

**C21\_ Curriculum**

**DIPLOMA IN AUTOMOBILE ENGINEERING**



**OFFERED BY**

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING,**

**TELANGANA: HYDERABAD**

### III Semester

Sl No	Course Code	Course Name	Teaching Scheme				Cred its	Examination Scheme						
			Instruction periods per week			Total Periods per semest er		Continuous internal evaluation			Semester end examination			
			L	T	P			Mid Sem1	Mid Sem2	Internal evaluati on	Max Mark s	Min Mark s	Total Mark s	Min marks for Passing including internal
1	SC-301	Applied Engineering Mathematics	4	1	0	75	3	20	20	20	40	14	100	35
2	AU-302	Engineering Materials and Manufacturing Processes	4	1	0	75	3	20	20	20	40	14	100	35
3	AU-303	Applied Mechanics	4	1	0	75	3	20	20	20	40	14	100	35
4	AU-304	Basic Automobile Engineering	4	1	0	75	3	20	20	20	40	14	100	35
5	AU-305	Basics of Heat Transfer and Thermodynamics	4	1	0	75	3	20	20	20	40	14	100	35
6	ME-306	Machine Drawing	1	0	2	45	1.5	20	20	20	40	20	100	50
7	ME-307	Basic Manufacturing & Fabrication Engineering Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
8	AU-308	Solid Modeling Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
9	AU-309	Basic Automobile Engineering Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
10	HU-310	Communication and Life Skills lab	1	0	2	45	1.5	20	20	20	40	20	100	50
11	AU-311	Skill Upgradation	0	0	8	120	2.5	0	0	Rubrics			--	-
Activities: student performance is to be assessed through Rubrics														

## SC-301 - APPLIED ENGINEERING MATHEMATICS

Course Title	Applied Engineering Mathematics	Course Code	SC-301
SEMESTER	III	Course Group	Foundation
Teaching Scheme in periods ( L : T : P )	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

### Pre requisites

This course requires the knowledge of Basic Engineering Mathematics and Engineering Mathematics at Diploma 1<sup>st</sup> and 2<sup>nd</sup> Semester level.

### Course Outcomes: COs

At the end of the course, the student will have the ability to:

CO 1	Integrate different kinds of continuous functions
CO 2	Integrate various continuous functions using different methods of integration
CO 3	Find the values of definite integrals using fundamental theorem of integral calculus.
CO 4	Apply definite integrals to determine Areas, Volumes of irregular shapes.
CO 5	Find the Mean and RMS values of various functions and Approximate values of Definite integrals using Trapezoidal and Simpson's 1/3 <sup>rd</sup> rule
CO 6	Find order and degree of a Differential equation, form the Differential Equation from given primitive by eliminating the arbitrary constants and Solve Simple DEs of 1 <sup>st</sup> order and 1 <sup>st</sup> degree.

### Course Content:

#### Unit-I

**Duration: 14 Periods ( L: 11 – T:3 )**

#### Indefinite Integration-I

Integration regarded as anti-derivative – Indefinite integral of standard functions. Properties of indefinite integral. Integration by substitution or change of variable. Integrals of the form  $\sin^m \theta \cdot \cos^n \theta$ . Where m and n are positive integers. Integrals of  $\tan x$ ,  $\cot x$ ,  $\sec x$ ,  $\operatorname{cosec} x$  and powers of  $\tan x$ ,  $\sec x$  by substitution. Evaluation of integrals which are reducible to the following forms: (Nine standard integrals)

$$\begin{aligned}
 &i) \frac{1}{a^2 + x^2}, \frac{1}{a^2 - x^2}, \frac{1}{x^2 - a^2} \\
 &ii) \frac{1}{\sqrt{a^2 + x^2}}, \frac{1}{\sqrt{a^2 - x^2}}, \frac{1}{\sqrt{x^2 - a^2}} \\
 &iii) \sqrt{x^2 + a^2}, \sqrt{a^2 - x^2}, \sqrt{x^2 - a^2}
 \end{aligned}$$

## Unit – II

**Duration: 10 Periods ( L: 8 – T:2 )**

### Indefinite Integration-II

Integration by decomposition of the integrand into simple rational algebraic functions.  
Integration by parts - Bernoulli's rule.

## Unit-III

**Duration: 10 Periods (L: 8 – T: 2)**

### Definite Integral and its Properties:

Definite integral fundamental theorem of integral calculus properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum.

## Unit – IV

**Duration: 12 Periods (L: 10 – T: 2)**

### Applications of Definite Integrals:

Areas under plane curves – Sign of the Area – Area enclosed between two curves. Solid of revolution – Volumes of solids of revolution.

## Unit – V

**Duration: 10 Periods (L: 8 – T: 2)**

### Mean , RMS values and Numerical Integration:

Mean values and Root Mean Square values of a function on a given interval. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a definite integral.

## Unit – VI

**Duration: 19 Periods (L: 15 – T: 4)**

### Differential Equations of First Order:

Definition of a differential equation – order and degree of a differential equation – formation of differential equations – solution of differential equation of first order, first degree : Variables - separable, Homogeneous, Exact, Linear differential equation, Bernoulli's equation.

## Reference Books:

1. Integral Calculus Vol. I, by M. Pillai and Shanti Narayan
2. Thomas' Calculus, Pearson Addison –Wesley Publishers
3. Higher Engineering. Mathematics, by B.S. Grewal— Khanna publishers—New Delhi

## Suggested E-Learning references

1. [www.freebookcentre.net/mathematics/introductory-mathematics-books.html](http://www.freebookcentre.net/mathematics/introductory-mathematics-books.html)
2. E-books: [www.mathebook.net](http://www.mathebook.net)

## Suggested Learning Outcomes

At the end of the course, the student will have the ability to:

### Unit-I

#### 1.0 Use Indefinite Integration to solve engineering problems

- 1.1 Use the concept of Indefinite integral as an anti-derivative.
- 1.2 Use the indefinite integrals of standard functions and properties of Integrals  $\int (u + v) dx$  And  $\int k u dx$  where  $k$  is constant and  $u, v$  are functions of  $x$  in solving simple problems.
- 1.3 Solve integration problems involving standard functions using the above rules.
- 1.4 Evaluate integrals involving simple functions of the following type by the method of Substitution.
  - (i)  $\int f(ax + b) dx$  where  $f(x) dx$  is in standard form.
  - (ii)  $\int [f(x)]^n f'(x) dx$
  - (iii)  $\int f(x)/[f(x)] dx$
  - (iv)  $\int f\{g(x)\} g'(x) dx$
- 1.5 Find the Integrals of  $\tan x$ ,  $\cot x$ ,  $\sec x$  and  $\operatorname{cosec} x$  using the above.
- 1.6 Evaluate the integrals of the form  $\int \sin^m \theta \cos^n \theta. d\theta$  where  $m$  and  $n$  are positive integers.
- 1.7 Evaluate integrals of powers of  $\tan x$  and  $\sec x$ .
- 1.8 Evaluate the Standard Integrals of the functions of the type : (Nine standard integrals)

$$\begin{aligned} \text{i)} & \frac{1}{a^2 + x^2}, \frac{1}{a^2 - x^2}, \frac{1}{x^2 - a^2} \\ \text{ii)} & \frac{1}{\sqrt{a^2 + x^2}}, \frac{1}{\sqrt{a^2 - x^2}}, \frac{1}{\sqrt{x^2 - a^2}} \\ \text{iii)} & \sqrt{x^2 + a^2}, \sqrt{a^2 - x^2}, \sqrt{x^2 - a^2} \end{aligned}$$

- 1.9 Evaluate the integrals of the type :

$$\int \frac{1}{a \pm b \sin \theta} d\theta, \int \frac{1}{a \pm b \cos \theta} d\theta \text{ and } \int \frac{1}{a \cos \theta \pm b \sin \theta \pm c} d\theta.$$

## Unit-II

### 2.0 Use Indefinite Integration to solve engineering problems

- 2.1 Evaluate integrals using decomposition method.
- 2.2 Evaluate integrals using integration by parts with examples.
- 2.3 Apply the Bernoulli's rule for evaluating the integrals of the form  $\int u.v dx$ .
- 2.4 Evaluate the integrals of the form  $\int e^x [f(x) + f'(x)] dx$ .

## Unit-III

### 3.0 Understand definite integral and use it in engineering applications

- 3.1 Use the fundamental theorem of integral calculus in solving problems
- 3.2 Calculate the definite integral over an interval.
- 3.3 Apply various properties of definite integrals in engineering problems.
- 3.4 Evaluate simple problems on definite integrals using the above properties.
- 3.5 Find definite integral as a limit of sum by considering an area.

## Unit –IV

### 4.0 Understand definite integral and use it in Engineering applications

- 4.1 Find the Areas under plane curves and area enclosed between two curves using Integration.
- 4.2 Obtain the Volumes of solids of revolution and solve problems.

## Unit –V

### 5.0 Understand Mean, RMS values and Numerical Methods

- 5.1 Obtain the Mean value and Root Mean Square (RMS) value of the functions in any given Interval.
- 5.2 Apply the Trapezoidal rule, Simpson's 1/3 rules for approximation of definite integrals and solve some problems.

## Unit –VI

### 6.0 Solve Differential Equations in engineering problems.

- 6.1 Identify a Differential equation and find its order and degree
- 6.2 Form a differential equation by eliminating arbitrary constants.
- 6.3 Solve the first order first degree differential equations by the following methods:
  - (i) Variables Separable.
  - (ii) Homogeneous Equations.
  - (iii) Exact Differential Equations
  - (iv) Linear Differential equation of the form  $\frac{dy}{dx} + Py = Q$ ,  
Where P and Q are functions of x or constants.
  - (v) Bernoulli's Equation (Reducible to linear form.)
- 6.4 Solve simple problems leading to engineering applications by using above methods.

**Suggested Student Activities**

1. Student visits Library to refer Standard Books on Mathematics and collect related material
2. Quiz
3. Group discussion
4. Surprise tests
5. Seminars
6. Home Assignments
7. Mathematics for preparing competitive exams and solving old question papers on arithmetical ability.

**CO / PO - MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapped POs
CO1	3	2					3	1, 2 ,7
CO2	3	2					3	1, 2 ,7
CO3	3	2					3	1, 2 ,7
CO4	3	2					3	1, 2 ,7
CO5	3	2					3	1, 2 ,7
CO6	3	2					3	1, 2 ,7



	MID SEM-I EXAM								
S.No	Unit Name	R	U	A	Remarks				
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)					
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)					
Total Questions		4	4	4					
MID SEM –II EXAM									
S.No	Unit Name	R	U	A	Remarks				
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)					
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)					
Total Questions		4	4	4					
	Semester End Examination								
Sl No	Unit No.	Questions to be set for SEE				Remarks			
		R		U	A				
1	I	4	1	9(a)		13(a)			
2	II								
3	III		2	10(a)		14(a)			
4	IV								
5	V		3	5, 6	9(b)		13(b)		
					11(a)		15(a)		
					11(b)		15(b)		
6	VI			7,8	10(b)		14(b)		
					12(a)		16(a)		
					12(b)		16(b)		
Total Questions		8		8		8			
Legend:		Remembering (R)	1 Mark						
		Understanding (U)	3 Marks						
		Application (A)	5 Marks						

**BOARD DIPLOMA EXAMINATIONS (C21)**  
**MID SEM –I, III SEMESTER**  
**SC-301- APPLIED ENGINEERING MATHEMATICS**

**TIME: 1: 00 Hour**

**Max. Marks: 20**

**PART-A**

Instructions:                      1. Answer **ALL** questions                                      04 X 01 = 04  
   2 Each question carries **ONE** mark

1. Integrate (  $e^x - \sin x + x^4$  ) with respect to x
2. Find  $\int \frac{dx}{5x+7}$  dx
3. Write Bernoulli's rule of integration
4. Find  $\int x \log x$  dx

**PART-B**

Instructions:                      1. Answer **ALL** questions                                      02 X 03 = 06  
   2. Each question carries **THREE** marks

5 a) Evaluate  $\int \frac{x^5}{1+x^{12}} dx$  .

OR

5 b) Evaluate  $\int \frac{dx}{(x^2+16)}$

6 a) Evaluate  $\int x \sin x dx$

OR

6 b) Evaluate  $\int \frac{3x+2}{(x-1)(2x+3)} dx$ .

**PART- C**

Instructions:                      1. Answer **ALL** questions                                      02 X 05 = 10  
   2. Each question carries **FIVE** marks

7 a) Evaluate  $\int \sqrt{x^2 + 2x + 5} dx$

OR

7 b) Evaluate:  $\int \cos x \cos 2x dx$  .

8 a) Find  $\int x \tan^{-1} x dx$ .

OR

8 b) Find  $\int x^4 \cos 2x dx$ .

**BOARD DIPLOMA EXAMINATIONS (C21)**  
**MID SEM –II, III SEMESTER**  
**SC-301-APPLIED ENGINEERING MATHEMATICS**

**TIME: 1: 00 Hour**

**Max. Marks: 20**

**PART-A**

Instructions:

1. Answer **ALL** questions
- 2 Each question carries **ONE** mark

04 X 01 = 04

1. Find  $\int_0^1 (x^4 + 1) dx$
2. Evaluate :  $\int_0^\pi \sin 3x dx$
3. Evaluate :  $\int_0^1 \frac{1}{1+x^2} dx$
4. Write the formula to find area bounded by the curve  $y=f(x)$  , x-axis, between the limits  $x=a$  and  $x=b$

**PART-B**

Instructions:

1. Answer **ALL** questions
2. Each question carries **THREE** marks

02 X 03 = 06

5 a) Evaluate:  $\int_0^{\frac{\pi}{2}} \sqrt{1 - \sin 2x} dx$

OR

5 b) Evaluate:  $\int_0^{\frac{\pi}{2}} \sin^2 x dx$

6 a) Find the area bounded by the line  $2x + y = 8$ , x-axis and the lines  $x = 2$  and  $x = 4$ .

