STRENGTH OF MATERIALS | |
|---|---|
| **Teaching Scheme**<br>**Practical: 2 Hrs/Week**<br>**Credit: 1** | **Examination Scheme**<br>**Term Work : 25 Marks**<br>**Practical Examination & Viva Voce :25 Marks** |

**Course Outcome**

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

| | |
|---|---|
| CO1 | Interpret the test results |
| CO2 | Test and measure the performance of material |
| CO3 | Apply test knowledge to define and understand different material behavioural concept |

**List of Experiments (Any Six)**

| Sr. No. | Details |
|---|---|
| 1 | Study of Universal Testing Machine and its attachments and Extensometer |
| 2 | Tension test on mild steel and Tor Steel specimens |
| 3 | Shear test on metals (Direct and punching) |
| 4 | Flexural test on timber specimens |
| 5 | Impact test on metals |
| 6 | Hardness test on metals (Brinell and Rockwell) |
| 7 | Torsion test on mild steel and Tor steel circular specimens |

**Practical / Oral Examinations**

Viva – voce based on the Term work, syllabus, and Assignment submitted.

**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | 1 | 1 | | | 2 | | | | | | | 2 | |
| CO2 | | 2 | | 1 | | 2 | | | | | | | 1 | |
| CO3 | | | | 2 | | 2 | | | | | | | 2 | |

**1 – High 2 – Medium 3 - Low**

Head of The Department
Mechanical Engineering
Govt. Engg. College A'bad

| ME 2020: Lab- Computer Applications In Mechanical Engineering-I | |
|---|---|
| **Teaching Scheme**<br>**Practical: 2 Hrs/Week**<br>**Credit: 1** | **Examination Scheme**<br>**Term Work : 25 Marks**<br>**Practical Examination & Viva Voce :25 Marks** |

**Course Outcome**

As an outcome of completing the Laboratory course, students will able to:

| | |
|---|---|
| CO1 | Acquire practical knowledge of 3D modeling software. |
| CO2 | Create and edit 2D drawing in 3D modeling software. |
| CO3 | Create 3D modeling, Visualize the parts of machine in part module. |
| CO4 | Construct assemblies from the concepts learnt using 3D modeling software |

**List of Experiments**

| Sr. No. | Details |
|---|---|
| 1 | Perform following Practical on any 3 D modeling Software platform<br>**Introduction**<br>Strengths and weaknesses of conventional 2D drawing. Types of geometric modeling, wire frame modeling, surface modeling, solid modeling |
| 2 | **Sketching**<br>Sketching, line, circle, arc, spline. Connect two elements using an arc or a spline. Filleting, trimming. Dimensioning linear, angular, diameter, radius, modifying dimension. Constraints parallel, perpendicular, co-incident, vertical, horizontal, tangent, symmetric. Edit and modify sketches ( Two assignment on sketching ) |
| 3 | **Solid Modeling**<br>Sketch based features extrude, revolve, sweep, variable section sweep, loft. Add, subtract, intersection. Use of part library threads, tapped holes, ribs, nuts, bolts etc. Datum planes, points, curves etc. parent child relationship. Modifying commands fillet, chamfer, array, copy, mirror etc. (Two assignment on Solid Modeling) |
| 4 | **Assembly and drafting**<br>Assembly top down and bottom up approach, constraints, mate, align, Joints, Detailing generating views, sectional views, Orthographic views, isometric Dimensioning views, adding dimensional and geometric tolerances, surface finish. Creating BOM. (Two assemblies of machine component like knuckle joint, coupling, gate valve, stop valve Bench vice, tool post and Detailing of any one assembly and parts made in assignment) |

**Mapping of Course outcome with Program Outcomes**

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

| ME 2021 : WORKSHOP PRACTICE – IV | |
|---|---|
| **Teaching Scheme**<br>**Practical: 2 Hrs/Week** | **Examination Scheme**<br>**Term Work: 25 Marks**<br>**Practical Examination & Viva Voce :25 Marks** |

**Course Objectives:** To acquire the hands on experience and skills for various operations like pattern making, moulding, sheet metal working and CNC Machining

**Course Outcome**

As an outcome of completing the Laboratory course, students will able to:

| | |
|---|---|
| CO1 | Enhancing the skills in operations like pattern making, moulding, sheet metal working and CNC Machining |

