Government of Karnataka
Department of Technical Education

C-25 Diploma in Mechanical Engineering

Scheme of Studies

(Effect from the AY 2025-26)

Government of Karnataka

DEPARTMENT OF TECHNICAL EDUCATION

Curriculum Structure

I Semester Scheme of Studies – Mechanical Engineering

Sl. No.	Teaching Department	Course Code	Course Name	Hours per week			Total Contact Hours/week	Credits	CIE Marks		Theory SEE Marks		Practice SEE Marks		Total Marks
				L	T	P			Max	Min	Max	Min	Max	Min	
Integrated Courses															
1	SC	25SC11I	Engineering Mathematics-I	4	0	4	8	6	50	20	50	20	-	-	100
2	ENG	25EG01I	Essential English Communication	4	0	4	8	6	50	20	-	-	50	20	100
3	ME	25ME01I	Computer Aided Engineering Drawing	3	0	4	7	5	50	20	-	-	50	20	100
4	ME	25ME11I	Concepts of Mechanical Engineering-I	4	0	4	8	6	50	20	50	20	-	-	100
Audit Course															
5	ME	25ME12T	Environmental Sustainability	2	0	0	2	2	50	20	-	-	-	-	50
6	Personality Development		NCC/NSS/YOGA/SPORTS...	Students are expected to engage in any one of these activities from 1st semester to 6th semester (No Credits)											
Total				**17**	**0**	**16**	**33**	**25**	**250**	**-**	**100**	**-**	**100**	**-**	**450**

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	**Mechanical Engineering**	**Semester**	**I**
Course Name	Concepts of Mechanical Engineering - I	**Type of Course**	Integrated
Course Code	**25ME11I**	**Contact Hours**	104 hrs/Sem
Teaching Scheme	L: T:P – 4-0-4	**Credits**	6
CIE Marks	**50**	**SEE Marks**	**50 (Theory)**

1. Rationale:

Engineering Materials play an important role through conventional and advanced materials leading to technological advances. Over a period of time, a lot of research has been done to develop materials that transformed civil society. Understanding the structure-property relationship and selecting the right material for a given application is vital in the modern customer-driven market. Therefore, a Diploma engineering student must be conversant with the properties, composition and behavior of materials from the point of view of the product's reliability, sustainability and performance. The study of engineering materials will help the students to understand engineering subjects where the emphasis is laid on the application of these materials. Understanding the basics of **Theory of Machines** is essential for mechanical engineers to design, develop, and optimize mechanical systems, mechanisms, and machines.

Diploma Engineers are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various manufacturing processes is essential. This requires training the students with a focus on **Fitting and Welding**, operations provides essential skills, knowledge, and experience about the various manufacturing processes. Hence this integrated course is introduced to provide strong foundation in practical skills, safety awareness, and problem-solving abilities essential for success in mechanical engineering and related fields.

2. **Course Outcomes:** At the end of the Course, the students will be able to:

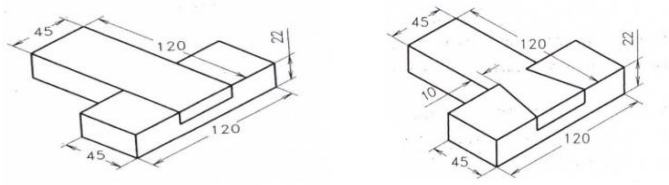
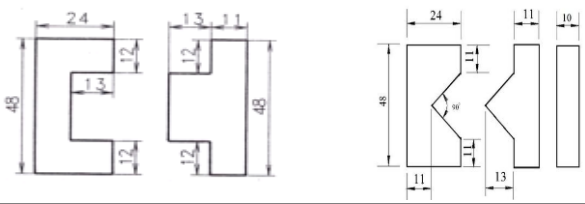
CO-01	Identify the Measuring instruments required for measuring the given component and Record the dimensions.
CO-02	Select suitable material for the real-world components and analyze their mechanical, thermal, and electrical properties.
CO-03	Assemble and test kinematic mechanisms, gear trains, and transmission systems to study

	their functionality and performance in mechanical applications.
CO-04	Perform fitting, welding, and carpentry operations by following safety guidelines with accuracy.

3. Details of Course Content

WEEK	CO	PO	Theory	Practice
1	1	-	• **Introduction to Mechanical Engineering,** scope of Mechanical Engineering and Career's opportunities for Mechanical Engineers • **Fundamental Units** – Definition and units of Length, Mass, Time & Temperature in CGS, FPS, MKS & SI Units with conversions. • **Derived Units** – units of Area, Volume, Density, Velocity, Acceleration, Force, Work, Energy Power in CGS, FPS, MKS & SI Units with conversions. (Formulae & Simple numerical examples)	• Measurement of linear dimensions using Vernier calipers. • Measurement of height using Height gauge. • Measurement of outside diameter by using screw gauge. • Measurement of inside diameter using inside caliper. • Measurement of angle by using bevel protractor and sine Bar.
2	2	1,2, 4	**Classification of Engineering Materials** **Ferrous Materials** • **Cast Iron-** Types of cast iron- Grey, White, Malleable. Properties, composition and applications of cast iron. • **Stee**l –Types, Designation of steel, Types -Plain Carbon Steel- Low (0.15-0.25%C), Mild (0.25%C), Medium (0.25-0.65%C), High Carbon (0.65-1.5%C), Properties, composition and applications of steel. • **Alloy Steel**- Tool Steel, Tungsten steel, Stainless-Steel, High-Speed Steel, Properties, composition and applications of alloy steel. *This concept shall be thought by Using the components made of cast iron, steel and alloy steel as teaching aids,* ***Examples****: Rails in Railways, Machine tool beds, Flywheels, Man-hole Cover, Sewage pipes. Pump Casing, Ball Mills, Wear Plate, Marine Pump Impeller, Gear Housing, Clamps Fixtures, Wrench and Pliers, Welding Electrodes, Chassis, car body, gears, axels, Shafts, Fasteners, exhaust, springs, axles, laminated springs, Cutting Tools, Sheet metals etc*	• Display different components made of cast iron, steel and alloy steel. • Students shall identify minimum 10 components and prepare the chart showing the components pictures, properties and applications.

3	2	1,2	**Non-Ferrous Materials** Properties, composition and applications of • **Aluminum and Aluminum Alloys** – Duralumin, Y-Alloy, Magnesium, Hindalium. • **Copper and Copper Alloys** - Brass, Bronze, Gun Metal, lead, Tin. Bearing Metals. • **Zinc Based Alloys** – Solder, German silver; • **Nickel Based Alloys** – Inconel, Monel metals. *This concept shall be thought by Using the components made up of Aluminum & Aluminium Alloys, Copper & Copper Alloys, Zinc Based Alloys, Nickel Based Alloys as teaching aids,* ***Example****: Food Wrapping, Rivets, Connecting Rods, Aircraft engine Parts, utensils, Electrical Connectors, tubes used in refrigerators, Water Pump parts, Bearings, bushes, Gun Parts, bells, Solders, propellers., Gun Parts, bells, Solders, propellers. Heat Exchangers, Cutting Tool Inserts.*	• Display different components made of Aluminum & Aluminum Alloys, Copper & Copper Alloys, Zinc Based Alloys, Nickel Based Alloys. • Students shall identify minimum 10 components and prepare the chart showing the components pictures, properties and applications.
4	2	1,2, 4	**Properties of Engineering Materials** • **Mechanical Properties** - Elasticity, Plasticity, Malleability, Ductility, Brittleness, Strength, Toughness, Hardness, Stiffness, Resilience, Creep, Endurance, Fatigue & Machinability. • **Thermal Properties** - Thermal conductivity, Specific Heat, Thermal Expansion. • **Electrical Properties** – Resistivity, Conductivity, Dielectric Strength, Temperature Coefficient. • **Chemical Properties** – Reaction with Oxygen and Water. • **Magnetic Properties-** Magnetic permeability, Magnetic Flux Density.	Students shall prepare the chart showing Mechanical, Thermal, Electrical, Chemical and Magnetic Properties of Engineering Materials.

5	2	1,2, 4	**Non- Metals** Properties, composition and applications of • **Polymers:** Thermoplastics (PE, PLA, PVC, Nylon, ABS), thermosetting polymers (Bakelite, Epoxy) and Biodegradable Polymers. • **Ceramics**- Types - Oxides, Carbides, properties and applications. • **Composites**- Types, Properties and Applications. *This concepts shall be thought by Using the components made of Polymers, Ceramics, Composites as teaching aids,* ***Example****: Plastic bags, Water bottles, Water mugs & buckets, Plumbing pipes, Spectacle frame, Tires, Ropes, Electric switch board, Fan, Shoes, Rain coats, Biodegradable polymers, Spark plug, Wash Basin, Artificial teeth, Electric Resistors and Fuse Holder, video of Wind turbine blades, Aircraft wings, Bicycle Frame etc.*	• Display different components made of Polymers, Ceramics, Composites. • Students shall identify minimum 10 components and prepare the chart showing the components pictures, properties and applications.
6	1, 4	4	**Carpentry Practice** • Explain and show the different Types of wood, their Properties and applications. • Demonstrate the Safety precautions to be followed in Carpentry shop. • Demonstrate the tools and equipment's used in Carpentry shop. • Prepare the model as per give drawing (Given models are only suggestive). • Check the dimensions using measuring instruments as per the given drawing. 	
7	1, 4	4	**Fitting Practice** • Demonstrate the Safety precautions to be followed in Fitting shop. • Demonstrate the tools and equipment's used in Fitting shop. • Demonstrate the different operations like chipping, filing, drilling, tapping, sawing, cutting etc. • Prepare Fitting job as per given drawing (Given models are only suggestive). • Check the dimension using measuring instruments as per the given drawing. 	