OR

6 b) Find the Volume of the Solid generated by revolving the part of the Circle

$x^2 + y^2 = 36$  From  $x = 0$  to  $x = 4$  about x – axis.

**PART C**

Instructions:

1. Answer **ALL** questions
2. Each question carries **FIVE** marks

02 X 05 = 10

7 a) Evaluate:  $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

Or

7 b) Evaluate:  $\int_0^{\frac{\pi}{2}} \log \cos x dx$

8 a) Find the area enclosed between the Parabolas  $y = 3x - x^2$  and  $y = x^2 - x$ .

Or

8 b) Find the Volume of the Solid generated by the revolution of the area bounded by the

Ellipse  $\frac{x^2}{25} + \frac{y^2}{16} = 1$ , about x- axis.

**BOARD DIPLOMA EXAMINATION (C-21)**  
**III SEMESTER END EXAMINATION**  
**SC-301-APPLIED ENGINEERING MATHEMATICS**

**Time: 2 hours**

**[Total Marks: 40]**

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**PART-A**

Instructions:

1. Answer **ALL** questions

08 X 01 = 08

2 Each question carries **ONE** mark

1. Find  $\int (x^8 - \frac{5}{x}) dx$
2. Evaluate  $\int_0^1 (x^2 + 1) dx$
3. Write the formula to find mean value of  $y = f(x)$ , in the interval (a, b)
4. Find the Order and Degree of the Differential Equation  $x \frac{dy}{dx} = \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$ .
5. Write Trapezoidal Rule to find the approximate value of  $\int_a^b f(x) dx$ .
6. Write the formula to find RMS value of  $y = f(x)$  over the range  $x=a$  and  $x=b$ .
7. Solve  $\frac{dy}{dx} = e^{4x+y}$
8. Write the condition for exactness of the differential equation  $M(x, y)dx + N(x, y)dy = 0$

**PART-B**

Instructions:

1. Answer **ALL** questions

04 X 03 = 12

2. Each question carries **THREE** marks

9.

a) Evaluate:  $\int_0^{\frac{\pi}{2}} \sqrt{1 - \sin 2x} dx$

**OR**

b) Find the approximate value of  $\int_0^6 \frac{dx}{1+x}$  by taking  $n = 6$  using Trapezoidal rule.

10.

a) Find the area bounded by the Parabola  $y = x^2 - 2x + 1$  and x-axis.

**OR**

b) Form the Differential Equation from  $y = Ae^x + Be^{3x}$  where A, B are arbitrary constants

11.

- a) Find the RMS value of  $\sqrt{\log x}$  over the range  $x = 1$  and  $x = e$

**OR**

- b) Calculate approximate value of  $\int_0^4 \frac{dx}{1+x}$  by taking  $n = 4$  using Simpson's 1/3 rule

12.

- a) Solve:  $x \frac{dy}{dx} + 2y = \log x$ .

**OR**

- b) Solve:  $x(1 - y^2)dx + y(1 - x^2)dy = 0$

### PART C

Instructions:

1. Answer **ALL** questions

04 X 05 = 20

2. Each question carries **FIVE** marks

13.

- a) Evaluate:  $\int \frac{1}{x^2 + 8x + 25} dx$

**OR**

- b) Find the RMS value of  $y = \sqrt{8 - 4x^2}$  between  $x = 0$  and  $x = 2$

14.

- a) Find the volume of solid generated by revolving the Ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  about Major axis

**OR**

- b) Solve:  $\frac{dy}{dx} = \sin(x + y)$

15.

- a) A curve is drawn to passing through the points given by the following table:

x	1	1.5	2	2.5	3	3.5	4
y	3	3.4	3.7	3.8	2.7	2.6	2.1

Calculate the approximate area bounded by the curve, x-axis and the lines  $x = 1$  and  $x = 4$  using Simpson's 1/3 rule

**OR**

- b) Evaluate:  $\int_0^1 \sqrt{(1 - x^2)} dx$  approximately by taking  $n = 4$  using Simpson's 1/3 rd Rule.

16.

- a) Solve:  $(y^2 - xy)dx = x^2 dy$ .

**OR**

- b) Solve:  $\frac{dy}{dx} + y \cos x = y^3 \sin 2x$ .



### AU-302-Engineering Materials and Manufacturing Processes

Course Title	Engineering Materials and Manufacturing Processes	Course Code	AU-302
SEMESTER	III	Course Group	Foundation
Teaching Scheme in periods ( L : T : P )	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

#### Pre requisites

This course requires the basic knowledge of Engineering Physics, Engineering Mechanics, Strength of Materials, Machine drawing and Workshop Technology.

SL No	Unit No	Questions to be set for SEE				Periods	
		R		U	A		
1	Engineering Materials & Iron– Carbon System	4	1		9(a)	13(a)	12
2	Manufacture of steel &Heat Treatment						13
3	Ferrous &Non-Ferrous Metals and alloys		2		10(a)	14(a)	10
4	Lathe and Lathe Work						10
5	Welding		3	5,6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	15
6	Drilling, Shaping, Slotting & Planing Machines			7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)	15
Total Questions		8		8	8	75	
Legend		Remembering(R)			1 Marks		
		Understanding (U)			3 Marks		
		Application (A)			5 Marks		

### Course Outcomes:

On successful completion of the course student should be able to:

CO1	Explain the properties, importance of engineering materials and their engineering applications.
CO2	Demonstrate the various methods of manufacturing of Iron, Steel and their alloys and modify the properties of steel by appropriate heat treatment methods for a given engineering application
CO3	Select a suitable ferrous and non-ferrous materials based on composition and properties for industrial applications.
CO4	Demonstrate the various types of Lathes, working principles and various operations on Lathes
CO5	Demonstrate the various types of welding processes and recent developments in welding techniques for industrial applications.
CO6	Perform various machining operations using different machine tools as per industrial requirements.

### Course Content:

#### UNIT- 1: Engineering Materials & Iron– Carbon System

**Duration: 13 periods (L: 10 – T: 03)**

Introduction– Classification of engineering materials-Importance of materials in modern Technology-Mechanical properties – Tensile strength, Compressive strength, Stiffness, Elasticity, Brittleness,Ductility,Malleability,Hardness,Toughness,Fatigueresistance, Creep, Impact strength – brief explanation of the above terms with examples.

Types of testing – Destructive and non-destructive-Testing methods to determine tensile strength, Compressive strength: By using UTM - Impact strength: Charpy and Izod tests – Hardness test: Brinell, Rockwell and Vicker’s hardness tests - Fatigue strength – Equipment and procedure for testing-Formulae – Calculations –Importance of non–destructive tests –Visual inspection - Penetrate test - Magnetic particles test – Radiography Test: X-ray and Gamma ray test – Ultrasonic test – Spark stream test - Identification of metals - Use of these tests in industry.

Space lattice-Unit cell-three main types of metallic space lattices like BCC, FCC and HCP– Cooling curve for pure Iron–Allotropic forms of pure iron – Iron–Carbon equilibrium diagram.

#### UNIT-2: Manufacture of Steel &Heat Treatment

**Duration: 12 periods (L: 10 – T: 02)**

Introduction - Manufacture of Cast iron – Cupola Furnace -manufacture of steel – Open hearth furnace – Bessemer converter – L.D. process –Electric arc furnace and Electric Induction furnace.

Need of Heat Treatment–stages of heat treatment-purpose of Heat Treatment –Description of different heat Treatment processes–Annealing, types –Normalizing–Hardening, types-



Tempering, types –Case Hardening and Nitriding - Carburizing–Application of these heat treatment processes.

### **UNIT-3: Ferrous &Non- Ferrous Metals and alloys**

**Duration: 10 periods (L: 08 – T: 02)**

Classification of Ferrous metals–types of Cast Iron-White, Grey, Modular, Malleable and alloy Cast Iron- Types of plain Carbon steels– Low, Medium, High carbon steels and their alloys– Special alloy Steels such as Stainless Steel and High speed steel, their composition, properties and uses.

Need for the use of Non – Ferrous metals and their alloys in engineering applications – composition- properties and uses of Copper, Aluminum- Tin- Zinc - Lead - Nickel- Magnesium and their alloys–their Industrial applications.

### **UNIT-4: Lathe and Lathe Work**

**Duration: 10 periods (L: 08 – T: 02)**

Functions –Types of Lathes – Engine Lathe -Lathe construction – Functions of each part – Lathe specifications – Work holding Devices – Tool holding Devices- Lathe operations: Cylindrical Turning – Taper turning –Methods of Taper turning- Taper turning by Tailstock set over Method- Thread cutting – Knurling – Facing – Parting off – Drilling- Boring- Reaming on Lathe.

Capstan and Turret lathe -Constructional details and working principles - comparison between Capstan and Turret lathe -Turret mechanism - Work and Tool holding devices.

### **UNIT-5: Welding**

**Duration: 15 periods (L: 12 – T: 03)**

Introduction – Types of welding – Pressure welding and Non-pressure welding- Principle of Electric Arc welding – Metal Arc- Atomic Hydrogen welding – TIG and MIG welding – Submerged Arc welding-Welding rods-types-specifications- principle of Resistance welding – Spot, Seam and Butt welding.

Oxy-acetylene gas welding –Gas welding Equipment-Types of Oxy-acetylene gas flames and their uses – Techniques of gas welding - Gas cutting (oxygen and oxygen Lance cutting) – Termite welding-Robotic welding-recent developments in welding techniques.

### **UNIT-6: Drilling, Shaping, Slotting &Planing Machines :**

**Duration: 15 periods (L: 12 – T: 03)**

Function-Types of Drilling machines- Sensitive drilling machine- Radial drilling machine- Description of these machines parts and their functions- specifications - Tool holding devices and Work holding devices-Machining operations: Reaming-Boring-Counter boring- Counter sinking-Tapping-Spot facing.

Shaper: Work holding Devices – Quick return motion arrangement– Crank and slotted lever method- Whit worth method– Automatic feed mechanism-Shaper specifications.

Slotting machine: General use of a Slotter – Slotter parts and their functions –Tool and Work holding devices – Quick return motion arrangement – Slotter specifications.

Planing machine: General use of Planer – Planer parts and their functions – Tool and working holding devices – table drive and feeds – Planer specifications - comparison of Shaper, Planer and Slotter.

Recommended Books :

- |   |                   |
|---|-------------------|
| 1. Material science                                 | by HazraChowdhary |
| 2. A course in workshop Technology vol.I & II       | by Raghuvamsi     |
| 3. Engineering Materials                            | by R.S. Deshpande |
| 4. Production Technology                            | by R.B. Gupta     |
| 5. Engineering Material and Manufacturing Processes | by V.N. Kumar     |
| 6. Engineering Materials                            | By Ray&Chowdhary  |
| 7. Elements of Workshop Technology Volume I& II     | by HazraChowdhary |

### **Suggested Learning Outcomes:**

#### **1.0 Engineering Materials & Iron– Carbon System**

- 1.1 Explain the importance of Engineering materials and their applications.
- 1.2 List the various properties of engineering materials.
- 1.3 Define the terms Ductility, Malleability, Hardness, Brittleness, Toughness, Impact strength, Tensile strength, Compressive strength, Stiffness, Elasticity, Plasticity, Fatigue resistance and Creep.
- 1.4 Identify the tests to measure impact strength, Hardness, Fatigue and creep resistance.
- 1.5 Classify the different Destructive and Non-destructive tests.
- 1.6 Compare the difference between Destructive and Non-destructive tests.
- 1.7 Demonstrate the different destructive tests like Tensile test and Compression tests by using Universal Testing Machine (UTM).
- 1.8 Demonstrate the impact strength of a given specimen by using Charpy and Izod testing apparatus.
- 1.9 Demonstrate and calculate the Hardness number of a given specimen by using Brinell, Rockwell and Vickers hardness testing apparatus.
- 1.10 Explain the different non-destructive tests like Visual inspection, Penetrate test, Magnetic particles test, Radiography (X-ray and Gamma ray) test, Ultrasonic test and Spark stream test.
- 1.11 Illustrate the Space lattice and Unit cell.

- 1.12 Explain the Cooling curves of pure Iron.
- 1.13 Explain the Allotropic forms of pure iron with temperature and their Crystal Structures.
- 1.14 Demonstrate and draw Iron–Carbon equilibrium diagram.

## **2.0 Manufacture of steel & Heat Treatment**

- 2.1 Identify the Iron ore materials.
- 2.2 List the various manufacturing methods of Iron and steel.
- 2.3 Explain the sequence of operations involved in the manufacturing cast iron in cupola furnace.
- 2.4 Identify the sequence of steps to be followed in the manufacture of steel by Bessemer converter, Open-hearth process, L.D. process, Electric arc furnace and Electric induction furnace.
- 2.5 Identify the sequence of operations involved in Heat Treatment process.
- 2.6 Explain various heat treatment methods such as Annealing, Normalizing, Hardening, Tempering, Casehardening, Nitriding and Carburizing.
- 2.7 Identify the changes in Mechanical properties of materials by using heat treatment
- 2.8 Identify the appropriate heat treatment methods for a given application.

## **3.0 Ferrous & Non- Ferrous Metals and alloys**

- 3.1 Identify the properties of ferrous metals and their alloys.
- 3.2 Explain the importance of alloying steels with other elements.
- 3.3 Identify the composition, properties and Industrial applications of alloy steels.
- 3.4 Choose the proper alloy steel for a particular engineering application.
- 3.5 List the advantages and disadvantages of Ferrous metals and their alloys.
- 3.6 Identify the composition, properties and industrial applications of non-ferrous metals.
- 3.7 Identify the proper non-ferrous alloys for given engineering applications.
- 3.8 List the advantages and disadvantages of Non-ferrous metals and their alloys.

