



**For batches admitted in Academic Session 2023-24**

**3100021: Basic Mechanical Engineering**

Category	Title	Code	Credit-3			Theory Paper
			L	T	P	
Engineering Science-ESC	Basic Mechanical Engineering	3100021/100204/CEL/ MEL/CSL/EEL/ ELL/ITL/CHL/ BTL114/2X24	2	1	-	Max.Marks-60 Duration-2 hrs.

**Course Objectives:** To make the students:

1. Develop the fundamentals of Engineering materials, measurement and reciprocating machines.
2. Develop an ability to understand the Thermodynamic laws, steam generator and reciprocating machines for solving engineering problems.
3. Demonstrate Engines and Boiler fundamentals using models.

**Syllabus**

**UNIT-I:**

**Materials:** Classification of engineering material, composition of cast iron and carbon steels on iron-carbon diagram and their mechanical properties; Alloy steel and their applications; Stress-Strain diagram, Hooks law and modulus of elasticity. Tensile, shear, hardness and fatigue testing of materials.

**UNIT-II:**

**Measurement:** Temperature, pressure, velocity, flow, strain, force and torque measurement, concept of measurement error & uncertainty analysis, measurement by Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar and combination set; introduction to lathe drilling, milling and shaping machines.

**UNIT-III**

**Fluids:** Fluid properties, pressure, density and viscosity; pressure variation with depth, static and kinetic energy; Bernoulli's equation for incompressible fluids, viscous and turbulent flow, working principle of fluid coupling, pumps, compressors, turbines, positive displacement machines and pneumatic machines. Hydraulic power & pumped storage plants for peak load management as compared to base load plants.

**UNIT-IV**

**Thermodynamics:** Zeroth, First, second and third law of thermodynamics; steam properties, steam processes at constant pressure, volume, enthalpy & entropy, classification and working of boilers, efficiency & performance analysis, natural and induced draught, calculation of chimney height. Refrigeration, vapour absorption and compression cycles, coefficient of performance (COP).

**UNIT-V**

**Reciprocating Machines:** Steam engines, hypothetical and actual indicator diagram; Carnot cycle and ideal efficiency; Otto and diesel cycles; working of two stroke & four stroke petrol and diesel IC engines.

**Course Outcomes:** After successful completion of this course students will be able to:

- CO1. **Define** the essential concepts of thermal, design and production used in Mechanical Engineering.
- CO2. **Summarize** fundamental techniques and process used in power generating machines
- CO3. **Solve** the various problems based on basic concepts of Mechanical Engineering.
- CO4. **Analyze** the various gas, steam and air cycles.
- CO5. **Evaluate** the problems of Steam Generator, Thermodynamics, Steam and I.C. engines
- CO6. **Generate** the skills to demonstrate steam Generator and reciprocating machine in depth.



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Scheme of Evaluation

### Reference Books:

1. Narula; Material Science; TMH
2. Agrawal B & CM; Basic Mechanical Engineering; TMH
3. Nag PK, Tripathi et al; Basic Mechanical Engineering; TMH
4. Rajput; Basic Mechanical Engineering;
5. Sawhney GS; Fundamentals of Mechanical Engineering; PHI
6. Nakra and Chaudhary; Instrumentation and Measurement; TMH
7. Nag PK; Engineering Thermodynamics; TMH
8. Ganesan; Combustion Engines; TMH.



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**Basic Mechanical Engineering Lab**

Category	Title	Code	Credit-1			Practical End Sem Max.Marks-40
			L	T	P	
Engineering Science-ESC	Basic Mechanical Engineering Lab	3120026	L	T	P	
			-	-	2	

**Lists of Experiments:**

1. Study of vertical boilers.
2. Study of Locomotive boilers.
3. Study of Babcock and Wilcox boilers.
4. Study of Lancashire, Cornish and Cochran boilers.
5. Study of boiler mounting and accessories.
6. Study of 2 stroke diesel and petrol engines.
7. Study of 4 stroke diesel and petrol engines.
8. Study of steam engines.
9. Study of Lathe machine.
10. Study of Vernier and Micrometer.
11. Study of Internal Combustion Engine Parts.