8	3	1,2, 3	**Basics of Kinematics of Machines** • Kinematic link or Element- Types of links Kinematic pair–Types. • Types of constrained Motions, Kinematic chain- Definition of Machine, Structure and Mechanism. • Inversions-Types of Kinematic Chains, Four Bar Chain, Beam Engine. *This concepts shall be thought by Using the models of different applications of kinematics such as Piston and cylinder, drawer slides, hinged joints, robotic arm joints, Ball-and-socket joints (hip, shoulder), Nut and bolt, lead screw in a machine tool etc as teaching aids*	**Practice** Students shall build simple models and demonstrate the mechanisms.
9	3	1,2, 4	**Inversions and Kinematic Chains** • Single Slider Crank Chain, Crank and Slotted Lever. • Quick Return Motion Mechanism • Double Slider Crank Chain, Scotch yoke mechanism, • Pantograph *This concepts shall be thought by showing the different inversions of kinematic chain used in shaping, cutting machines, slotting machines, rotary internal combustion engines, Reciprocating engines and control valve actuators as teaching aids*	**Practice** Students shall build simple models and demonstrate the mechanisms.
10	3	1,2, 4	**Transmission System** Classification of Transmission system – Belt drives, Rope Drives, Chain drives. • Types of Belt Drives. • Length of belt drive in open and cross belt drive. • Concept of Velocity Ratio, Slip and Creep. • Material used for Belts. • Applications of Rope drives. • Applications of chain drives. • Simple problems *This concept shall be thought by showing the different applications of belt drives in Flour Mills, Lathe Machines, Compressors, Vehicle Engines, Blowers, washing machines, Rope drives in cranes, elevators etc. as teaching aids.*	• Simple Problems on Velocity Ratio, and Power Transmitted by Belt (Flat & V-Belt) in Machine Shop. • Simple Problems on calculating number of Ropes required to transmit power.

11	3	1,2, 4	**Gears and Gear Trains** • Gears Drives– Introduction, Classification, Gear Terminology. • Gear Trains – Introduction, Types, Simple & Compound Gear Trains. • Reverted and Epicyclic Gear trains • Simple Problems. *Use different applications of gear trains in Lathe Machines, Milling Machines, Gear boxes, etc. as teaching aids*	• Simple Problems on Gear Trains. • Determine the velocity ratios of belt drives/gear drives used in Lathe/Drilling/Shaper/Planer/Grinding machines in the workshop.
12	4	1,4	**Metal Joining processes** **Classification of Joining Process** - Temporary and Permanent joining processes. **Fasteners -** Rivets, Bolts and Nuts and types. **Welding** - Classification of welding process, **Arc welding process**- Arc welding electrodes, Arc welding equipment's. TIG (GTAW) and MIG (GMAW) welding, Defects in arc welding process.	**Practice -** • Demonstrate the Safety precautions to be followed in arc welding. • Demonstrate the tools and equipment's used for arc welding. • Demonstrate the arc welding process. • Practice the arc welding process as per given drawing. • Check for the defects in welding process. ***Prepare Joints****- Fillet Corner joint, Fillet Butt joint, Fillet T-Joint and Fillet Lap Joint* on MS plate 10 mm thick in flat position.
13	4	4	**Gas welding Process** • CO_2 and Oxy-Acetylene gas welding process • Different types of gas welding flames. • Welding Positions – 1G, 2G, 3G, 5G. **Soldering and Brazing** • Principles of Soldering and Brazing Processes, • Fillers, heating methods Applications	**Practice** • Demonstrate the Safety precautions to be followed in gas welding process. • Demonstrate the tools and equipment's used for gas welding. • Demonstrate the gas welding process with different flames. • Practice the gas welding process as per given drawing. • Check for the defects in welding process ***Prepare Joints-*** *Straight line beads and multi-layer practice* on M.S. Plate 10 mm thick in Horizontal position, *Structural pipe welding butt joint* on MS pipe Ø 50 and 3mm WT in 1G position.

4. References:

Sl. No.	Author	Title of Books	Publication/Year
1.	J. W. Martin	Materials for Engineering	Woodhead Publishing Limited, 3rd Edition, 2006
2.	William D. Callister Jr.	Material Science and Engineering	Wiley Publications, 10th Edition, 2020
3.	V K Manchanda, GBS Narang, J S Narang	Materials science and Metallurgy	Khanna Publishers, 1st Edition, 2021
4.	R.K. Rajput	Materials science and Engineering	S.K. Kataria & Sons, 5th Edition 2016, Reprint 2024
5.	Rangwala	Engineering Materials	Charotar Publishing house, 43rd Edition, 2019
6.	C P Sharma	Engineering Materials	PHI Learning, 2004
7.	S S Rattan	Theory of Machines	Mc Graw Hill Publications, 4th Edition, 2019
8.	R S Khurmi	Theory of Machines	S Chand Publication, 2005
9.	J S Brar, R K Bansal	Theory of machines	Firewall Media, 2004
10.	K R Gopalakrishna	Elements of Mechanical Engineering	2019
11	S. K. Hajra Choudhury, A. K. Hajra Choudhury, Nirijhar Roy	Elements of Workshop Technology Vol-I Manufacturing Processes	Media Promoters & Publishers Private Limited - 2008
12	S. K. Hajra Choudhury, Nirijhar Roy	Elements of Workshop Technology Vol-II Machine Tools	Media Promoters & Publishers Private Limited - 2010
13	R. B. Gupta	Workshop Practice	Stay Prakashan - 2024
14	G. S. Sethi	Welder Trade Tutorial	Computech Publications Limited - 2022
15	G. S. Sethi Balbir Singh	Fitter	Computech Publications Limited - 2021

5. CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max Marks	
1.	CIE-1 Theory Test	4	90	50	Average of all CIE=50 Marks
2.	CIE-2 Practice Test	7	180	50	
3.	CIE-3 Theory Test	10	90	50	
4.	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all practices and activities through Rubrics	1-13	-	50	
Total					**50 Marks**

6. SEE - Theory Assessment Methodologies

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper

Program	Mechanical Engineering		Semester- 1	
Course Name	Concepts of Mechanical Engineering - I		Test	I
Course Code	25ME11I	Duration- 90 min	Marks-50	
Name of the Course Coordinator:				
Note: Answer any one full question from each section. Each question carries equal marks.				

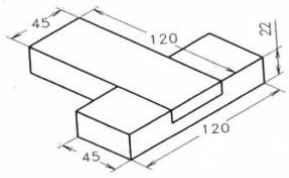
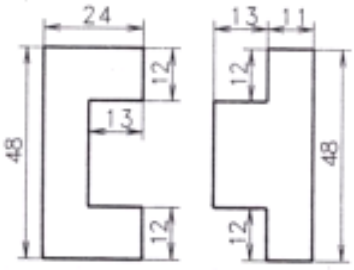
Q. No	Questions	CL	CO	Marks
	Section - 1			
1	a) A cylinder tank has a volume of 2 m^3. How many liters of liquid can it hold? b) Identify the key properties required for materials used in **Bearings.** c) Suggest essential properties used for **Shafts** in machinery. d) Identify the properties required for the materials used in manufacturing of **Springs**. e) Recognize properties should materials for **Bolts and fasteners** possesses.	Apply	CO1, CO2	**5X5 = 25**
2	a) The density of a metal is 7800 kg/m3. Convert this density to gm/cm3 b) Suggest the key properties considered when selecting cast iron for **sewage pipelines and fittings**. Recommend a suitable type of cast iron. c) Identify the desired properties for **laminated springs** in automobile suspension systems and recommend the appropriate type of carbon steel d) Identify the significant properties required for **Kitchen utensils** made from Stainless Steel. Suggest suitable Stainless steel. e) Suggest the critical engineering properties needed for the manufacturing of **machine beds** and recommend a suitable metal.	Apply	CO1, CO2	**5X5 = 25**
	Section - 2			
3	a) Propose the appropriate non -ferrous metals for tubes used in **refrigerators** and justify your choice based on the required properties. b) Aluminum alloys are preferable choice in Aerospace industries. Highlight its Advantages and Disadvantages. c) Propose the appropriate non -ferrous metals for **food packing** and justify your choice based on the required properties. d) Which non -ferrous metal is suitable for making **bearings and bushes** and why is it chosen based on its properties. e) Which non -ferrous metal is suitable for making **cutting tool inserts** and why is it chosen based on its properties.	Apply	CO2	**5X5 = 25**
4	a) Which polymer is suitable for **water bottles** and why are they preferred over metal bottles? b) A wash basin can be made of a metal as well as a **ceramic**. Appreciate the use of ceramics over metals. Suggest a suitable ceramic material. c) Appreciate the suitability of composite material for **aircraft wing** application and suggest suitable composite material.	Apply	CO2	**5X5 = 25**

	d) Which nonmetal is used the production of **Spark plugs**. Highlight its properties. e) Which nonmetal is used the production of **Gun parts**. Discuss its properties.			
Note for the Course coordinator: Each question may have two, three, four and five subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

8. CIE Practice Test model question paper

Program	Mechanical Engineering			**Semester**	I
Course Name	Concepts of Mechanical Engineering - I			**Test**	II
Course Code	25ME11I	**Duration**	180 min	**Marks**	50
Name of the Course Coordinator:					
Note: Answer any one full question from the following					

Questions	CO	Marks
1. a. Explain the Safety precautions used in Carpentry shop. b. Prepare the model as per the dimensions given below.  2. a. Explain the Safety precautions used in Fitting shop. b. Prepare the model as per the dimensions given below. 	1,4	10+40 = **50 Marks**
Scheme of Assessment -Q No.1 & 2 - a) Identify safety outfits, usage of appropriate safety method - 10 Marks b) • Listing of tools & operations required for performing job – 10 Marks • Marking of job - 05 Marks • Operations performed - 20 Marks • Finishing and Dimensional accuracy of the job - 05 Marks		**50 Marks**

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

9. Suggestive Activities for Tutorials:

- The students shall do minimum of one suggested activities
- List is an Example and not inclusive of all possible activities of the course.
- Student and Faculty are encouraged to choose activities that are relevant to the topic.