## **4.0 Lathe and Lathe Work**

- 4.1 Explain the constructional details and working principle of Lathe.
- 4.2 Demonstrate the classification of lathe, different parts of lathe and their functions.
- 4.3 Explain the steps to be followed for various Lathe operations.
- 4.4 Identify the various methods of Taper turning.
- 4.5 Explain the working principle of Turret and Capstan lathes.
- 4.6 List the specifications of Turret and Capstan lathes.
- 4.7 Compare the Turret and Capstan lathes.
- 4.8 Identify the Tool holding and Work holding devices of Lathe machine.

## **5.0 Welding**

- 5.1 Demonstrate the principle of joining metals by Fusion welding.
- 5.2 Explain the working principle of Arc welding process.
- 5.3 Identify the equipment used in Arc welding and their functions.
- 5.4 Explain the principle of Gas welding and know the procedure of gas welding.
- 5.5 Identify the equipment used in Gas welding and their functions.
- 5.6 List the types of flames used in Gas welding and their applications.
- 5.7 Compare the limitations of Gas and Arc welding processes.
- 5.8 Identify the Oxy-acetylene cutting equipment and selecting the type of nozzle for gas cutting.
- 5.9 Explain Shielded arc welding, Inert gas welding-TIG welding, MIG welding and Atomic Hydrogen welding processes.
- 5.10 Explain the principle of Electric resistance welding and its types, Spot welding, Seam welding, Butt welding.
- 5.11 Identify the Robotic welding and recent developments in welding techniques.

## **6.0 Drilling, Shaping, Slotting & Planning Machines**

- 6.1 Explain the working principle of a Drilling machine
- 6.2 Identify the parts and their functions of Sensitive drilling machine and Radial drilling machines.
- 6.3 Demonstrate the different operations such as Drilling, Reaming, Boring that can be done on a drilling machine.
- 6.4 List the specifications of Drilling machine.
- 6.5 Identify the various Tool holding and Work holding tools of Drilling machine.
- 6.6 Compare the Drilling, Reaming and Boring.
- 6.7 Explain the working principle of Shaping, Slotting and Planning machine.
- 6.8 Identify the parts of Shaping, Slotting and Planning machines and their functions.
- 6.9 List the sequence of operations involved for machining a given job on Shaping, Slotting and Planning machines.
- 6.10 Identify the various Tool holding and Work holding tools Shaping, Slotting and Planning machines.
- 6.11 List the specifications of Shaping, Slotting and Planning machines for procurement..
- 6.12 Compare the Crank and slotted lever and Whit worth quick return mechanisms of Shaper.
- 6.13 Demonstrate the Quick return motion arrangement of Slotter.

6.14 Compare the Shaping, Slotting and Planning machines.

**Suggested Student Activities:**

1. Student visits Library to refer to manual of Engineering Materials to find their properties.
2. Student inspects the available equipment in the Laboratory to identify the components.
3. The students can visit nearby workshops/Industries and collect information like which type of materials are used for particular purpose and their mechanical properties, design features of various machine components.
4. The students can visit nearby workshops/Industries and collect information about different
5. Types of welding processes and welding techniques used for different materials according to their properties and observe the recent developments.
6. The students can visit nearby workshops/Industries and collect information about various manufacturing processes by using different machine tools and observe their specifications.
7. The student should Download and present various presentations related to design of Machine elements.
8. The student should prepare the different products as mini-project.

**Suggested E-Learning Activities:**

[www.sae.org](http://www.sae.org)

[www.learnengineering.org](http://www.learnengineering.org)

[www.nptl.ac.in](http://www.nptl.ac.in)

### Mid Semester Examination Blueprint of Questions and Marks:

MID SEM –I EXAM					
S.No	Unit Name	R	U	A	Marks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	10
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	10
Total Questions		4	4	4	20
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Marks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	10
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	10
Total Questions		4	4	4	20

### CO-PO Mapping Matrix:

Course Outcome		CL	Linked POs	Periods
C01	Explain the properties, importance of engineering materials and their engineering applications.	R/U/A	2,5	12
C02	Demonstrate the various methods of manufacturing of Iron, Steel and their alloys and modify the properties of steel by appropriate heat treatment methods for a given engineering application	R/U/A	2,3,4,5,7	13
C03	Select a suitable ferrous and non-ferrous materials based on composition and properties for industrial applications.	R/U/A	2,3,5	10
C04	Demonstrate the various types of Lathes, working principles and various operations on Lathes	R/U/A	2,3,5,6	10
C05	Demonstrate the various types of welding processes and recent developments in welding techniques for industrial applications.	R/U/A	2,3,4,6,7	15
C06	Perform various machining operations using different machine tools as per industrial requirements.	R/U/A	2,3,4,6,7	15

**(Model Question Paper)**

**Mid Sem -I**

Subject Name: **Engineering Materials and Manufacturing Processes**

Subject Code: **AU-302**

**Time : 1:00 hour**

**Max Marks :20**

**PART – A**

**Remembering type questions**

**Answer all Questions. Each question carries 1marks**

**4 X 1M = 04 marks**

- 1) Define the term 'Elasticity'.
- 2) Draw a neat sketch of 'Unit cell'.
- 3) List any four Iron ore materials.
- 4) Write any four uses of heat treatment processes.

**PART – B**

**Understanding type questions**

**Answer any two Questions. Each question carries 3marks**

**2 X 3M = 06 Marks**

5. a) Interpret the difference between Tensile strength and Compressive strength. (OR)  
b) Illustratethe Allotropic forms of pure iron with diagram.
6. a) Write the difference between Cast iron and Steel?  
(OR)  
b) State the significance of Case hardening in engineering practice.

**PART – C**

**Application type questions**

**Answer any two Questions. Each question carries 5marks**

**5 X 2M = 10 Marks**

7. a) Write the procedure of tensile test by using Universal Testing Machine (UTM) for a given Mild Steel specimen.  
(OR)  
b) Illustrate the Iron-Carbon equilibrium diagram with neat sketch and mark the salient points.
8. a) Explainthe manufacturing procedure of Cast Iron in Cupola furnace with neat sketch. (OR)  
b) What is Annealing Process? Write any four advantages of Annealing Process.

**(Model Question Paper)**

**Mid Sem-II**

Subject Name: **Engineering Materials and Manufacturing Processes**

Subject Code: **AU-302**

**Time : 1:00 hour**

**Max Marks :  
20**

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**PART – A**

**Remembering type questions**

**Answer all Questions. Each question carries 1 marks**

**4 X 1M = 04 marks**

1. Define the term 'Ferrous metal'?
2. List any four properties of Aluminum.
3. What is the function 'Chuck' in Lathe?
4. List any four work holding and tool holding tools in Lathe.

**PART – B**

**Understanding type questions**

**Answer any two Questions. Each question carries 3 marks**

**2 X 3M = 06 Marks**

5. a) State the composition of High Speed Steel. (OR)  
b) Write any four engineering applications of Non-Ferrous metals with examples.
6. a) List any three specifications of Lathe. (OR)  
b) Draw a neat sketch of Tail stock in Lathe and label the parts.

**PART – C**

**Application type questions**

**Answer any two Questions. Each question carries**

**5 X 2M = 10marks**

7. a) Explain about different plain carbon steels according to their carbon content. (OR)  
b) Explain the different Industrial applications of Copper and write its properties, advantages and disadvantages.
8. a) Draw a line diagram of Engine lathe, show its main parts and explain the functions of each part. (OR)  
b) Explain about Capstan Lathe with neat sketch.



**(Model Question Paper)**  
**Semester End examination (SEE)**

Subject Name: **Engineering Materials and Manufacturing Processes**

Subject Code: **AU-302**

**Time : 2 hours**

**Max Marks : 40**

**PART-A**

**Remembering type questions**

**Answer all Questions. Each question carries 2 marks**

**8 x 1M = 08M**

1. Define the term 'Ductility'.
2. What is 'Non-ferrous metal'?
3. State the function of Drill bit.
4. Define the term 'Space lattice'.
5. What is Pressure welding?
6. List any four safety precautions should be followed while welding.
7. Write any two specifications Shaper.
8. State the function of Planer.

**PART-B**

**Understanding type questions**

**Answer any four Questions. Each question carries 3 marks**

**4 x 3M = 12M**

9. a) What is the difference between Hardness and Toughness? (OR)  
b) State the working principle Butt welding.
10. a) What is the function of 'Head stock' in lathe machine.  
(OR)  
b) Write any three specifications Shaper.
11. a) Explain about the different types of flames in Oxy-acetylene gas welding with diagrams.  
(OR)  
b) What are the different types of gas welding techniques?
12. a) Write any three specifications of Planer. (OR)  
b) List any six Drilling operations

PART-C

**Application type questions**

**Answer any four Questions. Each question carries 10 marks    4 x 5M = 20 Marks**

13. a) Describe the process of Steel making by Bessemer converter with neat sketch. (OR)
- b) Explain about the Spot welding process with neat sketch.
14. a) Draw a line diagram of Engine lathe, show its main parts and explain the function of each part.
- (OR)
- b) Describe the quick return mechanism of Shaper.
15. a) Explain the working of TIG welding with neat sketch and write its applications. (OR)
- b) Explain the working of Electric Arc welding. List out the equipment used in Arc welding and explain their functions.
16. a) Describe the construction and working of Shaper with line diagram.
- (OR)
- b) Draw a line diagram of Slotter, name the parts and explain its working.



### AU-303-APPLIED MECHANICS

Course Title :	Applied Mechanics	Course Code	AU-303
Semester	III	Course Group	Core
Teaching Scheme in Periods (L:T:P)	4:1:0	Credits	3
Methodology	Lecture + Tutorials	Total Contact Periods	75
CIE	20+20+20=60 Marks	SEE	40 Marks

#### Pre requisites

This course requires the basic knowledge of Basic Physics and Mathematics at Secondary school level

#### Course Content and Blue Print of Marks for SEE

S.No	Unit Name	Questions for SEE				Periods
		R		U	A	
1	Statics	4	1	9(a)	13(a)	10
2	Friction					10
3	Dynamics		2	10(a)	14(a)	10
4	Basic Link Mechanisms					08
5	Simple machines	3	5, 6	9(b)	13(b)	10
				11(a)	15(a)	
				11(b)	15(b)	
6	Transmission of power		7,8	10(b)	14(b)	12
				12(a)	16(a)	
				12(b)	16(b)	
Total Questions		8		8	8	60

**R-Remembering, U-Understanding, A- Application type questions each carrying 1, 3 and 5 Marks respectively.**

#### Course Outcomes:

On successful completion of the course student should be able to

CO1 :	Determine magnitude and direction of the resultant for a given system forces.
CO2 :	Calculate the effect of friction on horizontal and inclined surfaces.
CO3 :	Summarize the different types of motions.
CO4 :	Form various mechanisms required for different machines and construct various simple machines.
CO5 :	Acquire the knowledge on contemporary issues in the field of engineering mechanics.
CO6 :	Comprehend the transmission of power through different media.

## **COURSE CONTENT:**

### **UNIT 1: Statics**

**Duration: 09 periods (L: 7 – T:3)**

Meaning of word Mechanics-Application of mechanics to engineering-System of Units-Definition and specifications of a force-Classification of forces-System of forces and classification of system of forces-Composition and resolution of forces-Statement of Parallelogram law of forces and its formulae (No derivation)-Method of Resolution of forces-Lami's theorem and its formulae (No derivation)-Numerical problems related to coplanar concurrent forces on above cases-Equilibrium and Equilibrant-Condition for equilibrium of a rigid body subjected to number of coplanar concurrent forces-Related Numerical problems.

### **UNIT 2: Friction**

**Duration: 09 periods (L: 7– T:3)**

Define static, dynamic and impending friction-Define coefficient of friction-Laws of dry and fluid friction-Derivation of limiting angle of friction and angle of repose-Resolution of Forces considering Friction when a body moves on horizontal plane-Resolution of Forces considering Friction when a body moves on inclined plane-Numerical examples on the above cases.

### **UNIT 3: Dynamics**

**Duration: 10 periods (L: 7 – T:3)**

Definition of Kinematics and Kinetics-Classification of motion-Definition of displacement, velocity and acceleration-Equations of motion (without derivation)-Solving the problems related to the rectilinear motion of a Particle-Newton's laws of motion-Law of conservation of momentum; Impulse–momentum equation; Solve the problems on kinetics using the above principles-Rotary motion of a particle-Simple harmonic motion.

### **UNIT 4: Basic Link Mechanisms**

**Duration: 8 periods (L: 6 – T:2)**

Definition of the terms: link, kinematic pair, kinematic chain, Mechanism, structure-Classification of Kinematic pairs-Condition to form a kinematic chain-Quadric cycle chain and its inversions-Slider Crank chain and its inversions.

### **UNIT 5: Simple machines**

**Duration: 10 periods (L: 7 – T:3)**

Definition of Simple machine-Uses of simple machines like levers and inclined plane-Define fundamental terms like input, output, mechanical advantage, velocity ratio and efficiency of the simple machines-Derive the expressions for VR in case of Simple pulley, Differential

pulley, System of pulleys, Wheel and axle, Differential wheel and axle, Worm and Worm wheel, Rack and pinion, Winch crabs, & Screw jack- Conditions for reversibility and self locking-Law of Machine-Effort lost in friction, Load equivalent of Friction- Max. M.A. and Max. Efficiency.