**Skill Based Projects:**

1. Measurement and calibration using slip gauges
2. Performing energy audit using stroboscope and lux meter
3. Make a Free energy Steam Engine at home
4. Make an Air Compressor at home
5. Mini Bench Tapping machine project
6. Make a Robotic Arm
7. Tornado in a bottle
8. Make a Hydraulic Lift
9. Thermal Expansion project
10. Make a positive displacement pump
11. Make a mini thermal power plant
12. Make a fire hydrant.
13. How an airplane wing creates lift and how wind turbine blades are spun by the wind. Make a model.
14. To make a model for measuring the pressure distribution in a convergent – divergent duct to confirm Bernoulli's equation.
15. Make a digital hydraulic bench.
16. To make a model for induced draught and natural draught

**Course Outcomes:** After successful completion of this course students will be able to:

- CO1. Define** the essential concepts of thermal, design and production used in Mechanical Engineering.  
**CO2. Summarize** fundamental techniques and process used in power generating machines  
**CO3. Solve** the various problems based on basic concepts of Mechanical Engineering.  
**CO4. Analyze** the various gas, steam and air cycles.  
**CO5. Evaluate** the problems of Steam Generator, Thermodynamics, Steam and I.C. engines  
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7. Nag PK; Engineering Thermodynamics; TMH
8. Ganesan; Combustion Engines; TMH



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**3100014: Engineering Graphics**

Category	Title	Code	Credit-3			Theory Slot
Engineering Science-ESC	Engineering Graphics	3100014	L	T	P	Max.Marks-60 Min.Marks-19 Duration-2hrs.
			2	1	-	

**Course Objective:**

1. To inculcate the imagination and mental visualization capabilities for interpreting the geometrical details of common engineering objects.
2. To impart knowledge about principles/methods related to projections of one,two and three dimensional objects.

**Syllabus:**

**Unit - 1**

**Introduction and scale:** Basics of instruments, Lettering and dimensioning, Plane geometrical constructions. Plain and diagonal scale - Representative fraction, Unit conversion and Exercises based on linear, area, volume and speed. Scale of chord.

**Engineering curves:** Cycloidal curves - cycloid, epicycloid and hypocycloid curve, tangent and normal. Spiral curves - Archimedean and logarithmic spiral curves. Tangent & normal on the curves. Involute curve.

**Unit - 2**

**Projection of points:** Introduction, types of projections, quadrant system, positions of points and Exercise.

**Projection of straight line:** Introduction, Orientation of a straight line, Traces of a line and Exercise.

**Unit - 3**

**Projection of planes:** Introduction, Types of planes, Traces of planes, Position of planes and Exercise.

**Projection of solids:** Introduction, Types of solids, Positions of solids and Exercise.

**Unit - 4**

**Section of solids:** introduction, Types of section planes and Anti-section and Exercise.

**Development of surfaces of right solids:** Introduction, Methods of development & anti-development and Exercise.

**Intersection of cylinders:** Introduction, methods of developments, intersection of cylinder by another cylinder and exercise.

**Unit - 5**

**Isometric projections:** Introduction, isometric scale, isometric axis, isometric view and isometric projections from orthographic views, orthographic views from pictorial view and exercise.

**Computer Aided Drafting using Auto CAD:** Introduction, software's basic commands, transformation and editing commands.

**Course Outcomes:** After successful completion of this course students will be able to:

- CO1. **Visualize** the geometric details of engineering objects.
- CO2. **Translate** the geometric information of engineering objects into engineering drawings.
- CO3. **Draw** orthographic projections and sections.
- CO4. **Develop** knowledge to read, understand and explain drawing.
- CO5. **Improve** their skills so that they can apply these skills in developing new products.
- CO6. **Prepare** simple layout of factory, machine and buildings.



**Text books:**

1. Engineering Drawing by N. D. Bhatt, Charotar Publication Pvt. Ltd.
2. Engineering Drawing by P.S. Gill, S. K. kataria& sons, Delhi
3. Engineering Drawing by BasantAgrawal& C. M. Agrawal, Tata McGraw Hill Education Pvt. Ltd.
4. Engineering Graphics by K. Venugopal, New Age International Publication, India

**NPTEL Link for Engineering Graphics:**

<http://nptel.ac.in/courses/112103019/>



## Engineering Graphics Lab

Category	Title	Code	Credit-1			Practical End Sem
ESC	Engineering Graphics Lab	3100018	L	T	P	Max.Marks-40
			-	-	2	

## Laboratory Work

### List of Experiments:

1. To prepare sheet of Plain scale, diagonal scale and Scale of chord.
2. To prepare sheet of Cycloidal curves.
3. To prepare sheet of Projection of points and lines.
4. To prepare sheet of Projection of Planes.
5. To prepare sheet of Projection of Solids.
6. To prepare sheet of Section of Solids.
7. To prepare sheet of Development of Surfaces.
8. To prepare sheet of Isometric and Intersection of Solids

### Skill Based Projects:

1. To prepare the 3D view of any object.
2. To Prepare scale for your home and make a map using this scale.
3. To prepare cut section models drawing of any object.
4. To make paper object, cut and show the development of surfaces.