Sl.No.	Suggestive Activities for Tutorials
01	Develop the working model of Single Slider crank mechanisms.
02	Develop the working model of Double slider crank lever mechanisms
03	Develop the working model of Quick return mechanisms

04	Develop the working model of Crank and slotted lever mechanisms
05	Develop the working model of Four bar chain mechanism

10. Rubrics for Assessment of Graded Exercises and Activities (Qualitative Assessment)

Sl. No.	Dimension	Unsatisfactory	Need Improvement	Satisfactory	Good	Excellent	Student Score
		(0-10)	(11-20)	(21-30)	(31-40)	(41-50)	
1	Preparation	Not prepared at all	Lacks several important materials or tools	Adequately prepared but missing key items	Mostly prepared with minor omissions	Fully prepared with all necessary materials and tools	40
2	Execution/Implementation	Task not executed	Major errors affecting results or functionality	Some inconsistencies or inaccuracies present	Minor errors in execution, but overall effective	Test or task performed flawlessly with precision and accuracy	40
3	Quality of Work	No quality demonstrated	Poor quality, major flaws impacting functionality	Acceptable quality with noticeable defects	Good quality with minor flaws	High-quality output, meets or exceeds standards	30
4	Use of Tools/Techniques	No proper tool use demonstrated	Weak use of tools, significant risks noted	Basic use of tools, some inefficiencies	Good use of tools, minor issues with technique	Mastery of tools and techniques demonstrated safely and effectively	40
5	Practical Record submission	Major sections are not addressed.	Major sections are missing or poorly addressed.	Some sections are included, but lack detail.	Most sections are complete with minor omissions.	All required sections are included and thoroughly detailed.	50
	Average Marks=(40+40+30+40+50)/5=40						**40**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

11. Equipment/software list with Specification for a batch of 30 students

Sl. No.	Particulars	Specification	Quantity
	Fitting shop		
01	Flat file	14″ rough bastard file	30
02	Try square	6″	30
03	Triangular file	10″ rough	30
04	Hack saw frame	12″	30
05	Center punch	Standard size	30
06	Ball peen hammer	11/2 lbs	30
07	Flat chisel	6″	30
08	Smooth file	10″ flat	30

09	Bench vice	8″	30
10	Leg vice	6″	10
11	Power hack saw	Standard size	01
12	Bench grinding	Standard size	01
13	Tap set and die set	Upto1″	01
14	Vernier caliper	0-300 mm	10
15	Spring divider	Standard size	20
16	Steel scale	0-300 mm	30
17	Vernier height gauge	0-300 mm	01
18	Surface plate	2 x 3 feet	01
19	Number punch	Standard size	01
20	Anvil	Standard size	10
21	V block	Standard size	02
Welding shop			
01	Arc welding transformer	Upto 300 Amps	03
02	Welding shield	Standard size	20
03	Ball peen Hammer	11/2 Lbs	10
04	Chipping Hammer	Standard size	10
05	Wire brush	Standard size	10
06	Anvil	Standard size	01
07	Hand Gloves	Standard size	05
08	Flat tongs	Standard size	10
09	Steel scales	0-300mm	10
10	Flat file	14” rough bastard file	10
11	Oxygen cylinder	Standard capacity	01
12	Acetylene cylinder	Standard capacity	01
13	$C0_2$ Gas Cylinder	Standard capacity	01
14	Gas welding torch	Standard size	05
15	Spark lighter	Standard size	05
16	Gas welding goggles	Standard size	10
17	Gas cutting torch	Standard size	02
18	Try square	6”	10
Carpentry shop			
01	Carpenter Benchvice	Standard size	20
02	G or C clamp	6’’	20
03	Marking gauge	Standard size	20
04	Try square	19mmx4″	20
05	Wooden mallet	Standard size	20

06	Firmer chisel	2″	20
07	Firmer chisel	3/4″	20
08	Mortise chisel	1/2″	20
09	Metal jack plane	9″	20
10	Beveled square	6″	20
11	Hand saw or cross cut saw	Standard size	20
12	Steel scale	12″	20

Government of Karnataka

DEPARTMENT OF TECHNICAL EDUCATION

Program	ME & Allied Programs	**Semester**	I
Course Name	Computer Aided Engineering Drawing (CAED)	**Type of Course**	Integrated
Course Code	25ME01I	**Contact Hours**	7 Hrs/Week= 1Hrs
Teaching Scheme	L: T:P 3:0:4	**Credits**	5
CIE Marks	50	**SEE Marks**	50 (Practice)

1. **Rationale:** Engineering Drawing is universal & effective language of engineers that strengthens the technological structure. It helps in communicating design ideas and technical information to engineers and other professionals throughout the design process. The objective of Engineering drawing & CAD is to introduce the students, the techniques of drawing, visualize and represent 3D objects in 2D & create solid model.

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

CO-01	Use drawing instruments and dimension the drawing as per the standards.
CO-02	Draw the principal views of points, lines, planes and solids.
CO-03	Convert Orthographic views of a given drawing to pictorial Drawing.
CO-04	Create Solid model of the pictorial Drawing in CAD.

3. **Course Content -**

***Note: Practice of Drawings should be done in Drawing Sheet (A2) only.**

WEEK	CO	PO	Lecture (3 Hours per Week)	Practical (CAD) (4 Hours per Week)
1	1	1, 4, 7	**Fundamentals of Engineering Drawing:** • Introduction to Engineering Drawing - Need for Engineering Drawing, Instruments Used in Engineering Drawing • Layout of Drawing sheet, Title Block, Types of Lines and its Applications. **Dimensioning:** Introduction to dimensioning, Need for dimensioning & Eelements of dimensioning.	• Practice different types of Lines using drawing instruments. • Conventional representation of Materials. • **Practice Dimensioning of common features:** Line, Radius, Diameter, Arc, Chord, Angles, Sphere , Chamfer, Hole, through hole, Counter bore & Counter Sink.

2	1	1,4,7	• **Concept of Scale:** Representative fraction (RF), Full scale, reduced scale & enlarged scale. Conversion of Linear measurements of an object in mm, cm & Meter • **System of dimensioning:** Aligned system & Uni-direction system. • **Methods of Dimensioning** Chain, Parallel, Combined & Progressive Dimensioning	• Practice Problems on Scaling • Practice Problem on- Aligned and Uni-direction system of dimensioning. * • Practice Problems on - Chain Dimensioning, Parallel Dimensioning, Combined Dimensioning, Progressive Dimensioning
3	2	1,4,7	**Projection of Points:** • Planes of Projections and Views – Principal planes & Views. • First angle & Third angle projection with symbolic representation. • Problems on projection of points.	Practice Problems on projection of points.*
4	2	1,4,7	**Projection of Lines** (Only First angle projection) for following conditions • Line parallel to both HP & VP • Line parallel to HP & Perpendicular to VP • Line parallel to VP & Perpendicular to HP. • Line inclined to HP & Parallel to VP • Line inclined to VP & Parallel to HP.	Practice Problems on Projection of Lines**.***
5	2	1,4,7	**Projection of Planes:** • Problems on projection of Planes (Triangular, Square, Pentagonal & Hexagonal laminas) With conditions: o Base edge resting on HP o Corner resting on HP o Inclination only to HP • Problems on projection Circular lamina with Inclination only to HP.	Practice Problems on Projection of Planes.*
6	2	1,4,7	**Projection of Solids:** • Problems on projections of Solids (Triangular and Square prism & pyramid) with conditions: o Base edge resting on HP o Corner resting on HP o Base Inclination only to HP. • Problems on projections of Cone with base Inclination only to HP	Practice Problems on Projection of Solids**.***

7	2	1,4,7	• Problems on projections of Solids (Pentagonal, Hexagonal prism & pyramid) with conditions: ○ Base edge resting on HP ○ Corner resting on HP ○ Base Inclination only to HP. • Problems on projections of Cylinder with base Inclination only to HP	Practice Problems on Projection of Solids.*
8	3,4	1,4,7	**Orthographic Projections & Solid Modeling:** Draw Orthographic Views for given Pictorial drawings.	• Familiarization of CAD window Commands like New file, saving the file, opening an existing drawing file, Undo, Redo, move commands, Menu bar, Tool bar, Task bar & Ribbon bar. • Practice CAD commands like arc, circle, square, rectangle, chamfer, Trim, inclined lines, Extend, Extend to Next, Shell, • Fillet, Group, Array and Mirror commands
9	3,4	1,4,7	Draw Orthographic Views for given Pictorial drawings.	Create Solid model for Pictorial drawings in CAD & Extract Views.*
10	3,4	1,4,7	Draw Orthographic Views for given Pictorial drawings.	Create Solid model for Pictorial drawings in CAD & Extract Views.*
11	3,4	1,4,7	Draw Orthographic Views for given Pictorial drawings.	Create Solid model for Pictorial drawings in CAD & Extract Sectional Views with an arbitrary Sectional Plane.*
12	3,4	1,4,7	Draw Orthographic Views for given Pictorial drawings.	Create Solid model for Pictorial drawings in CAD & Extract Sectional Views with an arbitrary Sectional Plane.*
13	3,4	1,4,7	Draw Orthographic Views for given Pictorial drawings.	Create Solid model for Pictorial drawings in CAD &Extract Sectional Views with an arbitrary Sectional Plane.*

Note - * ***Refer annexure for Practice Questions & portfolio evaluation***

4. References:

Sl. No.	Author	Title of Book	Publication/Year
01	Basant Agrawal/C N Agrawal	Engineering Drawing	3rd Edition, McGraw-Hill, 2019
02	K Venkata Reddy	Textbook of Engineering Drawing	2nd Edition, B S Publication
03	Venugopal K	Engineering Drawing and Graphics with Auto CAD	2009
04	N D Bhatt	Engineering Drawing	Charotar Publication
05	Imtiaz Hashmi	Fundamentals of Engineering Drawing	Lambert Academic Publishing ,2010
06	M B Shah	Engineering Drawing	Pearson Education India, 2013
07	Frederick E Giesecke and Ivan L Hill	Technical Drawing with Engineering Graphics	Pearson Education Limited, 2013
08	K R Gopala Krishna	Engineering Graphics	Subhash Publications
09	R K Dhawan	Text book of Engineering Drawing	S Chand Publications
10	Maurice Arthur Parker	Engineering Drawing with Worked Examples, Volume 1	Stanley Thornes Publications