#### **UNIT 6: Transmission of power**

**Duration: 14 periods (L: 9– T:3)**

Belt drive-Materials for the belt drive and belt fasteners- Explanation of the terms-Velocity ratio in terms of diameters of pulleys-Slip, percentage of slip and its effect on velocity ratio- Thickness of belt and its effect on velocity ratio-Tight side and slack side of the belt-Open belt and cross belt drive-Effective tension ( $T_1 - T_2$ )-Velocity of the belt and Power transmitted by belt - Problems on –Velocity ratio, slip, length of the belt and power transmitted in a belt drive.

Rope drive – Advantages and limitations over a belt drive.

Chain drive – Advantages and limitations over a belt drive; Types of chains.

Gears and Gear trains-Nomenclature of gear-Types of gears – spur, helical, bevel, and spiral. Simple and compound gear trains-Velocity ratio in gear drives and problems-Advantages and limitations of gear drive over a belt drive.

#### **Recommended Books**

1	Basic Mechanical Engineering	by	V.N Kumar
2	Elements of Mech.Engineering	by	Roy & Choudary
3	Engineering Mechanics	by	Singer B.S.Publications
4	Engineering Mechanics	by	Basudeb Bhattacharya – Oxford Pub
5	Engineering Mechanics	by	A Nelson      Mc Graw Hill
6	Engineering Mechanics	by	I.B.Prasad
7	Engineering Mechanics	by	R.S.Khurmi      S.Chand & Comp
8	Theory of Machines	by	S.S.Rathan      Tata Mc Hill Pub
9	Theory of Machines	by	R.S. Khurmi
10	Theory of Mechanisms and Machines	by	Malik & Ghose

#### **Suggested learning outcomes:**

**The student will be able to**

#### **1.0 Understand the concept of Statics**

- 1.1 Explain the meaning of mechanics in engineering.
- 1.2 What is the importance of mechanics in engineering?
- 1.3 Recall the system of units used.
- 1.4 Explain the concept of force.
- 1.5 List the types of forces.

- 1.6 Explain the system forces.
  - a) Co-planar and Non-Coplanar,
  - b) Parallel and Non-Parallel,
  - c) Like and Un like,
  - d) Concurrent and Non-concurrent
- 1.7 Explain the concept of equilibrium.
- 1.8 Define the parallelogram law of forces.
- 1.9 Define the Lami's theorem.
- 1.10 Solve the problems involving concurrent coplanar forces.
- 1.11 Solve simple problems using Lami's theorem.
- 1.12 What are the conditions of equilibrium of a body acted upon by co-planar forces?

## **2.0 Understand the concept of Friction**

- 2.1 Explain the concept of friction.
- 2.2 What are the laws of friction?
- 2.3 Identify the machine members in which friction exists and desirable.
- 2.4 Resolve the forces acting on bodies moving on horizontal plane.
- 2.5 Resolve the forces acting on bodies moving along the inclined planes.
- 2.6 Solve the related numerical problems.

## **3.0 Understand the concept of Dynamics**

- 3.1 Define the terms Kinematics and Kinetics.
- 3.2 Classify the motion types.
- 3.3 Define the terms displacement, velocity and acceleration.
- 3.4 State the Newton's Laws of motion (without derivation).
- 3.5 Solve the problems related to the rectilinear motion of a particle.
- 3.6 Define the Law of conservation of momentum.
- 3.7 Explain the Impulse –momentum equation.
- 3.8 Solve the problems using the above principles.
- 3.9 Explain the Rotary motion of particle.
- 3.10 Describe simple harmonic motion.
- 3.11 Explain the application of simple harmonic motion in engineering.

## **4.0 Understand the concept of Basic Link mechanism**

- 4.1 Define important terms of Basic link mechanism.
  - a) Link, b) kinematics pair, c) Kinematic chain, d) Mechanism & machine
- 4.2 Classify the kinematic pairs.

- 4.3 Explain kinematic pair and kinematic chain with the help of legible sketch.
- 4.4 List examples for Lower and Higher pairs.
- 4.5 List examples for inversion of quadric cycle chain and slider crank chain.
- 4.6 What is the condition to form a kinematic chain?

## **5.0 Comprehend the Principles involved in Simple Machines**

- 5.1 Define the important terms of simple machines.
  - a) Machine, b) Mechanical Advantage, c) Velocity Ratio, d) Efficiency.
- 5.2 Illustrate the use of three classes of simple lever.
- 5.3 Show that an inclined plane is a simple machine to reduce the effort in lifting loads.
- 5.4 Derive expression for VR in cases of wheel & axle, Weston Differential pulley blocks, pulleys, Worm & Worm wheel, single and double purchase winch crabs, screw jack, rack & pinion.
- 5.5 Solve the problems to find the efficiency of a given machine.
- 5.6 Solve the problems to find effort required to raise or lower the load under given conditions.
- 5.7 Interpret the law of machine.
- 5.8 What are the conditions for self-locking and reversibility.
- 5.9 Illustrate the effort lost in friction and load equivalent of friction.
- 5.10 Solve the problems to find the effort lost in friction and load equivalent of friction.
- 5.11 Illustrate the conditions for maximum M.A. & Maximum efficiency.

## **6.0 Understand the concept of transmission of power in Engineering.**

- 6.1 Identify various power transmitting drives like belt, Chain, rope, gears.
- 6.2 Select suitable material for belt.
- 6.3 Explain the belt fasteners.
- 6.4 Explain the term slip in belt and its effect on velocity ratio.
- 6.5 Explain the combined effect of belt thickness and slip on velocity ratio.
- 6.6 Explain the use of jockey pulley.
- 6.7 Compare between open belt drive and cross belt drive.
- 6.8 Explain the tensions in tight and slack sides of a belt.
- 6.9 Solve the problems to find velocity ratio and power transmitted by belt drive.
- 6.10 Explain the rope drive.
- 6.11 List the advantages and limitations of rope drive.
- 6.12 Explain the chain drive.



- 6.13 List the advantages and limitations chain drive.
- 6.14 Explain the types of chain.
- 6.15 Explain the principle of gear drive.
- 6.16 List the advantages and limitations gear drive.
- 6.17 Classify the gears.
- 6.18 Explain Nomenclature of a gear.
- 6.19 Explain the simple and compound gear train.
- 6.20 Explain the applications of the above drives in engineering.

**Suggested student's activity:**

- 1. Students visits library to refer various reference books
- 2. Students visits nearby industries to familiarize with machines and devices.
- 3. Quiz
- 4. Group discussion
- 5. Surprise test
- 6. Write the mechanisms which you are using in your day to day life. Sketch any three forms of mechanisms. Study and submit handwritten report of 500 words.
- 7. Take a photo of a actual kinematic mechanism used in an automobile, study and submit handwritten report of 500 words.
- 8. Analyse the effect of friction in real situation and submit handwritten report of 500 words.
- 9. List the mechanism used in a typical car. study and submit handwritten report of 500words.
- 10. Identify and name different simple machines used in day to day life. study and submit hand written report of 500 words.
- 11. Identify the types of belts, gears and gear trains used in different automobiles and also the type of chains in automobile and bicycle. Study and submit handwritten report of 500 words.
- 12. Visit the market/industry and collect the data of items which are used in any mechanisms. Data includes specifications, cost, applications, etc. Also name the mechanism/s in which such item/s is/are use. Study and submit handwritten report of 500 words.

**Suggested E-Learning references:**

1. [www.learnengineering.org](http://www.learnengineering.org)
2. [www.sae.org](http://www.sae.org)
3. [www.nptel.ac.in](http://www.nptel.ac.in)
4. <http://nptel.iitm.ac.in/video.php?subjectId=112104121>
5. <http://www.technologystudent.com/gears1/gears7.htm>
6. [http://kmoddl.library.cornell.edu/model.php?m=20http://www3.ul.ie/~kirwanp/whatisaca\\_mandfollowersyste.htm](http://kmoddl.library.cornell.edu/model.php?m=20http://www3.ul.ie/~kirwanp/whatisaca_mandfollowersyste.htm)
7. <http://nptel.iitm.ac.in/courses/Webcourse-contents/IITDelhi/Kinematics%20of%20Machine/index.htm>
8. [http://elearning.vtu.ac.in/12/enotes/Des\\_Mac-Ele2/Unit6-RK.pdf](http://elearning.vtu.ac.in/12/enotes/Des_Mac-Ele2/Unit6-RK.pdf)
9. [www.tequipment.com/Theory\\_of\\_Machines.aspx](http://www.tequipment.com/Theory_of_Machines.aspx)
10. [www.researchgate.net/.../0094-114X\\_Mechanism\\_and\\_Machine\\_Theory](http://www.researchgate.net/.../0094-114X_Mechanism_and_Machine_Theory)
11. [www.journals.elsevier.com/mechanism-and-machine-theory/](http://www.journals.elsevier.com/mechanism-and-machine-theory/)
12. [www.iftomm.org/](http://www.iftomm.org/)
13. [www.wiziq.com/online-tests/44047-mechanical-theory-of-machine](http://www.wiziq.com/online-tests/44047-mechanical-theory-of-machine)
14. [www.cs.ubc.ca/~murphyk/Teaching/CS340-Fall07/infoTheory.pdf](http://www.cs.ubc.ca/~murphyk/Teaching/CS340-Fall07/infoTheory.pdf)

**CO- PO Mapping Matrix**

Course Outcome		CL	Linked PO	Teaching periods
CO1	Determine magnitude and direction of the resultant for a given system forces.	R/U/A	1,2,3	10
CO2	Calculate the effect of friction on horizontal and inclined planes.	R/U	1,2,3	10
CO3	Summarize different types of motions.	U/A	1,2,3	10
CO4	Form various mechanisms required for different machines and Construct various simple machines	U/A	1,2,3	8
CO5	Acquire the knowledge on contemporary issues in the field of engineering mechanics.	R/U	1,2,3,10	10
CO6	Comprehend the transmission of power through different media.	R/U	1,2,3	12

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

**Mid Semester Examination Blueprint of Questions and Marks:****MID SEM-I EXAM****Max.Marks: 20**

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

**MID SEM –II EXAM      Max.Marks: 20**

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

**R-Remembering, U-Understanding, A- Application type questions each carrying 1, 3 and 5 Marks respectively.**

**MID SEM-I MODEL QUESTION PAPER  
C-21, DIPLOMA IN AUTOMOBILE ENGINEERING**

**Subject Name: Applied Mechanics**

**Subject Code: AU-303**

**Time: 1hr**

**Max Marks: 20**

**PART-A**

**Short answers questions**

**Answer All Questions. Each question carries ONE mark**

**4 x 1 = 4 Marks**

1. Define system forces?
2. State the term equilibrium?
3. Define coefficient of friction?
4. State any two laws of dry friction?

**PART-B**

**Essay type questions**

**Answer any TWO Questions by choosing either (a) or (b) from each question.**

**Each question carries THREE marks**

**2 x 3 = 6 Marks**

5. a). State the condition of equilibrium of a body acted upon by co-planar forces? OR  
b). State the Lami's theorem and represent it through diagram with formula ?
6. a) List any two names of the machine members in which friction is desirable and why it is required? OR  
b) Derive formula for limiting angle of friction?

**PART-C**

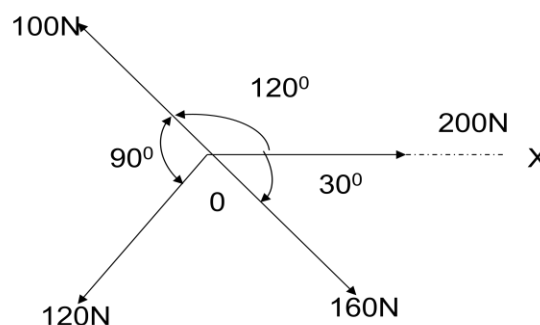
**Application type questions**

**Answer any TWO Questions by choosing either (a) or (b) from each question.**

**Each question carries THREE marks**

**2 x 5 = 10 Marks**

7. a). Determine the magnitude of the equilibrant of the forces shown in figure below.  
State the angle made by it OX axis.



**OR**

b). Two forces 30 N and 40 N act at a point with angle of  $30^\circ$  between them find the magnitude and direction of the resultant.

8. a) A body weighing 250 N is laying on a rough horizontal plane. A horizontal effort of 50 N is required to cause the body to slide. Determine.

(i) Limiting force of friction. (ii) Co-efficient of friction.

**OR**

b). A body of weight 735 N rests on rough inclined plane. The plane is inclined at an angle  $30^\circ$  with the horizontal and the angle of friction between the body and the plane is 15. Find the horizontal force required to hold the body from sliding down the plane.

**MID SEM-II MODEL QUESTION PAPER**  
**C-21, DIPLOMA IN AUTOMOBILE ENGINEERING**  
**Subject Name: Applied Mechanics**  
**Subject Code: AU-303**

**Time: 1hr**

**Max Marks: 20**

**PART-A**

**Short answers questions**

**Answer All Questions. Each question carries ONE mark**

**4 x1 = 4 Marks**

1. Define the term velocity?
2. State the Newton's III<sup>rd</sup> Laws of motion?
3. Define the term link?
4. List the names of any two links?

**PART-B**

**Essay type questions**

**Answer any TWO Questions by choosing either (a) or (b) from each question.**

**Each question carries THREE marks**

**2 x 3 = 6 Marks**

5. a). Describe simple harmonic motion?  
OR  
b). Define the Law of conservation of momentum?
6. a) Define lower pair and any write two  
examples of it? OR  
b) Differentiate between machine and mechanism?

**PART-C**

**Application type questions**

**Answer any TWO Questions by choosing either (a) or (b) from each question.**

**Each question carries THREE marks**

**2 x 5 = 10 Marks**

7. a) State the Newton's I<sup>st</sup> and II<sup>nd</sup> Law of motion?  
OR  
b) State Law of conservation of momentum?
8. a) Explain the inversions of Quadric cycle chain with a  
neat sketch? OR  
b) Explain kinematic pair and kinematic chain?