**List of Experiments**

| Sr. No. | Details |
|---|---|
| 1 | **Pattern Making Shop:** Study of pattern materials, types of patterns and cores, allowances, pattern making tools and allowances, safety precaution etc.<br>**Job:** Preparing at least one pattern in wood, involving details like, allowances, core prints, parting line of multi piece patterns etc. |
| 2 | **Foundry Shop:** Sand moulding, types of sands, preparing sand for moulding, equipments, sand moulds (cope, drag, check etc.), safety precaution etc.<br>**Job:** preparing sand moulds for single, multi-piece pattern in at least two or multi-piece moulding boxes and details like runners, risers, gates etc mould cavity finishing, demonstration of casting using ferrous of non-ferrous metal. |
| 3 | **Sheet Metal Working Shop:** Cutting operations (cut off, blanking, piercing etc) forming operations (blending, ribbing, corrugating etc) drawing operations, study of development of surfaces, safety precaution etc.<br>**Job:** Preparing a job individually or in a group of students of any useful item of daily use using various sheet metals working operations. Jobs for development of surfaces like pipe bend, elbow U shape, ducts etc. |
| 4 | **CNC Shop:** Study of different operations to be carried out on the CNC lathe machine using tail Stock, taper turning methods (calculations), internal cutting tool operations, internal threading, Facing, finishing cuts, CNC milling, Non-conventional machining processes, safety precaution etc.<br>**Job:** Preparing at least one job on CNC lathe machine / CNC milling machine with programming and different operations etc. Individually or in a group |

**Term Work**

The term work will consist of submitting a file for all the shops with neatly/written records of the study and diagrams. A workshop diary should be maintained by the students to record the progress of the jobs done. The term work will be assessed by the course coordinator

**Practical Examination**

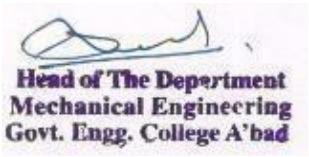
The Practical Examination will comprise of two jobs in any two shops. The jobs should involve all the operations studied during the semester. Duration will be three hours for each job.

The jobs will be assessed by two examiners, one will be the course coordinator and other will be examiner appointed by DSB

**Mapping of Course outcome with Program Outcomes**

| Course Outcome | PO 1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | 2 | | 3 | | | | | | | | 2 | |

**1 – High 2 – Medium 3 – Low**



| ME2023 : Entrepreneurship Development Programme (Open Elective) | |
|---|---|
| **Teaching Scheme**<br>**Lectures : 3 Hrs/Week**<br>**Tutorial : —**<br>**Total Credits : 3** | **Examination Scheme**<br>**Class Test I : 15 Marks**<br>**Class Test II : 15 Marks**<br>**Teachers' Assessment : 10 Marks**<br>**End -Semester Exam : 60 Marks** |

**Pre-requisite: NIL**

**Course Description:**

This course is to create awareness about entrepreneurship among students. This course focuses on motivating students for entrepreneurship. The more focus is given on creativity and innovation.

**Course Objectives:**

The objectives of the course are to:

1. Introduce students about various qualities of successful entrepreneurship
2. Explain various entrepreneurship models
3. Organize interaction with successful entrepreneurs
4. Introduce students about various tools as Six hat techniques, Five S etc.

**Course Outcomes:**

After completing the course students will able to-

| | |
|---|---|
| **C0l** | Identify qualities of entrepreneurs |
| **C02** | Write project proposal |
| **C03** | Use various entrepreneurship models |
| **C04** | Understand various schemes supporting entrepreneurship |
| **C05** | Think creative and innovative |

**Detailed Syllabus:**

| | |
|---|---|
| UNIT-I | **Introduction to entrepreneurship**<br>Entrepreneur- definition , Characteristics of a successful entrepreneur , Qualities and skills required to be an entrepreneur Six Hat, 5 S technique, Principles of Management ,Types of entrepreneurs ,Social and Women Entrepreneurship<br>, Functions of entrepreneur , Social and Environmental responsibilities of entrepreneur , Role of entrepreneur in nation building, society up liftmen, poverty alleviation and employment generation. |
| UNIT-II | **Project report preparation**<br>Introduction ,Idea selection, Selection of product or service, Aspects and phases of project, Contents of Project report |
| UNIT-III | **Introduction to various types of entrepreneurship**<br>Manufacturing sector, Service Sector, Freelancing, E commerce platform, Leadership and its types |
| UNIT-IV | **Entrepreneurial Support Agencies**<br>Industrial Park, Special Economic Zones (SEZ), National Small Industries Cooperation (NSIC) , The Small Industries Development Bank of India (SIDBI), Entrepreneurship Development Institute of India (EDII), Maharashtra Centre for Entrepreneurship Development (MCED) |

| | |
|---|---|
| UNIT-V | **Marketing Management**<br>Introduction, Types of marketing, Product marketing, Marketing Research and Consumer Behavior, Sales management and promotion, Product pricing, Advertising and branding, Decision Making<br>**Compliances for business**<br>Introduction, Companies Act 2013 and Environment Act 1986, Types of companies Basic compliances , Company registration, GST registration, Udyam registration |