5. CIE Assessment Methodologies

***Note:** *Drawings should be practiced in Drawing Sheet (A2) only, Except Orthographic drawings which shall be practiced in A4 sheet.*

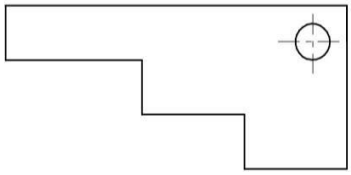
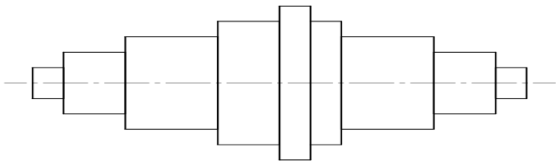
Sl.No.	CIE Assessment	Test Week	Duration (minutes)	Max Marks	
1.	CIE-1 Theory Test	4	90	50	Average of all CIE=50 Marks
2.	CIE-2 Practice Test	7	180	50	
3	CIE-3 Theory Test	10	90	50	
4.	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the Drawing sheets and activities through Rubrics	1-13	-	50	
Total					**50 Marks**

6. SEE – Practice Assessment Methodologies

Sl. No	SEE – Practice Assessment	Duration (minutes)	Max. Marks	Min. Marks to Pass
1.	Semester End Examination-Practice	180	50	20

7. CIE-1 Theory Test Model Question Paper

Program	Mechanical Engineering			**Semester - I**	
Course Name	Computer Aided Engineering Drawing (CAED)			**Test**	I
Course Code	25ME01I	**Duration**	90min	**Marks**	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					

Q. No	**Questions**	**Cognitive Level**	**Course Outcome**	**Marks**
	Section-1			
1	a) Draw layout of drawing sheet & List different sizes of Drawing sheet. b) Dimension the given sketch using aligned system with chain method. 	Apply	CO1	10+15=25
2	a) Draw Title block b) Dimension the given sketch using unidirectional system with parallel method. 	Apply	CO1	
	Section-2			
3	a) Draw three principal views of a point **P,** 30mm below HP, 50mm behind VP & 40mm from Left Profile Plane. b) Draw the three principal views of a line 40 mm long when it is placed parallel to VP and perpendicular to HP. The line is 30mm above HP, 40mm in front of VP and 30mm from right Profile plane.	Apply	CO2	10+15=25
4	a) Draw three principal views of a point **P**, 30mm Above HP, 50mm behind VP & 40mm from Left Profile Plane b) Draw the three principal views of a line40mm long which it is inclined at 30°to VP and parallel to HP. The line is 30mm above HP, 40mm in front of VP and 30mm from right profile plane.	Apply	CO2	

NotefortheCoursecoordinator:Eachquestionmayhaveone,twoorthreesubdivisions.Optionalquestionsineach section carry the same weightage of marks, cognitive level and course outcomes.

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

8. CIE-2 Practice Test model question paper

Program	Mechanical Engineering			**Semester**	I
Course Name	Computer Aided Engineering Drawing. (CAED)			**Test**	II
Course Code	25ME01I	**Duration**	180 min	**Marks**	50
Name of the Course Coordinator:					

Questions	**CO**	**Marks**
1. Draw the three principal views of a line 40 mm long when it is placed parallel to both HP & VP. The line is 30 mm above HP,40 mm in front of VP and 30mmfromright Profile plane.	CO2	15
2. A triangular lamina of base edge 40mm rests with one its base edge on HP so that the surface of the lamina is inclined at 30° to HP. Draw the projections of the lamina.	CO2	15
3. A square Prism of base edge 40mm and height 60mm rests with one its base edge on HP so that the axis of the prism is inclined at 30° to HP. Draw the projections of the prism.	CO2	20

Scheme of assessment Q1	**Scheme of assessment Q2**	**Scheme of assessment Q3**
Front View = 5 Marks Top View = 5 Marks Side View = 5 Marks	Initial position= 5 Marks In Inclined Position: Front View=5 Marks Top view= 5 Marks	In Initial Position: Front View=5 Marks Top view= 5 Marks In Inclined Position: Front View=5 Marks Top view= 5 Marks

Total Marks	**50**

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

9. Suggestive Activities for Tutorials:

- The students shall do minimum of one suggested activities
- List is an Example and not inclusive of all possible activities of the course.
- Student and Faculty are encouraged to choose activities that are relevant to the topic.

Sl.No.	**Suggestive Activities for Tutorials**
01	Prepare Nut and Bolt by 3D Printing
02	Prepare V block/ Patterns by 3D Printing
03	Prepare solid models of Inter-disciplinary components by 3D Printing

10. Rubrics for Assessment of Graded Exercises and Activities (Qualitative Assessment)

Sl. No.	Dimension	Unsatisfactory	Need Improvement	Satisfactory	Good	Excellent	Student Score
		(0-10)	(11-20)	(21-30)	(31-40)	(41-50)	
1	Technical Accuracy	Significant errors make the drawing unusable.	Multiple inaccuracies	Some errors affecting understanding but correctable.	Minor errors in interpretation or calculations	All details are accurate	40
2	Line Quality	Lines are messy and confusing.	Lines are uneven	Inconsistent line quality	Clear lines with minor inconsistencies.	Clean and consistent lines	40
3	Dimension	Dimensions are missing or incorrect.	Many errors; hard to interpret	Some dimension errors affecting interpretation.	Mostly accurate; minor issues	Dimensions are precise, clear, and correctly positioned, following standards.	45
4	Presentation & Neatness	Very untidy; Very poor presentation	Messy;Presentation hinders clarity	Somewhat neat;Some layout issues	Generally neat with minimal flaws; minor improvement in Presentation	Extremely neat and organized; all details easy to read	40
5	Adherence to Standards	Does not follow any drawing standards.	Limited adherence to standards	Lacks consistency.	Minor deviations from standards.	Aadheres to relevant drawing standards (ISO, ANSI, etc.).	35
	Average Marks = (40+40+45+40+35)/5 = 40 Marks						**40**

Note: *Dimension and Descriptor shall be defined by the respective course coordinator as per the activities*

11. SEE- Model Practice Question Paper

Program	Mechanical Engineering		**Semester**	I
Course Name	Computer Aided Engineering Drawing	**Course Code:** 25ME01I	**Duration**	180 min
			Maximum Marks	50

Questions	**CO**	Marks
1. A pentagonal Prism of base edge 40mm and height 60mm rests with one its corner on HP so that the base of the prism is inclined at 30° to HP. Draw the projections of the prism. (ANSWER SHEET)	CO2	20
2. Draw Orthographic views for the given pictorial Drawing (ANSWER SHEET) & create solid model (CAD) for the same and Extract Views.	CO3,CO4	30
Scheme of assessment for Q1 1. Draw projections of a Solid -15 Marks 2. Adopting Dimension& Drawing convention (types of lines) -5Marks	**Scheme of assessment for Q2** 1. Drawing orthographic Views in answer sheet-15 Marks 2. Creating solid model in CAD & print out -10Marks 3. Extracting Views- 5 Marks	
Total Marks		**50**

1) Signature of the Examiner **2) Signature of the Examiner**

12. Equipment/software list with Specification for a batch of 30 students

Sl.No.	Particulars	Specification	Quantity
01	Drawing tables	As per IS	30
02	CAD software	-	30 users
03	Computers	Latest configuration	30

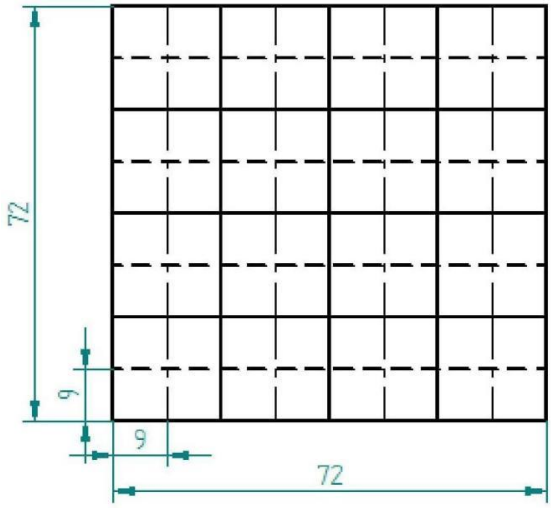
*Annexure

Students shall practice these or similar questions for portfolio evaluation

1. Fundamentals of Engineering Drawing

Drawing Sheet No. 1 – (Student has to submit Minimum one standard size drawing sheets (A2) in this unit for portfolio evaluation).

- DrawFig.1&Fig.2as per the drawing and identify types of lines.



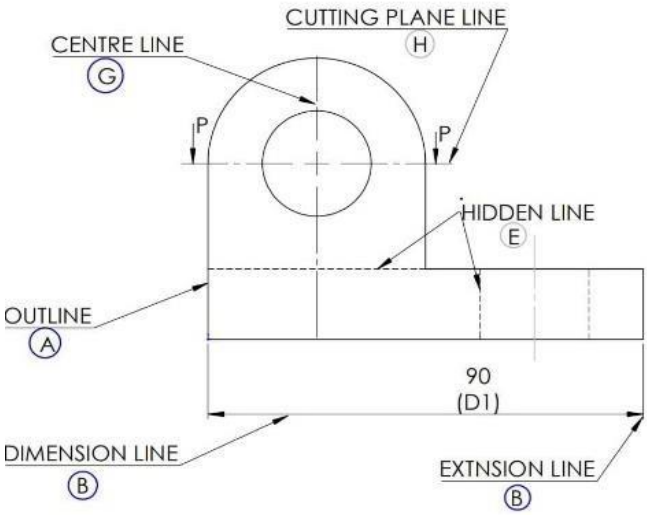


Fig.1 **Fig.2**

2. Dimensioning

Drawing Sheet No.2 & 3 - (Student has to submit Minimum two standard size drawing sheets (A2) in this unit for portfolio evaluation)

Draw Fig.3 to 1:1scale,1:2 scale & 2:1scale.