**SEMESTER END EXAMINATION**  
**MODEL QUESTION PAPER**  
**C-21, DIPLOMA IN AUTOMOBILE ENGINEERING**  
**Subject Name: Applied Mechanics Subject Code: AU-303**

**Time: 2 Hours**

**Max Marks: 40**

**PART-A**

**Answer all Questions. Each question carries *ONE* mark. **8 x 1 = 8 marks****

1. List any two types of forces and state units of force in SI system?
2. Define the term Kinematics?
3. What are advantages of Rope drives?
4. List any one type of lever with giving practical example?
5. Define terms mechanical advantage?
6. State the condition for reversibility of a simple machine?
7. Name the materials used for belts?
8. Write the use of jockey pulley?

**PART-B**

**Answer any FOUR questions choosing either (a) or (b) from each question.**

**Marks Each question carries *THREE* marks.  $4 \times 3 = 12$**

9. (a) Write any three Laws of dry friction.  
Or  
(b) Draw the sketch of a differential wheel and axle and label the parts?
10. (a) State the Newton's I<sup>st</sup> Law of motion?  
Or  
(b) Distinguish between open belt drive and cross belt drive?
11. (a) Write the expression for Velocity ratio of Single purchase crab winch with notations? Or  
(b) In a simple lifting machine an effort of 250 N is required to lift a load of 3150 N. The velocity ratio of the machine is 14. Determine frictional effort?
12. (a) State the advantages gear drive over a belt drive?  
Or  
(b) Define the terms addendum and dedendum of a gear wheel?

**PART-C**

**4 x 5 = 20 Marks**

**Answer any FOUR questions by choosing either (a) or (b) from each question.**

**Each question carries *FIVE* marks.**

12. (a) Find effort required to move a load of 686 N on rough horizontal plane. The coefficient of friction between the contact surfaces is 0.25. The effort is applied at an angle  $20^\circ$  with the horizontal?

Or

13. (b) In a Double purchase winch crab, the number of teeth on spur wheels is 80 and 100 and that on pinions are 30 and 40. The length of handle is 1.5 m and the radius of drum is 0.4 m. Determine the effort to be applied to lift a load of 5800N if the efficiency of the machine is 65%?

14. (a) Explain the Law of conservation of momentum?

Or

14. (b) A shaft is running at 150 rpm carries a pulley of 1250mm diameter, which drives another shaft at 1200 rpm by means of a belt 5mm thick. Determine the diameter of the pulley on driven shaft?

15. (a) In a simple wheel and axle, the diameter of effort wheel is 275 mm and that of axle is 80mm. Determine the effort required to lift a load of 8000 N if the efficiency of the machine is 65%?

Or

15. (b) An effort of 200 N lifts a load of 1500 N and an effort of 300 N lifts a load of 2800N on a simple machine. Establish the law of the machine. Determine

- a) Load to be lifted by an effort of 500N
- b) Effort required in lifting a load of 5 KN.
- c) Max. Efficiency if V.R is 20.
- d) Frictional effort.

(a) A driving pulley of 1.5 m diameter runs at 200r.p.m. The tensions in the tight and slack sides of the belt are 750 N and 400 N respectively. Find the power transmitted by belt.

Or

16. (b) The number of teeth on driver 'A' and driven 'D' gears are 14 and 45 respectively. The number teeth on the intermediate compound gears 'B' and 'C' are 70 and 15 respectively. If the speed of the driver shaft is 750 RPM. Find (i) V.R of gear train and (ii) Speed of driven shaft?





### AU-304- Basic Automobile Engineering

Course Title:	Basic Automobile Engineering	Course Code:	AU-304
Semester:	III	Course Group:	Core
Teaching Scheme in Periods (L:T:P):	4:1:0	Credits:	3
Methodology:	Tutorial + Practicals	Total Contact Hours :	75
CIE:	60 Marks	SEE:	40 Marks

#### Pre Requisites:

This course requires the basic knowledge of Basic Physics and Mathematics at Secondary school level.

#### Course Content and Blue Print of Marks for SEE

S.No	Unit No.	Questions to be set for SEE				Periods
		R		U	A	
1	Heat engines	4	1	9(a)	13(a)	15
2	Engine construction					12
3	Basics of Fuel system		2	10(a)	14(a)	12
4	Basics of Transmission					11
5	Basics of Chassis and Body	4	3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)
6	Cooling and Lubrication systems					
				10(b) 12(a) 12(b)	14(b) 16(a) 16(b)	15
<b>Total</b>		<b>8</b>		<b>8</b>	<b>8</b>	<b>75</b>
Legend:	Remembering (R)	1 Mark				
	Understanding (U)	3 Marks				
	Application (A)	5 Marks				

#### Course Outcomes

CO1 :	Describe the vehicle dimensions and calculate Engine specifications.
CO2 :	Identify the Engine components and summarize the materials used and method of manufacturing.
CO3 :	Describe cooling and Lubrication systems of an Engine.
CO4 :	Determine the air-fuel ratios and combustion limits.
CO5 :	Predict the various loads acting on Automobile frame and Body.
CO6 :	Explain construction and working of various types of clutch.

**Course Content:****UNIT- 1: HEAT ENGINES:****Duration: 12 Periods (L: 8 – T: 4)**

Automobile Definition - Classification of an Automobile - Layout of a typical Automobile – Chassis– Definition-Engine mounts–need–types, definition of : Wheel base - Wheel track - Overall length - Front overhung -Rear overhung -Height of C.G.-Ground clearance - Gross weight and Kerb weight.

Heat Engines-Definition –Types of heat engines -Comparision of I.C. and E.C.engines.

Engine Terminology-bore–stroke–TDC–BDC–clearance volume-swept volume - total volume - Compression ratio- mean effective pressure – indicated power – brake power - friction power - Engine Speed- engine torque.

Classification of I.C.Engines with respect to different parameters, Number of Cylinders-Arrangement of Cylinders etc.,-Overhead valve arrangement–Side valve arrangement-L,I,F and T- type valve arrangements.

Two Stroke & four stroke-S.I.engines-construction and working–C.I.engines construction and working - Comparison of SI and CI engines - Advantages and limitations of diesel engine over petrol engine - Comparison of Two stroke and Four stroke engines-Scavenging.

Valve timing diagram of 2-stroke & 4-stroke Petrol & Diesel engines-Firing Order–General Firing Orders of 4 , 6 and 8 cylinder engines.

Inlet and Exhaust System - Air Cleaners - Construction details of various types of air cleaners – Paper filter type air cleaner, Oil bath and Oil wetted type-Inlet and Exhaust Manifolds-Constructional details of Mufflers - types of Mufflers-Constructional details and working principle of various types of Mufflers.

**UNIT-2: ENGINE CONSTRUCTION****Duration: 08 Periods (L: 6 – T: 2)**

Engine - Cylinder Block- Cylinder Liners- Cylinder Head–Crankcase and Oil Pan–Gaskets–Piston, Piston types– Piston Pin and Piston Rings–Connecting Rod– Connecting Rod bearings–Crankshaft– Main Bearings–Need of oil Clearance–Flywheel–Vibration dampers-Valves-Valve springs –Valve Seat –Valve guide bushing and oil seal–Cam Shaft–Valve Lifter, Pushrod and Rocker arm-mention material used and method of manufacturing of components.

**UNIT-3: BASIC FUEL SYSTEM:****Duration: 10 Periods (L: 7 – T: 3)**

Fuels-Definition of fuel-Classification of fuels-Properties of fuels– Calorific value of fuels - H.C.V & L.C.V -Fuels used in I.C. Engines-Rating of I.C engine fuels-Octane rating, Cetane rating- Fuel dopes or additives.

Combustion of fuels-Introduction–Combustion limits of air and fuel mixtures- Stoichiometric ratio -Homogeneous mixture -Heterogeneous mixture-Air fuel ratios for different operating conditions.

Petrol Engine Fuel supply system-Line diagram of petrol engine fuel supply system-components-constructural details of fuel tank, fuel lines and fuel filters–working principle with constructural details of fuel pumps-Mechanical and Electrical-constructural details of simple carburetor. Defects in simple carburetor–List of various circuits in carburetors and their purpose - Classification of carburetors-Down draught, up draught and side draught, Constant Choke and Constant Vacuum type Carburetors. (construction and working of carburetors not included here).

**UNIT- 4. TRANSMISSION BASICS:****Duration: 10 Periods (L: 8 – T: 2)**

Purpose of the automotive transmission system – Arrangement of transmission in automotive vehicle -Functions of various components in the transmission-Function of clutch-Principle of Operation-General requirements of an automobile clutch-Constructural details and Working principle of different types of clutch-Single plate Clutch-Coil Spring type and Diaphragm spring type–Multi plate - Centrifugal -Semi centrifugal–vacuum and hydraulically operated clutches.

**UNIT- 5.CHASSIS AND BODY BASICS:****Duration: 10 Periods (L: 8 – T: 2)**

Chassis frame–Functions of the frame, types of chassis frame-Brief description of their constructural features -various loads acting on the frame.

Motor Vehicle Body–Requirements of automobile body–Types of body- Conventional type – Unitized type–Types of vehicles according to bodies –Private and Commercial use–Private vehicle bodies – Sedan, Saloon, Convertibles, 2-door,4-door etc.,–Commercial vehicle bodies–passenger vehicle bodies –Goods transport vehicles–Special purpose vehicle bodies

like water carriers, delivery vans, trucks, station wagons, tippers, ambulance vehicles, fire fighting vehicles - cess pool and gully water removal vehicles of municipality, break down service vehicles, goods transport vehicles for depots.

**UNIT- 6. Lubrication and Cooling Systems:      Duration: 10 Periods (L: 8 – T: 2)**

Types of lubricants–Properties required for a lubricating oil- viscosity-Fire and Flashpoint etc.,- Grades of Lubricating oils -S.A.E and API systems – Grades of Lubricants used for Engine, Gear Box, Differential

Types of lubrication systems used in Automobiles-Petrol type-Splash type-force feed lubrication system-Dry Sump and Wet sump Lubrication-Types of oil filters-Full flow and By-pass filter arrangements –Additives used for synthetic Lubricants.

Necessity of cooling-Disadvantages of over cooling and under cooling-Types of cooling systems – Air cooling,Water Cooling-Liquid cooling-Constructional details of an Aircooled engine-Thermo syphon system-Force feed type cooling systems-Radiator pressure cap– Constructional details and working principle of water pump - Radiator -core- Different types and their constructional details -Thermostat- Wax pellet type and Bellows type - Anti freezing additives – Anti rusting additives.

**Recommended Books for Reference:**

1. Automobile Engineering Vol. I & II	by	Dr. Kirpal Singh
2. Automotive Mechanics	by	Heitner
3. Automobile Engineering	by	G.B.S. Narang
4. Automobile Engineering	by	R.B.Gupta
5. Automobile Engineering	by	Banga and Nathun Singh
6. Automobile mechanics	by	William Crouse
7. Internal Combustion Engines	by	Mathur&Sharma
8. Automobile Engineering Vol. I	by	Anil Chikara

### **Suggested Learning Outcomes:**

- 1.1 Define Automobile
- 1.2 Classify an Automobile
- 1.3 Draw the layout of a four wheeler chassis
- 1.4 Discover the need of engine mounts
- 1.5 Define the vehicle dimensions like Wheel base, Wheel track etc.,
- 1.6 State the difference between Gross weight and Kerb weight
- 1.7 State the function of an engine
- 1.8 Classify an engine
- 1.9 Compare I.C engine and E.C engine
- 1.10 Identify the terminology of an I.C.Engine
- 1.11 Define the terms like stroke, stroke volume, clearance volume, total volume, compression ratio, Mean effective pressure, etc.,
- 1.12 Classify I.C engines based on different parameters
- 1.13 Describe the arrangement of cylinders in multi cylinder engines
- 1.14 Identify the type of valve arrangement in an engine
- 1.15 State the firing order in case of a multi cylinder engine
- 1.16 Explain the construction and working of 2-Stroke and 4-Stroke petrol engines
- 1.17 Explain the construction and working of 2-Stroke and 4-Stroke diesel engines
- 1.18 Compare 2-Stroke and 4-Stroke engines
- 1.19 Compare S.I and C.I engines
- 1.20 State the advantages and limitation of diesel engine over a petrol engine
- 1.21 State the need of scavenging process
- 1.22 Draw the valve timing diagram of 2-Stroke and 4-Stroke petrol engines
- 1.23 Draw the valve timing diagram of 2-Stroke and 4-Stroke diesel engines
- 1.24 State the requirements of Firing order.
- 1.25 Explain the firing order arrangement for 4 , 6 and 8 cylinder Engines (Inline & V type).
- 1.26 Explain the valve arrangements in L,I,F & T type Engines.
- 1.27 Draw and explain side valve and over head valve arrangements.
- 1.28 Explain valve clearance and its importance.
- 1.29 Identify the need of Inlet and Exhaust systems of an engine
- 1.30 Need of an air cleaner
- 1.31 List the types of air cleaners
- 1.32 List the types of manifolds
- 1.33 Classify the types of mufflers
- 1.34 Explain the construction and working of various types of mufflers

### **2.0 Comprehend the Engine Construction**

- 2.1 State the constructional details, materials used and functions of various engine components.
- 2.2 List various types of Gaskets used in Engines.
- 2.3 Explain the function of valve, Valve springs, valve seat, valve guides.
- 2.4 Explain the use of vibration dampers.
- 2.5 Explain over head cam shaft mechanism.