**Course Outcomes:** After successful completion of this course students will be able to:

- CO1. Visualize** the geometric details of engineering objects.
- CO2. Translate** the geometric information of engineering objects into engineering drawings.
- CO3. Draw** orthographic projections and sections.
- CO4. Develop** knowledge to read, understand and explain drawing.
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4. Engineering Graphics by K. Venugopal, New Age International Publication, India



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**3100024: Manufacturing Practices**

Category	Title	Code	Credit-1			Practical End Sem
			L	T	P	
Engineering Science-ESC	Manufacturing Practices	3100024	--	-	2	Max.Marks-40

**Course Objectives:**

1. To familiarize with the basics of tools and equipment used in fitting, carpentry, sheet metal, welding and smithy.
2. To with the production of simple models in the above trades.
3. To develop general machining skills in the students.

**Syllabus**

**UNIT-I**

**Introduction:** Manufacturing Processes and its Classification, Casting, Machining, Plastic deformation and Metal forming, Joining Processes, Heat treatment process, Assembly process.

**Black Smithy Shop**

Use of various smithy tools. Forging operations; Upsetting, Drawing down, Fullering, swaging, Cutting down, Forge welding, Punching and drafting.

**Suggested Jobs:** Forging of chisel, forging of Screw Driver.

**UNIT-II Carpentry Shop**

**Timber:** Type, Qualities of timber disease, Timber grains, Structure of timber, Timber seasoning, Timber preservation. Wood Working Tools: Wood Working Machinery, joints and joinery, various operations of planning using various carpentry planes sawing & marking of various carpentry joints.

**Suggested Jobs:** Name Plate, Any of the carpentry joint like mortise or tennon Joint.

**UNIT-III Fitting Shop:**

Study and use of measuring instruments, Engineer steel rule, Surface gauges caliper, Height gauges, feeler gauges, Micrometer. Different types of files, File cuts, File grades, Use of surface plate, Surface gauges drilling tapping Fitting Operations: Chipping filling, Drilling and Tapping.

**Suggested Jobs:** Preparation of job piece by making use of filing, sawing and chipping, drilling and tapping operation.

**UNIT-IV Foundry:**

**Pattern Making:** Study of pattern materials, pattern allowances and types of patterns. Core box and core print, Use and care of tool used for making wooden patterns.

**Moulding:** Properties of good mould& Core sand, Composition of Green, Dry and Loam sand. Methods used to prepare simple green and bench and pit mould dry sand bench mould using single piece and split patterns.

**UNIT-V Welding:** Study and use of tools used for Brazing, Soldering, Gas& Arc welding. Preparing Lap & Butt joints using Gas and Arc welding methods, study of TIG and MIG welding processes. Safety precautions.

**Course Outcome:** After successful completion of this course students will be able to:

**CO1. Discuss** the hand tools, machine tools and power tools.

**CO2. Utilize** appropriate tools required for specific operation.

**CO3. Apply** safety measures required to be taken while using the tools in floor shops, Machine shops and carpentry shop.





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**CO4.** Use the techniques, skills, and modern engineering tools necessary for manufacturing and production engineering.

**CO5.** Conduct experiments in the field of Production engineering.

**CO6.** Design a system, components, or process to meet desired needs, ethical, health and safety, manufacturability and sustainability.

#### **Text & References Books:**

1. Bawa HS; Workshop Practice, TMH
2. Rao PN; Manufacturing Technology-Vol.1 & 2, TMH
3. John KC; Mechanical Workshop Practice; PHI
4. HazraChoudhry; workshop Practice-Vol.1 & 2.
5. Jain R. K.; Production Technology

#### **NPTEL Link for Manufacturing Practices**

<http://nptel.ac.in/courses/112107145/>

#### **Laboratory Work:**

Relevant shop floor exercises involving practice in forging, Carpentry, fitting, pattern making, Sand casting, Moulding, Welding, Sheet metal fabrication techniques.