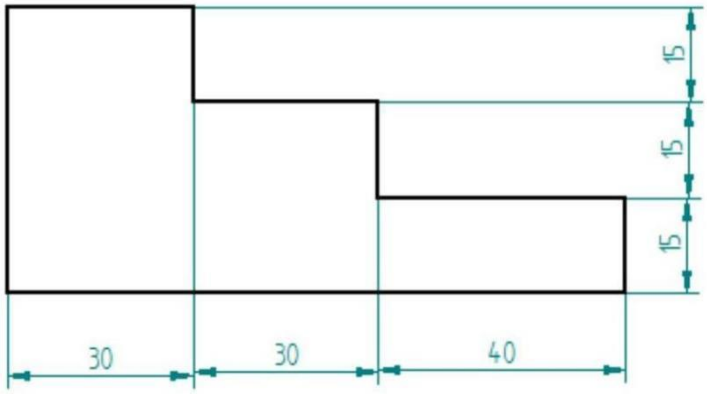


Fig.3

- Copy Fig. 3 to 1:1 scale and dimension it using both Aligned system & Uni-directional system.
- CopyFig.4to2:1ScaleanddimensionitusingAlignedsystemwithChaindimensioning.

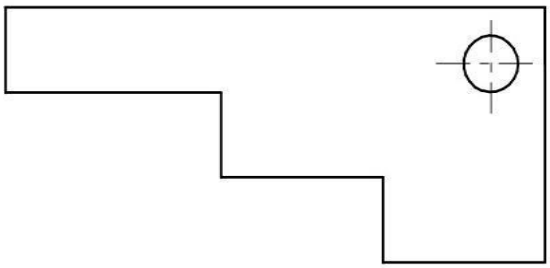


Fig.4

- Copy Fig. 5 to 1:1 Scale and dimension it using Unidirectional system with Parallel dimensioning

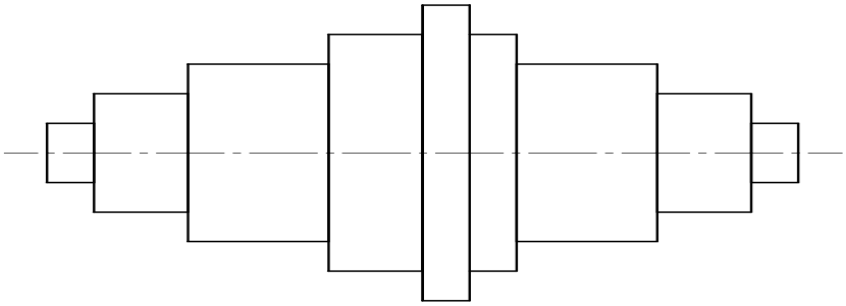


Fig.5

- Copy Fig. 6 to 1:1 scale and dimension it using unidirectional system with Combined dimensioning method

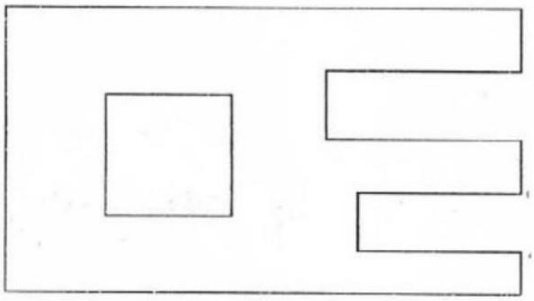


Fig.6

- Copy Fig. 7 to 1:1 scale and dimension it using Aligned system with Progressive dimensioning method

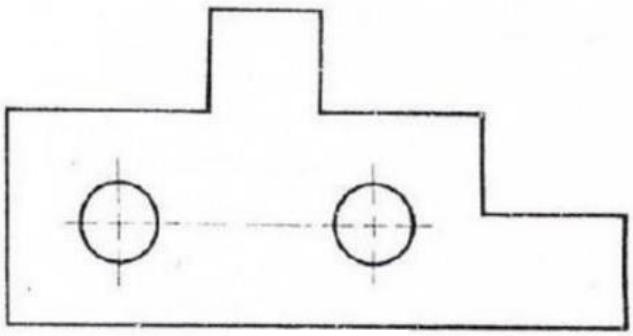
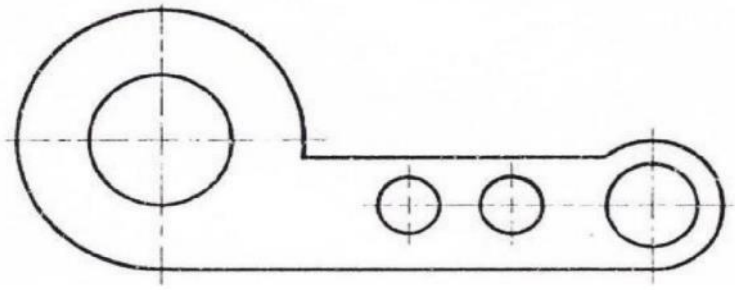


Fig.7

- Copy Fig. 8 to 1:1 scale and dimension it using Aligned system with chain dimensioning method



- **Fig.8**

2. Projection of Points

Drawing Sheet No.4- (Student has to submit Minimum one standard size drawing sheet (A2) in this unit for portfolio evaluation).

Q1. Draw three principal views of a point P, 30mm Above HP, 50mm in front of VP&40mm from Left Profile Plane.

Q2. Draw three principal views of a point P, 30mm Above HP, 50mm behind VP & 40mm from Left Profile Plane.

Q3. Draw three principal views of a point P, 30mm Below HP, 50mm behind VP & 40mm from Left Profile Plane.

Q4. Draw three principal views of a point P, 30mm Below HP, 50mm in front VP & 40mm from Left Profile Plane.

2. Projection of Lines

Drawing Sheet No.5- (Student has to submit Minimum one standard size drawing sheet in this unit for portfolio evaluation).

Q1. Draw the three principal views of a line 40 mm long when it is placed parallel to both HP & VP. The line is 30 mm above HP, 40 mm in front of VP and 30mm from right Profile plane.

Q2. Draw the three principal views of a line 40 mm long when it is placed parallel to HP and perpendicular to VP. The line is 30mm above HP, 40mm in front of VP and 30mm from right Profile plane.

Q3. Draw the three principal views of a line 40 mm long when it is placed parallel to VP and perpendicular to HP. The line is 30mm above HP, 40mm in front of VP and 30mm from right Profile plane.

Q4. Draw the three principal views of a line 40mm long which it is inclined at 30° to HP and parallel to VP. The line is 30mm above HP,40mm in front of VP and 30mm from right profile plane.

Q5. Draw the three principal views of a line 40mm long which it is inclined at 30° to VP and parallel to HP. The line is 30mm above HP,40mm in front of VP and 30mm from right profile plane.

3. Projections of Planes

Drawing Sheet No.6 - (Student has to submit Minimum one standard size drawing sheet (A2) in this unit for portfolio evaluation).

Q1. A triangular lamina of base edge 40mm rests with one its base edge on HP so that the surface of the lamina is inclined at 30° to HP. Draw the projections of the lamina.

Q2. A triangular lamina of base edge 40mm rests with one its Corner on HP so that the surface of the lamina is inclined at 30° to HP. Draw the projections of the lamina.

Q3. A square lamina of base edge 40mm rests with one its base edge on HP so that the surface of the lamina is inclined at 30° to HP. Draw the projections of the lamina.

Q4. A square lamina of base edge 40mm rests with one its corner on HP so that the surface of the lamina is inclined at 30° to HP. Draw the projections of the lamina.

Q5. A pentagonal lamina of base edge 40mm rests with one its base edge on HP so that the surface of the lamina is inclined at 30° to HP. Draw the projections of the lamina.

Q6. A pentagonal lamina of base edge 40mm rests with one its corner on HP so that the surface of the lamina is inclined at 30° to HP. Draw the projections of the lamina.

Q7. A hexagonal lamina of base edge 40mm rests with one its base edge on HP so that the surface of the lamina is inclined at 30° to HP. Draw the projections of the lamina.

Q8. A hexagonal lamina of base edge 40mm rests with one its corner on HP so that the surface of the lamina is inclined at 30° to HP. Draw the projections of the lamina.

Q9. A circular lamina of 30mm diameter rests on HP such that the surface of the lamina is inclined at 30° to HP. Draw the projections of the lamina.

4. Projections of Solids

Drawing Sheet No.7- (Student has to submit Minimum one standard size drawing sheet (A2) in this unit for portfolio evaluation).

Q1. A triangular Prism of base edge40mm and height 60mm rests with one its base edge on HP so that the base of the prism is inclined at 30° to HP. Draw the projections of the prism.

Q2. A square Prism of base edge 40mm and height 60mm rests with one its base edge on HP so that the axis of the prism is inclined at 30° to HP. Draw the projections of the prism.

Q3. A pentagonal Prism of base edge 40mm and height 60mm rests with one its corner on HP so that the base of the prism is inclined at 30° to HP. Draw the projections of the prism.

Q4. A hexagonal Prism of base edge 40mm and height 60mm rests with one its corner on HP so that the base of the prism is inclined at 30° to HP. Draw the projections of the prism.

Q5. Atriangularpyramidofbaseedge40mmandheight60mmisrestingwithoneofitscorneron HP so that axis of the pyramid is inclined at 30°to HP. Draw the projections of the pyramid.

Q6. AsquarepyramidofbaseedgeHP so that base of the pyramid is inclined at 30°to HP. Draw the projections of the pyramid.