**3.0 Define fuel, classify the fuels and recite the concepts of petrol engine fuel systems.**

- 3.1 Define the term fuel.
- 3.2 Classify the different types of fuels.
- 3.3 Identify the fuels used in I.C. Engine
- 3.4 State their merits and limitations of liquid fuels over solid fuels
- 3.5 State their merits and limitations of gaseous fuels over liquid fuels
- 3.6 List the properties of fuels
- 3.7 Define calorific value of a fuel
- 3.8 Differentiate between Gross calorific value and Net calorific value
- 3.9 Describe the process of assigning Octane number and Cetane number to the fuel sample.
- 3.10 Infer the need of fuel additives or fuel dopes.
- 3.11 Define Combustion
- 3.12 Identify the Combustion limits of air and fuel mixtures.
- 3.13 State the concept of Stoichiometric ratio
- 3.14 Apprise the types of air fuel mixtures used in I.C. Engines.
- 3.15 Understand the working of Petrol Engine Fuel supply System
- 3.16 Draw a line diagram of petrol engine fuel supply system
- 3.17 Identify the parts of each component like, Fuel tank, filter, fuel pump, and carburetors
- 3.18 State the function of each component like, Fuel tank, filter, fuel pump, and carburetors
- 3.19 Classify the types of Fuel pumps
- 3.20 Explain the working of mechanical and electrical fuel pumps with the help of legible sketches
- 3.21 Explain the function of carburetor and carburetion.
- 3.22 List the Air fuel ratios for different conditions
- 3.23 State the types of carburetors-Down draught, up draught and side draught.

**4.0 Describe various types of clutches**

- 4.1 State the function of transmission system of an automobile
- 4.2 List the components of transmission system
- 4.3 State the function of clutch
- 4.4 Explain the working principle of an automobile Clutch.
- 4.5 State the general requirements of an automobile clutch.
- 4.6 Summarize the classification of clutch.
- 4.7 Draw the line diagram and explain the working of single plate, multi plate, Centrifugal, Semi Centrifugal and diaphragm clutches.
- 4.8 Explain the working principle of vacuum and hydraulically operated clutches.

## **5.0 Understand the constructional features of different types of vehicle frame and body**

- 5.1 Identify the difference between chassis and frame.
- 5.2 List the types of frames
- 5.3 Briefly describe the constructional features of different types of frames
- 5.4 Enumerate the loads acting on a frame.
- 5.5 Explain the need of a body for an automobile.
- 5.6 List the requirement of a body
- 5.7 Compare Conventional and Unitized vehicle bodies.
- 5.8 Classify the vehicles based on their bodies and use.
- 5.9 Identify the difference in the customization of Private vehicle bodies and Commercial vehicle bodies.
- 5.10 Recite the types of private vehicle bodies
- 5.11 Quote the list of commercial vehicle bodies
- 5.12 Enumerate the types of special purpose vehicle bodies.

## **6.0 Understand the concept of Cooling System**

- 6.1 Classify the cooling systems.
- 6.2 Explain the constructional details and State the working principle of Air cooling, Liquid Cooling systems with the help of line diagrams.
- 6.3 Explain the constructional details of water pump and thermostat
- 6.4 Explain the types of Thermostats, Radiator and Pressure cap.
- 6.5 List out various Anti-freeze and anti-rusting liquids.
- 6.6 Classify the various lubricants used in I.C.engines
- 6.7 State the properties of lubricants
- 6.8 Explain the properties of lubricants, SAE number of lubricant and State its necessity.
- 6.9 State the requirements of engine lubrication.
- 6.10 Explain clearly the constructional details and working of Petroil , splash type, forced feed type lubrication systems.
- 6.11 Explain the dry sump and wet sump systems.
- 6.12 State the difference between By-pass filter and Full-flow filter.
- 6.13 List the various additives of lubricants.



**Suggested Student Activities:**

1. Visit library to refer manuals / browse on internet to collect the data of various two wheelers and compare data like parameters and submit a report.
2. Visit your institutional laboratory and list the tools and available equipment, note the purpose of each and submit a report.
3. Visit nearby workshop / service station and submit the report on the various activities taken up there.
4. Browse on internet to collect the data of various cars and compare data on parameters and submit a report.
5. Give a seminar on the need of energy conservation for the future generations.
6. Prepare a chart indicating the complete constructional details, general description and working of an automobile component or system.
7. Quiz before Mid Sem-1 and Mid Sem-2.
8. Group discussion on any topic relevant to the course with the approval of Head of section.
9. Surprise test-1 (Descriptive type)
10. Surprise test -2 (Objective type)

**Suggested E-Learning references:**

1. [www.learnengineering.org](http://www.learnengineering.org)
2. [www.sae.org](http://www.sae.org)
3. [www.nptel.ac.in](http://www.nptel.ac.in)
4. **HEAT ENGINES:**

<https://www.youtube.com/watch?v=e5h4sIZlmUo>  
<https://www.youtube.com/watch?v=IHnTKsHuJQw>  
<https://www.youtube.com/watch?v=ASJmVNcJqk4>  
<https://www.youtube.com/watch?v=vIJ50aUiBgM>

**5. ENGINE CONSTRUCTION:**

<https://www.youtube.com/watch?v=BJYSyA-u61U>  
[https://www.youtube.com/watch?v=zA\\_19bHxEYg](https://www.youtube.com/watch?v=zA_19bHxEYg)  
<https://www.youtube.com/watch?v=dfFvtpbjdow>

**6. BASIC FUEL SYSTEM:**

[https://www.youtube.com/watch?v=4O3nC9l\\_1f0](https://www.youtube.com/watch?v=4O3nC9l_1f0)  
[https://www.youtube.com/watch?v=Z5\\_vfZhMWOG](https://www.youtube.com/watch?v=Z5_vfZhMWOG)  
<https://www.youtube.com/watch?v=m6-KZS19HDU>  
<https://www.youtube.com/watch?v=l6qMhwyLUHA>  
<https://www.youtube.com/watch?v=mhPP6pnisL4>

<https://www.youtube.com/watch?v=6YzIki62ga8>

<https://www.youtube.com/watch?v=U6XGjYuX8ys>

## 7. TRANSMISSION BASICS:

<https://www.youtube.com/watch?v=G04Fthmue1A>

<https://www.youtube.com/watch?v=kTSBwYvm7u8>

<https://www.youtube.com/watch?v=6BaECAbapRg>

<https://www.youtube.com/watch?v=pqF-aBtTBnY>

<https://www.youtube.com/watch?v=devo3kdSPQY>

<https://www.youtube.com/watch?v=SQvFg4WbdZ4>

<https://www.youtube.com/watch?v=7K3q9Qd1QM>

<https://www.youtube.com/watch?v=TcYsV063lk8>

## 8. CHASSIS AND BODY BASICS:

<https://www.youtube.com/watch?v=tRojSOBUWgQ>

<https://www.youtube.com/watch?v=PjenO8nihaM>

[https://www.youtube.com/watch?v=hY\\_Nucbmaw](https://www.youtube.com/watch?v=hY_Nucbmaw)

<https://www.youtube.com/watch?v=IhbXPzPlzNI>

<https://www.youtube.com/watch?v=gTnhRiMQSME>

<https://www.youtube.com/watch?v=aptBwDKSPFg>

## 9. COOLING AND LUBRICATING SYSTEMS:

[https://www.youtube.com/watch?v=y5p31F\\_dVJU](https://www.youtube.com/watch?v=y5p31F_dVJU)

<https://www.youtube.com/watch?v=V7inC4lOpGs>

<https://www.youtube.com/watch?v=D9dYx9lF5uw>

<https://www.youtube.com/watch?v=mmmcj53TNic>

[https://www.youtube.com/watch?v=Rt\\_AWy4tsN0](https://www.youtube.com/watch?v=Rt_AWy4tsN0)

<https://www.youtube.com/watch?v=1oY8-tgl8q4>

<https://www.youtube.com/watch?v=V6x19pFplJw>

## CO PO Mapping Matrix

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Describe the vehicle dimensions and calculate Engine specifications.	R/A	1,2,4,6,7	15
CO2	Identify the Engine components and summarize the materials used and method of manufacturing.	R/U/A	1,2,5,7	12
CO3	Describe cooling and Lubrication systems of an Engine.	R	1	12
CO4	Determine the air-fuel ratios and combustion limits.	R/U/A	1,5,7	11
CO5	Predict the various loads acting on Automobile frame and Body.	U/A	1,2,4	10
CO6	Explain construction and working of various types of clutch.	R/U	1,5	15
Total				75

<b>MID SEM-I EXAM</b>					
S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
<b>MID SEM –II EXAM</b>					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

**Internal Assessment**

**Max.Marks: 20**

Type of test	Unit	Marks allotted	Remarks
Slip Test 1	1 and 2	5	2 Essay Questions out of 3 Questions
Slip Test 2	3 and 4	5	2 Essay Questions out of 3 Questions/ Objective type
Assignment	Any one Unit / Course	5	Different group assignments of Higher order Questions that develop problem solving skills, critical thinking and that promote lifelong learning should be given.
Seminar		5	Any topic approved by the faculty

**(Model Question Paper)**

**Mid Term –I**

**C-21, Diploma in Automobile Engineering**

**Subject Name: Basic Automobile Engineering**

**Subject Code: AU-304**

**Time: 1 Hr**

**Max Marks: 20**

**PART-A**

**Short answers questions**

**Answer All Questions. Each question carries ONE mark**

**4 x1 = 4 Marks**

1. Define Automobile?
2. Define Ground clearance?
3. Draw diagram of connecting rod and label the parts?
4. List the materials used for manufacturing of any four Engine components?

**PART-B**

**Essay type questions**

**Answer any TWO Questions by choosing either (a) or (b) from each question.**

**Each question carries THREE marks**

**2 x 3 = 6 Marks**

5. (a) Name the types of valve arrangements in I.C Engines?
5. (b) Sketch and explain theoretical valve timing diagram of a 4-stroke diesel engine?
6. (a) Explain the constructional details of Piston with a diagram?
6. (b) What is firing order? Mention firing order of four cylinders Engine?

**PART-C**

**Application type questions**

**Answer any TWO Questions by choosing either (a) or (b) from each question.**

**Each question carries FIVE marks**

**2 x 5 = 10 Marks**

7. (a) Explain any one type of Muffler used in a four wheeler?
7. (b) Draw and explain theoretical and actual valve timing diagrams of a four stroke petrol Engine?
8. (a) Sketch and explain the constructional details including materials used and manufacturing method of Crankshaft for a four cylinder Engine?
8. (b) With the aid of a sketch explain the constructional details including materials used and manufacturing method of a piston?

**(Model Question Paper)**

**Mid Term –I**

**C-21, Diploma in Automobile Engineering**

**Subject Name: Basic Automobile Engineering**

**Subject Code: AU-304**

**Time: 1 Hr**

**Max Marks : 20**

**PART-A**

**Short answers questions**

**Answer All Questions. Each question carries ONE mark**

**4 x1 = 4 Marks**

1. Define fuel?
2. Define calorific value?
3. Draw line diagram of Petrol Engine fuel supply system and label the parts?
4. What is the function of Clutch?

**PART-B**

**Essay type questions**

**Answer any TWO Questions by choosing either (a) or (b) from each question.**

**Each question carries THREE marks**

**2 x 3 = 6 Marks**

5. (a) Classify fuels and list the properties?
5. (b) Classify carburetors and explain their features?
6. (a) Explain working principle of hydraulically operated clutch?
6. (b) With the aid of a sketch explain working principle of vacuum operated clutch?

**PART-C**

**Application type questions**

**Answer any TWO Questions by choosing either (a) or (b) from each question.**

**Each question carries FIVE marks**

**2 x 5 = 10 Marks**

7. (a) Explain working of camshaft driven fuel pump used in petrol Engines?
7. (b) Draw the line diagram of a simple carburetor and explain constructional details and its working?
8. (a) Explain the working of a single plate clutch with the aid of a sketch?
8. (b) Sketch and explain the working of a multi plate clutch?

**SEMESTER END EXAMINATION**  
**MODEL QUESTION PAPER**  
**C-21, DIPLOMA IN AUTOMOBILE ENGINEERING**  
**Subject Name: Basic Automobile Engineering**  
**Subject Code: AU-304**

**Time: 2hrs**

**Max Marks: 40**

**PART-A**

**Answer all Questions. Each question carries One mark**

**8 x 1 = 8Marks**

1. Define 'Compression ratio'?
2. Name any eight engine components you know?
3. Expand S.A.E and A.P.I?
4. What is the function of a 'Flywheel'?
5. State any two functions of a frame?
6. List the loads acting on a frame?
7. Name the types of additives used for synthetic lubricants?
8. What are the types of lubricating systems used for lubricating of engine?

**PART-B**

**i. Choose either (a) or (b) from each question.**

**ii. Answer any FOUR questions**

**4 x 3 = 12 Marks**

9. (a) What is 'firing order'? Mention the firing order of six cylinders 'In-line engine'?
9. (b) State the use of 'Break down service vehicle'?
10. (a) Explain how 'Octane rating' is given to a sample of gasoline fuel?
10. (b) List the properties required for a lubricant?
11. (a) State any six requirements of a vehicle body?
11. (b) Explain constructional details of unitized type body?
12. (a) Which grade of lubricating oil is used for a gear box and narrate the process of lubrication in a gear box?
12. (b) Explain the necessity of engine cooling system?

**PART-C**

**i. Choose either (a) or (b) from each question.**

**ii. Answer any FOUR questions**

**4 x 5 = 20 Marks**

13. (a) Sketch and explain the valve timing diagrams of a four stroke diesel engine?
13. (b) Explain the constructional details of 'Non load carrying frame' with a diagram?
14. (a) With the aid of a diagram explain the working of a 'Single plate Clutch'?
14. (b) Draw a neat diagram of wet sump system of lubrication system and narrate the

process of lubricating various parts of an engine?