**Text Books:**

1. Dr. Gupta and Dr. Srinivasan, Entrepreneurship development in India
2. V asant Desai, Dynamics of Entrepreneurial Development and Management
3 .Sarugadharan and Resia Begum, Women Entrepreneurship; institutional support and problems
4. M.W.Deshpande, Entrepreneurship of small Scale Industries
5. D.L. Saxon and RW Sniilor(eds), The Art and Science of Entrepreneurs

**Reference Books:**

1. Venkateshwara Rao and UdaiPareek,(Eds) Entrepreneurnship-A Handbook
2. RajaGopal, Agriculture Business and Entrepreneurship
3. H.Sadhak, industrial development in Backward Regions in India
4. Ravi J. Mathai, Rural Entrepreneurship A Frame Work in Development Entrepreneurship -A Handbook

**1. Mapping of Course outcome with program outcomes**

| Corse outcome | POl | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 1I | PSO III |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Col | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | |
| C02 | | | | | | 1 | 1 | | 2 | 1 | | | | | |
| C03 | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | |
| C04 | | | | | | | | 1 | 1 | | | | 1 | 1 | |
| C05 | | | | | | | | 1 | 1 | 1 | | | | 2 | |

**1 –High 2 – Medium 3 – Low**

Teaching Strategies:
The teaching strategy is planed through the lectures, activities, expert lectures, and visit.
Teacher's Assessment: Teacher's Assessment of 10 marks is based on assignment given by faculty on case study writing and preparation of project proposal

**Assessment Pattern**

| **Assessment Pattern Level No.** | **Knowledge Level** | **Test I** | **Test II** | **Teachers Assessment/ Assignment** | **End Semester Exam** |
|---|---|---|---|---|---|
| K1 | Remember | 05 | 05 | 00 | 10 |
| K2 | Understand | 05 | 05 | 05 | 10 |
| K3 | Apply | 03 | 03 | 05 | 20 |
| K4 | Analyze | 02 | 02 | 00 | 20 |
| K5 | Evaluate | 00 | 00 | 00 | 00 |
| K6 | Create | 00 | 00 | 00 | 00 |
| **Total Marks 100** | | 15 | 15 | 10 | 60 |

**Assessment table**

| Assessment Tool | K1 | K2 | K3 | K4 |
|---|---|---|---|---|
| | C01/CO4 | C02 | C03/CO4 | CO3/CO5 |
| Class Test (15 Marks) | 05 | 05 | 03 | 02 |
| Class Test (15 Marks) | 05 | 05 | 03 | 02 |
| Teachers Assessment (10 Marks) | 00 | 05 | 05 | 00 |
| ESE Assessment (60 Marks) | 05 | 15 | 20 | 20 |

| AC2005 SOCIAL INNOVATION |
|---|
| **Teaching Scheme**<br>**Practical: 2 Hrs/Week**<br>**Total Credits : 00** |

**Course description**:

A theory of social change: Identifying the relevant theory and evidence for analysing a social problem. Social innovations and enterprises and their social impact: Key concepts, theories and evidence. Impacting social changes Vs. economic goals: How to design an innovative social enterprise that can achieve both. Design and plan a new social enterprise: Train, sharpen, and synthesize your insights in a team-based exercise by designing an actual new, innovative social enterprise with your fellow students

**Course Objective:**

- This course intends to explain with appropriate examples the concepts of social innovation and social entrepreneurship from theoretical as well as practical perspectives.
- Given a situation, determine alternative approaches to effecting social change.
- Analyze the impact of social ventures in various parts of the world and discuss the opportunities, challenges, and tensions encountered by the respective entrepreneurs.
- Describe contemporary development challenges facing impoverished communities in developing countries.
- Identify stakeholders in social ventures and describe their needs, capabilities and resources.
- Develop business models and implementation strategies to realize social ventures that are technologically appropriate, environmentally benign, socially acceptable and economically sustainable.
- Determine appropriate assessment metrics and identify (or devise) simple instruments to measure social impact and Return on Investment (ROI) on social ventures.

**Detailed syllabus:**

| | |
|---|---|
| **Unit-I** | **Social innovation: an introduction:**<br>The growing importance of social innovation<br>The Young Foundation: a centre of past and future social innovation |
| **Unit-II** | **What social innovation is:**<br>Defining social innovation<br>Fields for social innovation<br>A short history of social innovation<br>Social and economic change: the shape of the economy to come |
| **Unit-III** | **Who does social innovation: individuals, movements and organisations**<br>The wider context: understanding social change. |

| | |
|---|---|
| **Unit-IV** | **Stages of Innovation:**<br>Generating ideas by understanding needs and identifying potential solutions<br>Developing, prototyping and piloting ideas<br>Assessing then scaling up and diffusing the good ones<br>Learning and evolving |
| **Unit-V** | **Social organizations and enterprises:**<br>Social movements<br>Politics and government<br>Markets<br>Academia<br>Philanthropy<br>Social software and open source methods |