Q7. A pentagonal pyramid of base edge 40mm and height 60mm is resting with one of its base edge on HP so that base of the pyramid is inclined at30°toHP.Drawtheprojectionsof the pyramid.

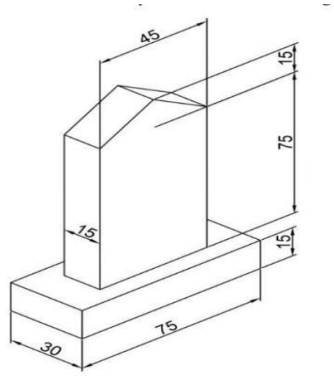
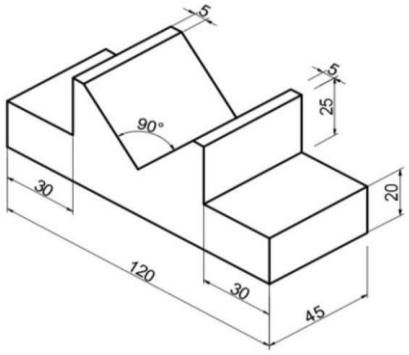
Q8. Ahexagonalpyramidofbaseedge40mmandheight60mmisrestingwithoneofitsbaseedge on HP so that base of the pyramid is inclined at30°toHP.Drawtheprojectionsof the pyramid.

Q9. A cylinder of 40mm diameter and axis height 65mm rests with its base on HP so that the base diameter inclined at 45° to the HP Draw the projections.

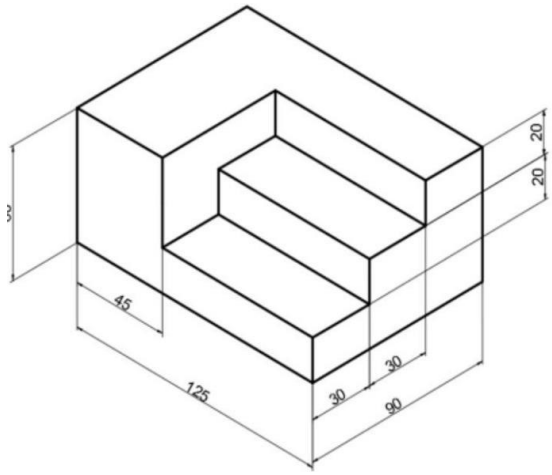
Q10. A cone of 40mm diameter and axis height 65mm is resting with its base on HP. Draw the projections if base diameter is inclined at 45° to HP.

5. Pictorial Drawings.

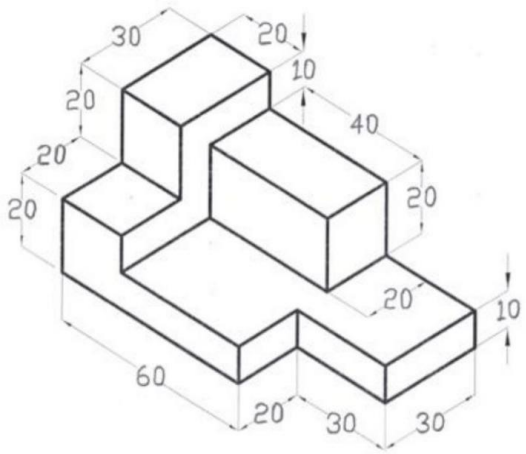
Drawing Sheet No.8,9& 10 - (Student has to submit Minimum two standard size drawing sheets(A2) in this unit for portfolio evaluation).

Q1. Draw the three principal views of the given component. & Create Solid Model. 	**Q2**. Draw the three principal views of the given component. & Create Solid Model. 

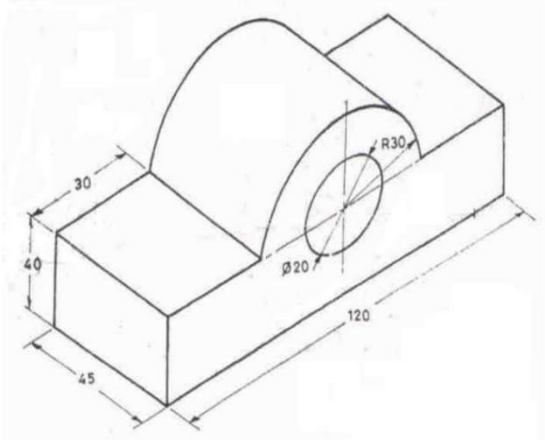
3. Draw the three principal views of the given component. & Create Solid Model.



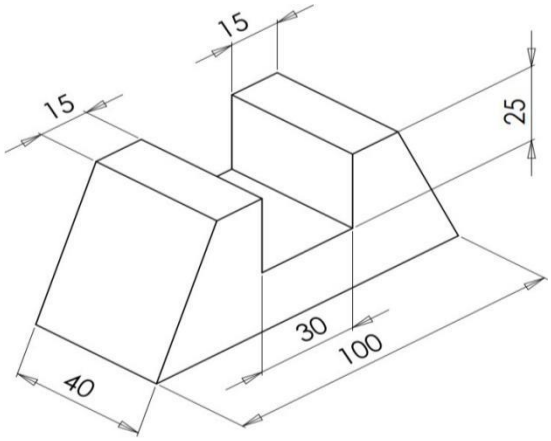
4. Draw the three principal views of the given component. & Create Solid Model.



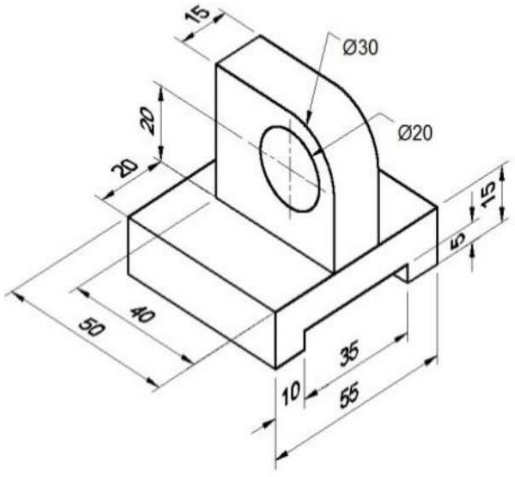
Q5. Draw the three principal views of the given component. & Create Solid Model.



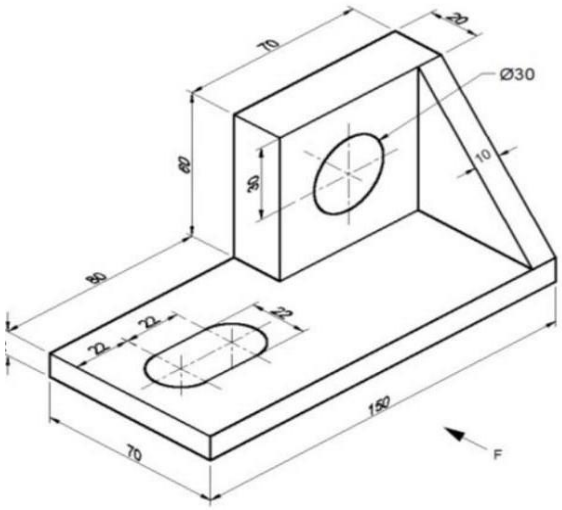
Q6 Draw the three principal views of the given component. & Create Solid Model.



7. Draw the three principal views of the given component. & Create Solid Model.



8 Draw the three principal views of the given component. & Create Solid Model.



Government Of Karnataka
DEPARTMENTOFTECHNICALEDUCATION

Curriculum Structure

II Semester Scheme of Studies – Mechanical Engineering

Sl. No.	Teaching Department	Course Code	Course Name	Hours per week			Total Contact Hours/week	Credits	CIE Marks		Theory SEE Marks		Practice SEE Marks		Total Marks
				L	T	P			Max	Min	Max	Min	Max	Min	
Integrated Courses															
1	SC	25SC21I	Engineering Mathematics-II	4	0	4	8	6	50	20	50	20	-	-	100
2	CS	25CS01I	IT Skills	3	0	4	7	5	50	20	-	-	50	20	100
3	EE	25EE01I	Fundamentals of Electrical & Electronics Engineering	3	0	4	7	5	50	20	-	-	50	20	100
4	ME	25ME21I	Concepts of Mechanical Engineering -II	4	0	4	8	6	50	20	50	20	-	-	100
Audit Course															
5	ME	25ME22T	Indian Constitution	2	0	0	2	2	50	20	-	-	-	-	50
6	Personality Development		NCC/NSS/YOGA/SPORTS...	Students are expected to engage in any one of these activities from 1st semester to 6th semester (No Credits)											
			Total	16	0	16	32	24	250	-	100	-	100	-	450

Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Mechanical Engineering	**Semester**	II
Course Name	Concepts of Mechanical Engineering -II	**Type of Course**	Integrated
Course Code	25ME21I	**Contact Hours**	104 hrs/Sem
Teaching Scheme	L: T:P :: 4:0:4	**Credits**	6
CIE Marks	50	**SEE Marks**	50 (Theory)

1. Rationale:

Material Science and Surface treatment are the fundamental concepts that equips diploma students with knowledge of various materials, their properties, applications and surface modification techniques. Understanding these concepts is crucial for students pursuing careers in engineering, manufacturing and construction. Diploma Engineers are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various manufacturing processes is essential.

Understanding the basics of **Metal forming and Machine tool techniques** are essential for mechanical engineers that equip students with knowledge of various metal forming and machining processes, tool design, and manufacturing methods. This requires training the students with a focus on **Casting and Sheet metal works**, operations provide essential skills, knowledge, and experience about the various manufacturing processes. Hence this integrated course is introduced to provide strong foundation in practical skills, safety awareness, and problem-solving abilities essential for success in mechanical engineering and related fields.

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

CO-01	Identify and apply suitable heat treatment and surface treatment processes for specific applications.
CO-02	Prepare castings using appropriate patterns, molds, and metal pouring techniques.
CO-03	Select and perform suitable metal forming processes such as forging, rolling, and extrusion.
CO-04	Develop and fabricate sheet metal components for various applications.
CO-05	Operate drilling and grinding machines to perform accurate machining and finishing operations.