15. (a) Explain the salient features of any five 'Private vehicle bodies' with the aid of sketches?
15. (b) List any six types of Special purpose vehicles and explain the features and facilities provided in an ambulance with a sketch?
16. (a) Draw a neat diagram of dry sump system of lubrication system, state where this system is used and compare with the wet sump system of lubrication?
16. (b) Sketch the forced feed cooling system; describe the constructional details and explain its working?

### AU-305- BASICS OF HEAT TRANSFER AND THERMODYNAMICS

Course Title	Basics of Heat Transfer and Thermodynamics	Course Code	AU-305
Semester	III	Course Group	Core
Teaching Scheme in Periods (L:T:P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Hours	75
CIE	20+20+20 = 60 Marks	SEE	40 Marks

#### Pre requisites

This course requires the basic knowledge of Basic Physics and Mathematics at Secondary school level

#### Course Content and Blue Print of Marks for SEE

S. No	Unit Name	Questions for SEE				Periods	
		R		U	A		
1	Basic Heat Transfer and Thermodynamics	4	1		9(a)	13(a)	12
2	Laws of perfect gases						08
3	Thermodynamic Processes		2		10(a)	14(a)	12
4	Air Standard Cycles						10
5	Fuels and combustion		3	5, 6	9(b)	13(b)	08
					11(a)	15(a)	
				11(b)	15(b)		
6	Performance of I.C Engines		7,8	10(b)	14(b)	10	
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8	60	

Legend	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks



## Course Outcomes

On successful completion of the course student should able to:

CO1 :	Summarize the basic concepts of Heat Transfer and Thermodynamics.
CO2 :	Explain the basic behavior of gases.
CO3 :	Outline the processes required for energy conversion from heat to work, to build a thermodynamic cycle.
CO4 :	Identify the importance of Air standard cycles, to appraise the theoretical performance of a cycle and to Compare the performance of various cycles for energy production.
CO5 :	Explain the basics of combustion of fuel and energy liberation
CO6 :	Evaluate the basic performance of an Internal combustion engine and to know about Mass and energy balance in Internal combustion engines.

## Course Content:

### UNIT- 1: Basics of Heat Transfer and Thermodynamics

**Duration: 16 Periods (L: 10– T: 6)**

Different forms of energy – Heat energy – Modes of heat transfer – Governing equations of heat transfer

Definitions of Thermodynamics: System - Boundary, Surrounding, Working medium, -Types of thermodynamic systems – Open, Closed and isolated systems with examples- Properties of a system- Intrinsic and Extrinsic properties with examples - State of a system -Definitions for properties like Pressure, Absolute Pressure, Volume, Specific Volume, Temperature , Absolute Temperature - Forms of Energies - Heat , Specific heat, Specific heats of a gas, - Thermodynamic work , Internal energy , Enthalpy and their units – Concept of thermodynamic Process, Change in state, Path, Reversible Process, Irreversible Process – Thermodynamic cycle - Definitions for Quasi-static Process, Flow-work, Non-Flow work, Steady flow energy equation -Zeroth, First, Second laws of thermodynamics(Statements only), Simple problems on conversion of Heat into Work and vice versa - Simple problems of elementary type on Steady flow energy equation.

**UNIT-2: Laws of perfect gases****Duration: 12 Periods (L: 8– T: 4)**

Definition of Perfect gas - Brief explanation of perfect Gas Laws – Boyle's law, Charles's Law – Avagadro's law, Joule's law and Regnault's law- Derive characteristic gas equation - Universal gas constant, Gas constant and their relationship with molecular weight of a gas - Universal gas equation- Reasons for two Specific heats for a gas- Derivation for the relationship between the two specific heats of a gas and the gas constant - Simple problems.

**UNIT-3: Thermodynamic Processes****Duration: 14 Periods (L: 8 – T: 6)**

Types of thermodynamic processes - Isochoric, Isobaric, Isothermal, Isentropic, Polytropic and throttling processes– Concept of Entropy – Derivations for P,V,T relations, Heat Transfer, Work Transfer, Change in Enthalpy, Change in Internal Energy, Change in entropy during these processes-Simple problems on the above processes.

**UNIT – 4: Air Standard Cycles****Duration: 10 Periods (L: 8– T: 2)**

Definition of Air standard cycles -Applications - Reversible and Irreversible cycles – Assumptions made for Air Standard Cycles –Representation of Carnot cycle, Otto cycle and Diesel cycles on P-V and T-S Diagrams, the Description of the cycle and Derivation for Efficiency of these cycles- Reasons for the highest efficiency of Carnot cycle over other cycles working between same temperature limits–Simple Problems.

**UNIT -5: Fuels and Combustion****Duration: 11 Periods (L: 8– T: 3)**

Combustion of fuel - Dulong's formula for calculating Heating value for given Composition of Fuel - Bomb calorimeter - Junker's Gas calorimeter –Calculation of minimum air required for the complete combustion of unit mass/unit volume of fuel having a given composition – Products of combustion.

**UNIT - 6: Performance of I.C Engines****Duration: 12 Periods (L: 8 – T: 4)**

Need for Engine performance testing –Testing of I.C Engines: Using Rope Brake dynamometer, Morse Test - Mean effective Pressure- Indicated, Brake and Friction Power - Mechanical Efficiency, Thermal Efficiency and Volumetric Efficiency – Specific Fuel Consumption - Heat Balance- Problems pertaining to Performance of I.C Engines and Heat balance.

## Recommended Reference Books

- |  |                               |
|--|-------------------------------|
| 1. Thermal Engineering Vol-I & Vol-II      | - Mathur & Mehta              |
| 2. Heat Engines                            | - R. C. Patel & Karamchandani |
| 3. Internal Combustion Engine Fundamentals | - John.B.Heywood              |
| 4. Internal Combustion Engines             | - V Ganeshan                  |
| 5. Engineering Thermodynamics              | - P. K. Nag                   |
| 6. Engineering Thermodynamics              | - C. P. Arora                 |
| 7. Thermal Engineering                     | - R. S. Khurmi                |
| 8. Thermal Engineering                     | - Kumar & Vasundari.          |

## Suggested Learning Outcomes:

- 1.0 Basics of Heat Transfer and Thermodynamics
- 1.1 Define energy.
- 1.2 State the forms of energy.
- 1.3 List the modes of heat transfer.
- 1.4 Define the terms Conduction, Convection and Radiation.
- 1.5 State the Governing equations of Conduction, Convection and Radiation.
- 1.6 Define the various terms associated with the Thermodynamic System.
- 1.7 Name the types of thermodynamic Systems.
- 1.8 Explain the closed system with Examples.
- 1.9 Explain the open system with examples.
- 1.10 Explain the isolated system with Examples.
- 1.11 List the thermodynamic Properties of System.
- 1.12 Define the various thermodynamic properties.
- 1.13 Write examples for each type of property and its units of measurement.
- 1.14 Know the forms of energy transfers to and from a system.
- 1.15 Represent the state of a system on a P-V Diagram.
- 1.16 Define Process, Path, Reversible Process, Irreversible Processes and Thermodynamic cycle.
- 1.17 State the Zeroth law of thermodynamics.
- 1.18 State the first law of thermodynamics.
- 1.19 State the second law of thermodynamics.
- 1.20 Solve problems dealing with conversion of heat into work and vice-versa.
- 1.21 Write steady flow energy equation
- 1.22 Write Non-flow energy equation.

- 1.23 Solve simple problems on Heat to Work Conversions and Steady flow energy equation.
- 2.0 Laws of perfect gases**
- 2.1 Define the term 'Perfect Gas'.
- 2.2 State "Boyle's Law".
- 2.3 State "Charle's Law".
- 2.4 State "Avagadro's Law".
- 2.5 State "Regnault's Law".
- 2.6 State "Joule's Law".
- 2.7 Derive Characteristic gas equation
- 2.8 Write the Universal Gas Equation.
- 2.9 State relationship between characteristic gas constant, Universal gas constant and molecular weight.
- 2.10 Define "Specific heat at constant pressure" ( $C_p$ ).
- 2.11 Define "Specific heat at constant volume ( $C_v$ )".
- 2.12 Infer why gases have two specific heats
- 2.13 Derive the relationship connecting the  $C_p$ ,  $C_v$  and  $R$ .
- 2.14 Solve simple problems using gas laws.
- 3.0 Thermodynamic Processes**
- 3.1 List out the different thermodynamic processes.
- 3.2 Derive  $P, V, T$  relations, Heat Transfer, Work Transfer, Change in Enthalpy, Change in Internal Energy, Change in Entropy in Iso-choric process.
- 3.3 Derive  $P, V, T$  relations, Heat Transfer, Work Transfer, Change in Enthalpy, Change in Internal Energy, Change in Entropy in Iso-baric process.
- 3.4 Derive  $P, V, T$  relations, Heat Transfer, Work Transfer, Change in Enthalpy, Change in Internal Energy, Change in Entropy in Iso-Thermal process.
- 3.5 Derive  $P, V, T$  relations, Heat Transfer, Work Transfer, Change in Enthalpy, Change in Internal Energy, Change in Entropy in Isentropic process.
- 3.6 Derive  $P, V, T$  relations, Heat Transfer, Work Transfer, Change in Enthalpy, Change in Internal Energy, Change in Entropy in Polytropic process.
- 3.7 Infer that Isothermal process is the same as hyperbolic process for gases.
- 3.8 Justify that work done in throttling process is Zero.
- 3.9 Sketch  $P-V$  and  $T-S$  diagrams for the above thermodynamic processes.
- 3.10 Solve simple problems on these thermodynamic processes.
- 4.0 Air standard cycles.**
- 4.1 Define the term 'Air Standard cycle'

- 4.2 Define the terms 'Reversible Cycle' and 'Irreversible Cycle'
- 4.3 State the assumptions made for Air Standard cycles.
- 4.4 Explain Carnot Cycle with the help of P -V and T-S diagrams.
- 4.5 Derive the formula for the air standard efficiency of Carnot cycle.
- 4.6 Solve simple problems on Carnot Cycle.
- 4.7 Explain Otto Cycle with the help of P-V and T-S diagram.
- 4.8 Derive the formula for air standard Efficiency of an Otto Cycle.
- 4.9 Solve simple problems on Otto Cycle.
- 4.10 Explain Diesel cycle with the help of P-V and T-S diagram.
- 4.11 Derive the formula for Air Standard Efficiency of Diesel Cycle.
- 4.12 Solve the simple problems on Diesel Cycles.
- 4.13 State the Reason for the highest efficiency of Carnot cycle over other cycles working between same temperature limits.

## **5.0 Fuels and Combustion**

- 5.1 Know different analysis of fuel – Ultimate and Proximate analysis.
- 5.2 Estimate calorific value of fuel from Dulong's formula.
- 5.3 Compare solid, liquid and gaseous fuels.
- 5.4 Know the components of a Bomb calorimeter, to explain the sequence of procedure for determination of calorific value using Bomb Calorimeter for a given liquid or solid fuel.
- 5.5 Know the components of a Junker's gas calorimeter, to explain the sequence of procedure for determination of calorific value using Junker's gas calorimeter.
- 5.6 Define combustion of fuel.
- 5.7 Know the expression for minimum air required for complete combustion of a given fuel.
- 5.8 Know the products of combustion.

## **6.0 Performance of I.C Engines**

- 6.1 Define I.P, B.P and F.P
- 6.2 Define Indicated mean effective pressure and Brake mean effective pressure.
- 6.3 Compute I.P, B.P and F.P
- 6.4 Compute Mechanical efficiency, Indicated and Brake Thermal Efficiency and Volumetric Efficiency.
- 6.5 Compute Indicated and Brake Specific Fuel consumption.
- 6.6 Prepare Heat Balance sheet for a given test result of an I.C. engine.

### Suggested Student Activities:

1. Demonstrate the Concept of Zeroth law of thermodynamics using a glass tube mercury thermometer.
2. List the combustion products of an automobile engine and their effects on human health.
3. Compare Brake Power of two wheelers engines of same cubic capacity.
4. Prepare a data sheet for comparing Brake Power of four wheelers engines of same cubic capacity.
5. Quiz on energy and its conservation.
6. Group discussion responsibility of engineers in building the society.
7. Prepare a leaflet narrating the effects of vehicular pollutants on the environment.
8. Group discussion on energy addition to the universe.