3. Details of Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,2	**Crystal structure** • Types of crystal structures – Crystalline & Non-crystalline • Structure of metal –unit cell, BCC, FCC and HCP structures**,** Mechanical Properties. • Atomic Packing factor for BCC, FCC and HCP crystal structure (no derivations)	• Types of Microscopes (SEM and TEMs) -Use virtual lab web link *https://emb-iitk.vlabs.ac.in/exp/sembasics/simulation.html* • Study the different crystal structures by using ball and stick or wire models. • Study the Iron Carbon diagram for phase changes.
2	1	1,2,4	**Heat Treatment of Steel** • Objectives, Types ○ Annealing (Ductility) ○ Normalizing (Machinability) ○ Hardening (Hardness) ○ Tempering (reduce hardness/ brittleness) ○ **Case Hardening** – Carburizing, Nitriding, Cyaniding. ○ **Surface hardening**- Induction Hardening, Flame hardening **These concepts shall be thought by using the following Examples* ***Annealing***: *steel and steel alloys,* ***Normalizing***: *carbon steels and alloy steels,* ***Tempering***: *steel in construction, automotive, and machinery applications,* ***Carburizing***: *gears, camshafts,* ***Nitriding***: *tools, dies, and engine components* *	**Heat Treatment** • Safety precautions to be followed in Heat Treatment shop. • Compare hardness of the work piece before and after heat treatment process by using Hardness Testing Machine. (BHN/RHN)
3	1	1,2,4	**Surface treatment** • **Corrosion** - Types, Methods of reduction of corrosion • **Surface coating processes** - Traditional methods - Painting, electroplating, Galvanizing, Spraying. • **Advanced coating technologies** - Physical vapor deposition, Chemical Vapor deposition, Laser treatment. * *These concepts shall be thought by using the following Examples* ***Electroplating***: *Zinc plating on*	**Surface treatment** • Coat an Iron key with copper and Copper sulphate using the electroplating • Coat the brass plate with copper and Copper sulphate using the electroplating

			steel, Gold or silver plating on jewelry, watches, and decorative items, Nickel plating on machinery parts, Gold plating on connectors and circuit boards, Silver plating on medical devices ***Galvanizing****: steel beams and columns, steel poles for power lines, brackets, bolts, and nuts, steel pipes for plumbing,**	
4	1	1,2,4	**Advanced materials** • **Biomaterials-** Properties and applications • **Smart Material -** Piezoelectric materials (Quartz, PZT and PVDF), Shape memory alloys (Nitinol, Ni–Mn–Ga)- Properties and applications • **Energy Materials**- Solar Energy, Battery- Properties and applications • **Nano-Materials-**Classification, properties and applications, Carbon – based CNT and Graphene. * *These concepts shall be thought by using teaching aids such as* ***Biomaterials*** *- Bone cement, Stitches, Stents, Bone plates, Piezoelectric - Stoves, gas burners. SMAs- shower heads, Stents.* ***Energy Materials*** *– Silicon, Lithium-Ion. Nano-materials – Face Cream, Nano Filters, Baseball Bat**	• Display different components made up of advanced materials • Students shall identify minimum 10 components and prepare the chart showing the component diagram, material type, properties and application
5	2	1,2,4	**Additive Manufacturing** • Introduction to Additive Manufacturing, Materials - metal, polymer, ceramic, and glass materials used in Additive Manufacturing, and its properties & limitations. • Types of Additive manufacturing Technologies- Overview of FDM, SLA & SLS technologies • Step-by-step additive manufacturing process • Applications of Additive Manufacturing	• Prepare a solid modeling of a simple component and convert into STL format. • Prepare the component by Additive Manufacturing process.

6	**2**	1,2, 4	**Casting process** • Types of casting process • Pattern and Mould making: Patterns – Materials, types, Pattern allowances • Mould – Molding sand types, properties. • Core making • Defects in casting processes, • Modern Casting processes. * *This concept shall be thought by using the teaching aids such as Piston, Engine blocks, Wheels, Valve bodies, etc**	**Foundry** • Safety precautions to be followed in Foundry shop. • Prepare a pattern (carpentry or 3D printed process), check the pattern for dimensional accuracy, Inspect the pattern for defects • Prepare sand mold using pattern and core • Pour metals (Al, Cu, Tin etc) into the mold • Inspect the casting for defects.
7	3	1,2,4	**Metal Forming Processes** • General classification of metal forming processes • **Bulk deformation processes** o **Forging** – Introduction, classification, Applications o **Rolling** – Introduction, Classification, Applications. o **Extrusion –** Introduction, Classification, Applications o **Wire & Bar Drawing –** Introduction**,** Applications * *This concept shall be thought by using the teaching aids such as* ***Forging*** *– Tractor plows, combine harvesters, Crankshafts, connecting rods, turbine discs, blades, Surgical & Dentistry tools.* ***Extrusion*** *– Bars, tubes, gear blanks, aluminum cans, cylinders, frames, doors, windows, Medical tubes, bags.* ***Rolling*** *– Structural steel I-Beams, Angle stock, bar stock, rail track, sheet metal.* ***Wire and Bar drawing*** *- Electrical wires, cables, springs, paper clips, musical instrument strings**	**Forging** • Safety precautions to be followed in forging shop. • Demonstrate the Forging tools and equipments. • Convert Round rod into square rod.
8	4	1,2,4	**Development and Preparation of surfaces** • Development of Cone, Cylinder, Prism and Pyramid. • Development of Frustum of cone. • Prepare the development drawing of a cylindrical box. • Prepare the development drawing of a **Funnel**	
9	4	1,4	**Sheet metal work** • Introduction • IS Standard gages and	**Sheet Metal work**

			Specifications of sheet metal • Sheet metal operations- Shearing, Bending, Forming. • Applications of sheet metal work * *This concept shall be thought by using the teaching aids such as Automobile components, Car body building, Aircraft body building**	• Prepare the sheet metal **cylindrical box** and Join end surfaces by means of Seam Joint and soldering. • Prepare the sheet metal **Funnel** and Join end surfaces by means of Seam Joint and soldering.
10	4	1,2,4	**Press Work** ● Overview ● Types of Presses ● Press Components ● Press Operations * *This concept shall be thought by using the teaching aids such as mechanical, hydraulic, pneumatic presses and their applications such as Washers, brackets, and automotive body components, frames, brackets, and enclosures, automotive components**	**Press work** • Safety precautions to be followed in press work. • Perform the simple operation in Press tool by using punch and Die.
11	5	1,4	**Cutting tools and Abrasives:** ● **Cutting tool** – classification of Cutting tools, Characteristics and selection of tool materials. ● Nomenclature of single point cutting tools, milling tools ● Surface finishing processes – Grinding, Polishing, Coating. ● Abrasives used in grinding wheels and its designations	**Surface grinding operations** ● Safety precautions to be followed in surface grinding operation. ● Demonstration of surface grinding of machine parts. • Students shall perform surface grinding operation on the given job.
12	5	1,4	**Drilling Machine** ● Introduction to drilling Machine ● Classifications of drilling machine. ● Drilling operations - List ● Nomenclature of Twist drill.	**Drilling machine operations** ● Safety precautions to be followed in drilling machine operation ● Demonstration of drilling machine parts ● Demonstration and perform of drilling, reaming and tapping operation • Measure the diameter of drilled hole by using Go and No Go gauge
13	5	1,2,4	**Lathe and Milling machines** ● Introduction to Lathe Machine ● Classifications of Lathe machines, Lathe operations - List ● Introduction to Milling Machine ● Classifications of Milling machines, Milling operations - List	**Lathe and Milling machine operations** ● Safety precautions to be followed in machine operations ● Demonstration of Lathe parts ● Demonstration of Lathe operations ● Demonstration of milling machine parts ● Demonstration of milling machine operations

4. References:

Sl. No	Author	Title of Books	Publication/Year
1.	J. W. Martin	Materials for Engineering	Woodhead Publishing Limited, 3rd Edition, 2006
2.	William D. Callister Jr.	Material Science and Engineering	Wiley Publications, 10th Edition, 2020
3.	V K Manchanda, GBS Narang, J S Narang	Materials science and Metallurgy	Khanna Publishers, 1st Edition, 2021
4.	R.K. Rajput	Materials science and Engineering	S.K. Kataria & Sons, 5th Edition 2016, Reprint 2024
5.	V. Raghavan	Materials science and Engineering	PHI, 6th Edition, 2016
6.	Sidney H. Avner	Introduction to Physical Metallurgy	Tata McGraw-Hill Education, 2nd Edition 2017
7.	Parashivamurthy K I	Material Science and Metallurgy	Pearson Education India, 1st Edition, 2012
8.	K R Gopalakrishna	Elements of Mechanical Engineering	2019
9.	S. K. Hajra Choudhury, A. K. Hajra Choudhury, Nirijhar Roy	Elements of Workshop Technology Vol-I Manufacturing Processes	Media Promoters & Publishers Private Limited - 2008
10.	S. K. Hajra Choudhury, Nirijhar Roy	Elements of Workshop Technology Vol-II Machine Tools	Media Promoters & Publishers Private Limited - 2010
11.	R. B. Gupta	Workshop Practice	Stay Prakashan - 2024
12.	Taylon Altan Erman Tekkaya	Forming Fundamentals	Arm International - 2012
13.	Rahul Shivaji Autade	Sheet Metal Engineering	Nirali Prakashan - 2023

5. CIE Assessment Methodologies

Sl.No	CIE Assessment	Test Week	Duration (minutes)	Max Marks	
1.	CIE-1 Theory Test	4	90	50	Average of all CIE=50 Marks
2.	CIE-2 Practice Test	7	180	50	
3	CIE-3 Theory Test	10	90	50	
4.	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all practices and activities through Rubrics.	1-13		50	
Total					**50 Marks**

6. SEE - Theory Assessment Methodologies

Sl. No	SEE – Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper

Program	Mechanical Engineering		**Semester- II**	
Course Name	Concepts of Mechanical Engineering - II		**Test**	**I**
Course Code	25ME21I	**Duration-** 90 min	**Marks-50**	
Name of the Course Coordinator:				
Note: *Answer any one full question from each section. Each full question carries equal marks.*				

Q. No	Questions	CL	CO	Marks
	Section - 1			
1	a) Identify the mechanical properties found in **BCC Crystal structure**. Suggest any 2 materials which exhibit BCC Crystal structure. b) Appreciate the importance of **Atomic Packing factors (APF)** in crystal structures. Outline the APF of different crystal structures. c) Identify the mechanical properties found in **FCC Crystal structure**. Outline any 2 materials which exhibit BCC Crystal structure. d) Highlight the Characteristics of **Crystalline and Non-Crystalline** structures with examples. e) Identify the mechanical properties found in **HCP Crystal structure**. Outline any 2 materials which exhibit BCC Crystal structure.	Apply	CO1	**5X5= 25**
2	a) Suggest an appropriate heat treatment process to improve the wearand fatigue properties of **machine tool guide ways**. Describe the process indetail. b) Substantiate why normalizing is more commonly used than annealing after performing cold work on **hardenable steels.** c) Identify the appropriate surface hardening process for the **Stainless steels** used in various industrial applications d) Identify the heat treatment process suitable for a **steel shaft** used in a high – speed turbine. Highlight the properties improved after heat treatment. e) Why is annealing crucial for **copper components** used in electrical applications? Justify your answer.	Apply	CO1	**5X5 = 25**
	Section - 2			
3	a) Suggest the best coating technique for the parts used in **marine applications** to prevent corrosion and enumerate the coating process. b) Identify **any 5 metals** which corrode into its oxides/sulphides when subjected to harsh corrosive environment. c) Suggest the best surface coating technique to prevent corrosion in **AC ducts** used in multistoried buildings and enumerate the coating process. d) Identify the best coating/surface treatment technique available to arrest corrosion of **nuts and bolts**. Highlight the coating process in detail. e) Identify the Advanced coating techniques for **electronic and optical applications**. Justify your selection.	Apply	CO1	**5X5 = 25**
4	a) Suggest the advanced material used for the manufacturing of **Stents**. Highlight its properties. b) Identify the Properties required for the production of **Energy materials** such as batteries. c) Discuss how **Nano filters** can benefit water purification through filtration? d) Which material is suitable for **solar panels**? Justify your answer. e) Nano materials are used in **Face cream applications**. What are the benefits of using it over traditional materials? Suggest a suitable nano material.	Apply	CO1	**5X5 = 25**

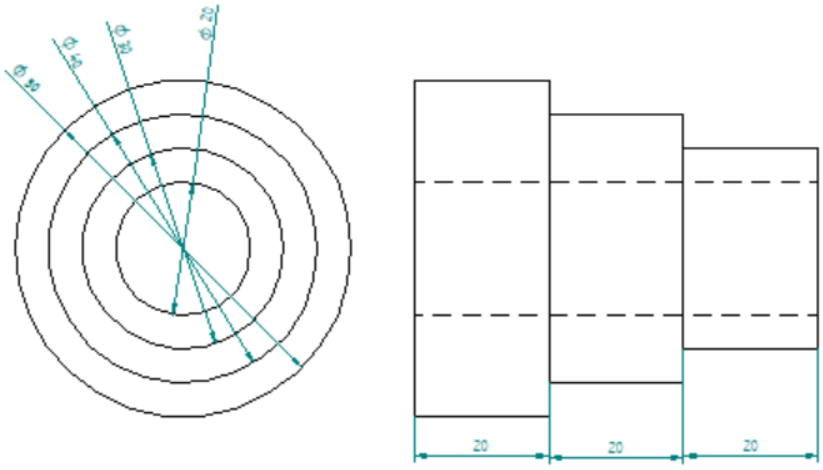
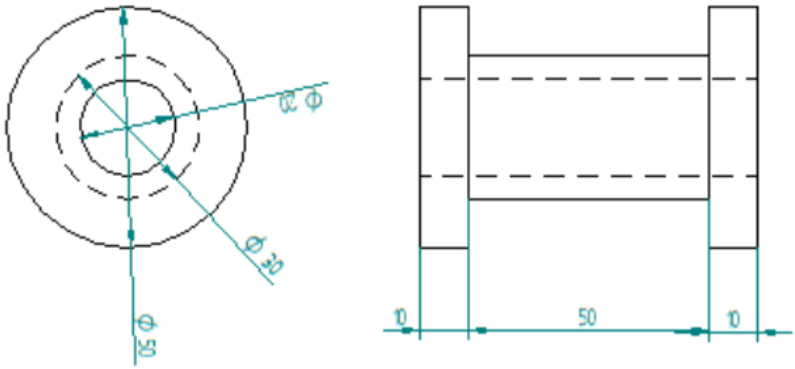
Note for the Course coordinator*: Each question may have two, three, four or five subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.*

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

8. CIE Practice Test model question paper

Program	Mechanical Engineering			**Semester**	II
Course Name	Mechanical Engineering Practices - II			**Test**	II
Course Code	25ME21I	**Duration**	180 min	**Marks**	50

Name of the Course Coordinator:
Note: Answer any one full question from the following

Questions	**CO**	**Marks**
1. a. Explain the Safety precautions used in Foundry shop. b. Prepare the mould using the pattern as per the diagram. 2. a. Outline the steps involved in Casting process b. Prepare the mould using the pattern as per the diagram.  **Q . No – 1 (b)**  **Q. No – 2 (b)**	CO2	10+15+25 = **50 Marks**

Scheme of Assessment		
Q No.1& 2		
a. Identify safety outfits, usage of appropriate safety method	10 Marks	
b. Listing of tools & operations required for performing job	10 Marks	
Preparation of Mould	15 Marks	**50 Marks**
Operation performed (Mould cavity)	10 Marks	
Finishing and Dimensional accuracy of the Mould	05 Marks	
	Total	**50 Marks**

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

9. Suggestive Activities for Tutorials:

- The students shall do minimum of one suggested activities
- List is an Example and not inclusive of all possible activities of the course.
- Student and Faculty are encouraged to choose activities that are relevant to the topic.

Sl.No.	Suggestive Activities for Tutorials
01	Prepare simple aluminum castings such as **washers, Nuts and bolts** used in automobiles
02	Prepare a **bracket** by using sheet metal operations.
03	Coat Zinc into **Mild steel** surface by using surface treatment technique.

10. Rubrics for Assessment of Graded Exercise (Qualitative Assessment)

Sl. No.	Dimension	Unsatisfactory	Need Improvement	Satisfactory	Good	Excellent	Student Score
		(0-10)	(11-20)	(21-30)	(31-40)	(41-50)	
1	Preparation	Not prepared at all	Lacks several important materials or tools	Adequately prepared but missing key items	Mostly prepared with minor omissions	Fully prepared with all necessary materials and tools	40
2	Execution/Implementation	Task not executed	Major errors affecting results or functionality	Some inconsistencies or inaccuracies present	Minor errors in execution, but overall effective	Test or task performed flawlessly with precision and accuracy	40
3	Quality of Work	No quality demonstrated	Poor quality, major flaws impacting functionality	Acceptable quality with noticeable defects	Good quality with minor flaws	High-quality output, meets or exceeds standards	30
4	Use of Tools/ Techniques	No proper tool use demonstrated	Weak use of tools, significant risks noted	Basic use of tools, some inefficiencies	Good use of tools, minor issues with technique	Mastery of tools and techniques demonstrated safely and effectively	40
5	Practical Record	Major sections are not addressed.	Major sections are missing or poorly addressed.	Some sections are included, but lack detail.	Most sections are complete with minor omissions.	All required sections are included and thoroughly detailed.	50
	Average Marks=(40+40+30+40+50)/5=40						**40**

Note: *Dimension and Descriptor shall be defined by the respective course coordinator as per the activities*

11. Equipment/software list with Specification for a batch of 30 students

Sl. No.	Particulars	Specification	Qty
01	Standard specimens	Hardness testing specimens (ASTM E18 for Rockwell)	05
02	Hardness Tester	Rockwell hardness-scales A,B and C.	01
03	Hardness Tester	Brinnel Hardness tester	01

04	Desktop Computers	Latest Configurations	20
05	CAD Software	Any latest Authorized Computer Aided Drafting Software	20
06	FDM 3D Printer	Any PLA/ABS 3D printers	02
Foundry Shop			
01	Moulding Box	300*300*100mm	20
02	Moulding Rammer	Standard Size	20
03	Moulding Tool kit	Standard Size	20
04	Electric furnace for melting (Wax/Low melting point metal with crucible and ladder for pouring)	Standard Size	04
05	Portable grinder for cleaning of casting	Standard Size	02
06	Sand Blaster	Standard Size	04
07	Ball peen Hammer	½ lb	05
08	Pattern Making Tool kit	Standard size	10
09	Furnace	Furnace	01
Sheet Metal Shop			
01	Sheet shearing Machine(Manual or M/c type)	Standard size	04
02	Sniper for cutting sheet	Standard size	20
03	Metal stake	Standard size	10
04	Wooden mallet	Standard size	20
05	Plastic Hammer	Standard size	20
06	Bench vice for Bending of sheet	Standard size	05
07	Brazing Gun	Standard size	10
Press Work			
01	Power press	Power house 10 ton	01
02	Hand power press	Hydraulic shop press with gauge	04
03	Progressive die	Standard size	04
04	Bending die	Standard size	04
05	Combination die	Standard size	01 Set
Machine Shop			
01	Drilling Machine	Radial Drilling Machine	01
02	Surface Grinding Machine	Surface Grinding Machine	01

03	Tool grinding machine	Tool grinding machine	01
04	lathe	Centre lathe	15
05	Milling Machine	Milling Machine	01