### Suggested E-Learning references:

1. [www.sae.org](http://www.sae.org)
2. [www.nptel.ac.in](http://www.nptel.ac.in)
3. Introduction to Heat Transfer:  
<https://www.youtube.com/watch?v=ObwHydso4JY>
4. Heat Transfer [Conduction, Convection, and Radiation]:  
<https://www.youtube.com/watch?v=kNZi12OV9Xc>
5. Heat Transfer - Conduction, Convection, and Radiation:  
<https://www.youtube.com/watch?v=bRZwzy0xvhM>
6. Introduction and fundamental concepts of thermodynamics:  
<https://www.youtube.com/watch?v=9GMBpZZtjXM>
7. Introduction to thermodynamics and fundamental concepts:  
<https://www.youtube.com/watch?v=9GMBpZZtjXM&list=PLD8E646BAB3366BC8>
8. Zeroth Law of thermodynamics and fundamental concepts:  
<https://www.youtube.com/watch?v=xQwi9fveGTQ&index=2&list=PLD8E646BAB3366BC8>
9. First Law of Thermodynamics and its applications:  
<https://www.youtube.com/watch?v=sUDfpFD0xX4&index=4&list=PLD8E646BAB3366BC8>
10. Heat and Thermodynamic Work:  
<https://www.youtube.com/watch?v=-42JmVBdlM4>
11. 1<sup>st</sup> Law of Thermodynamics:  
<https://www.youtube.com/watch?v=lbPEaaKiCww>
12. 2<sup>nd</sup> Law of Thermodynamics:  
<https://www.youtube.com/watch?v=gg-dlrXxzI>
13. Boyle's Law:  
<https://www.youtube.com/watch?v=Xto88gMmDzw>
14. Charle's Law:  
<https://www.youtube.com/watch?v=7ZpuMBkf1Ss>

15. Gay Lussac's Law:  
<https://www.youtube.com/watch?v=0Oq7bCSDPxE>
16. Carnot Cycle:  
<https://www.youtube.com/watch?v=pucd2b7jZJw>
17. Otto Cycle:  
<https://www.youtube.com/watch?v=K8RzTmeVWfM>
18. Diesel Cycle:  
<https://www.youtube.com/watch?v=fyadfj7NQqI>
19. Diesel Cycle and Limited Pressure cycle:  
<https://www.youtube.com/watch?v=YNGtJo-VspE>
20. Bomb Calorimeter:  
<https://www.youtube.com/watch?v=NG41IbDtd44>
21. Junkers' Gas Calorimeter:  
<https://www.youtube.com/watch?v=HeofLEQ6wuA>

### CO PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching Periods
CO1	Summarize the basic concepts of Heat Transfer and Thermodynamics.	R,U	2,3,5,6	16
CO2	Explain the basic behavior of gases.	R,U	2,3,5,6	12
CO3	Outline the processes required for energy conversion from heat to work, to build a thermodynamic cycle.	R,U,A	2,3,5,6	14
CO4	Identify the importance of Air standard cycles, to appraise the theoretical performance of a cycle and to Compare the performance of various cycles for energy production.	R,U,A	2,3,5,6,7	10
CO5	Explain the basics of combustion of fuel and energy liberation	R,U,A	2,3,5,6	11
CO6	Evaluate the basic performance of an Internal combustion engine and to know about Mass and energy balance in Internal combustion engines.	R,U,A	2,3,5,6	12

**Blue Print of Continuous Internal Evaluation (CIE):**

<b>MID SEM –I EXAM</b>					<b>Max.Marks: 20</b>
<b>S.No</b>	<b>Unit Name</b>	<b>R</b>	<b>U</b>	<b>A</b>	<b>Remarks</b>
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
<b>MID SEM –II EXAM</b>					<b>Max.Marks: 20</b>
<b>S.No</b>	<b>Unit Name</b>	<b>R</b>	<b>U</b>	<b>A</b>	<b>Remarks</b>
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

**R-Remembering, U-Understanding, A- Application type questions each carrying 1, 3 and 5 Marks respectively.**

<b>Internal Assessment:</b>		<b>Max.Marks : 20</b>
<b>S.No</b>	<b>Type of Test</b>	<b>Marks</b>
1	Slip Test -1	5
2	Slip Test - 2	5
3	Assignment	5
4	Seminar	5



**MODEL QUESTION PAPER: MID SEM - I**  
**C-21, DIPLOMA IN AUTOMOBILE ENGINEERING**

**Subject Name: Basics of Heat Transfer and Thermodynamics, Subject Code: AU-305**  
**Time: 1 Hour** **Max.Marks: 20**

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**PART-A**

**Answer all questions. Each question carries ONE mark**

**4 x 1 = 4 Marks**

1. Define 'Thermodynamic System' and 'Surrounding'?
2. Define 'Process and Path'?
3. State Boyle's Law?
4. What is Gas Constant, how it is related to Universal Gas Constant?

**PART-B**

**Answer any TWO Questions by choosing either (a) or (b) from each question.**

**Each question carries THREE marks**

**2 x 3 = 6 Marks**

5. (a) Explain Reversible and Irreversible Processes?
5. (b) State and explain both the statements of Second Law of Thermodynamics with necessary sketches?
6. (a) Derive the relationship between the two specific heats of a gas and the gas constant?
6. (b) Infer why gases have two specific heats?

**PART-C**

**Answer any TWO Questions by choosing either (a) or (b) from each question. Each**

**question carries FIVE marks**

**2 x 5 = 10 Marks**

7. (a) A fluid is confined in a cylinder by a spring loaded, frictionless piston so that the pressure in the fluid is a linear function of the volume as  $p = a + b.V$ . If the fluid changes from the initial state of 170 kPa,  $0.03 \text{ m}^3$  to final state of 400 kPa,  $0.06 \text{ m}^3$  with no work other than that done by the piston. Find the direction and magnitude of the work?
7. (b) In a steady-flow open system, a fluid substance flows at the rate of 4 kg/s. It enters the system at a pressure of  $600 \text{ kN/m}^2$ , a velocity of 220 m/s, internal energy  $2200 \text{ kJ/kg}$  and specific volume  $0.42 \text{ m}^3/\text{kg}$ . It leaves the system at a pressure of  $150 \text{ kN/m}^2$ , a velocity of 145 m/s, internal energy of  $1650 \text{ kJ/kg}$  and specific volume  $1.5 \text{ m}^3/\text{kg}$ . During its passage through the system, the substance has a loss by heat transfer of  $40 \text{ kJ/kg}$  to the surroundings. Determine the power of the system, stating whether it is from or to the system. Neglect any gravitational potential energy?
8. (a) A mass of air has an initial pressure of  $1.3 \text{ MN/m}^2$ , Volume of  $0.014 \text{ m}^3$  and temperature  $135^\circ\text{C}$ . It is expanded until its final pressure is  $275 \text{ kN/m}^2$  and its volume becomes  $0.056 \text{ m}^3$ . Determine (a) Mass of air (b) Final temperature of air. ?
8. (b) Derive the relationship between characteristic gas constant (R), Universal gas constant (G) and molecular weight (M).

**MODEL QUESTION PAPER: MID SEM - II**  
**C-21, DIPLOMA IN AUTOMOBILE ENGINEERING**

**Subject Name: Basics of Heat Transfer and Thermodynamics, Subject Code: AU-305**  
**Time: 1 Hour** **Max.Marks: 20**

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**PART-A**

**Answer all questions. Each question carries ONE mark** **4 x 1 = 4 Marks**

1. Represent Adiabatic Process on P-V and T-S diagrams?
2. What is 'Throttling Process'?
3. Define 'Air Standard Cycles'?
4. Write any two assumptions made for Air standard Cycles?

**PART-B**

**Answer any TWO Questions by choosing either (a) or (b) from each question.**  
**Each question carries THREE marks** **2 x 3 = 6 Marks**

5. (a) Deduce the P,V,T relations for an Iso-Thermal Process?  
(b) Derive the equation for work done in constant pressure process?
6. (a) Show a Carnot Cycle on P-V and T-S diagrams and list the processes in the cycle?  
(b) State the reason for highest efficiency of Carnot cycle over other cycles working between same temperature limits.

**PART-C**

**Answer any TWO Questions by choosing either (a) or (b) from each question. Each question carries FIVE marks** **2 x 5 = 10 Marks**

7. (a) Derive equations for P,V,T relations, Work transfer, Heat Transfer, Change in Enthalpy and Change in Internal Energy for an Adiabatic Process?
7. (b) From measurements taken from two points on the compression curve of an oil engine indicator diagram the following are recorded.  
(i) Pressure 140 kN/m<sup>2</sup>, Volume 12 litres  
(ii) Pressure 2.8 MN/m<sup>2</sup>, Volume 2.01 litres  
Determine the index 'n' for the curve between the two points and hence calculate the work between points. Assuming the temperature of 100°C at first point, calculate the temperature at the second point and hence find the change of internal energy between two points. Take R = 0.287 kJ/kg K ; C<sub>v</sub> = 0.717 kJ/kg K.
8. (a) Explain an Otto cycle on P-V and T-S diagrams and also deduce the equation for efficiency of the cycle?
8. (b) Explain an Diesel cycle on P-V and T-S diagrams and also deduce the equation for efficiency of the cycle?

## SEMESTER END EXAMINATION MODEL QUESTION PAPER

### C-21, DIPLOMA IN AUTOMOBILE ENGINEERING

Subject Name: Basics of Heat Transfer and Thermodynamics, Subject Code: AU-305

Time: 2 hrs

Marks: 40

#### PART-A

Answer all Questions. Each question carries One mark

8 x 1 = 8Marks

1. Define 'Thermodynamic State' and 'Thermodynamic Process'?
2. Represent Iso-Thermal Process on P-V and T-S diagrams?
3. Define Break Specific Fuel Consumption?
4. What is a 'Perfect Gas'?
5. Define a Fuel and Name any four fuels?
6. Define calorific/heating value?
7. Write the relation between I.P, F.P and B.P?
8. Define 'Mechanical Efficiency'?

#### PART-B

Answer any FOUR questions choosing either (a) or (b) from each question.

4 x 3 = 12 Marks

9. (a) 0.2 kg of gas is subjected to change of temperature from 288 K to 458 K at constant pressure. Find the heat transfer, change of internal energy and change of enthalpy? Assume  $C_p = 1.0 \text{ kJ/kg K}$  and Adiabatic index = 1.4
9. (b) Find the higher calorific value of the fuel whose composition by mass is as follows: Carbon = 91%, Hydrogen = 3%, Sulphur = 0.8%, the reminder is ash?
10. (a) List various thermodynamic Processes?
10. (b) Explain the need of Engine performance Test?
11. (a) Calculate the minimum air required for complete combustion of 1 kg of carbon.
11. (b) Compare solid and gaseous fuels in three aspects?
12. (a) What is Heat balance sheet?
12. (b) Define volumetric efficiency and Thermal efficiency?

#### PART-C

Answer any FOUR questions choosing either (a) or (b) from each question.

4 x 5 = 20 Marks

13. (a) In a steady-flow open system, a fluid substance flows at the rate of 4 kg/s. It enters the system at a pressure of  $600 \text{ kN/m}^2$ , a velocity of 220 m/s, internal energy  $2200 \text{ kJ/kg}$  and specific volume  $0.42 \text{ m}^3/\text{kg}$ . It leaves the system at a pressure of  $150 \text{ kN/m}^2$ , a velocity of 145 m/s, internal energy of  $1650 \text{ kJ/kg}$  and specific volume  $1.5 \text{ m}^3/\text{kg}$ . During its passage through the system, the substance has a loss by heat transfer of 40 kJ/kg to the surroundings. Determine the power of the system, stating whether it is from or to the system. Neglect any gravitational potential energy?
13. (b) Describe the procedure for determination of calorific value of a given solid fuel of known mass using bomb calorimeter.
14. (a) A diesel engine has a compression ratio of 1.4 and expansion ratio of 8. Find its air standard efficiency and heat supplied, if the net work done is 340 kJ?
14. (b) The following data refers to a test on a petrol engine. Indicated Power = 30 kW, Brake power = 26 kW, Engine speed = 1800 RPM, Brake specific fuel consumption =  $0.35 \text{ kg/kWh}$ , Calorific value of fuel =  $44100 \text{ kJ/kg}$ . Calculate Mechanical Efficiency, Indicated thermal efficiency and Brake thermal efficiency?

15. (a) With the aid of a neat diagram explain the procedure for finding the heating value of a gaseous fuel using Junker's Gas Calorimeter?
15. (b) The composition of a fuel on mass basis is as follows: C=90%, H<sub>2</sub>=3.5%, O<sub>2</sub>=1%, S=0.5% and Ash=5%. Calculate,
- (i) Min air required for complete combustion of 1 kg of this fuel.
  - (ii) The composition of dry flue gases on mass basis if 50% excess air is supplied.
16. (a) Explain the procedure for preparation of heat balance sheet for an I.C. Engine.
16. (b) A single cylinder diesel engine yielded the following data after a performance test
- i. Fuel consumption = 10.5 kg/hr
  - ii. Calorific value = 43000 kJ/kg
  - iii. Mass of air consumption = 3.6 kg /min
  - iv. Speed = 2000 rpm
  - v. Brake torque produced = 190 N-m
  - vi. Mass of Coolant used = 15.5 kg/min
  - vii. Temp rise of coolant = 32°C
  - viii. Exhaust gas temperature = 400°C
  - ix. Room Temperature = 24°C
  - x. Cp for exhaust gases = 1.18 kJ / kg.K

Calculate the data required and draw up heat balance sheet.

### ME-306 MACHINE DRAWING

Course title	Machine Drawing	Course Code	ME-306
Semester	III	Course group	Core
Teaching scheme in periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecturer + Practice	Total contact periods	45
CIE	60 Marks	SEE	40 Marks

**PRE REQUISITES:** This course requires the knowledge of Engineering Drawing

**COURSE OUTCOMES:** On successful completion of the course, the students will be able to

<b>CO1</b>	Understand the machine drawing.
<b>CO2</b>	Understand need and application of different types of fasteners and draw according to specifications, keys and cotter joints welded joints, piping layout and riveted joints as per IS standards.
<b>CO3</b>	Understanding and draw various Welding symbols
<b>CO4</b>	Understand various pipe fittings and layouts
<b>CO5</b>	Proficiency In reading and interpret various drawings of a component and understand the concepts of Assembly drawings

### BLUE PRINT OF MARKS FOR SEMESTER END EXAM

Unit No.	Unit Name	Periods	Questions for SEE			Remarks
			R	U	A	
1	Introduction and fastening devices	8		Q.No.1,2		
2	Pipe Layouts and Welding symbols	7		Q.No.3,4		
3	ASSEMBLY-I Assembly drawings of cotter joint, Gib and Cotter joint, Knuckle Joint, Muff coupling, universal coupling, Flange couplings, Screw Jack, Stuffing Box	15			Q.No.5	
4	ASSEMBLY –II Assembly Drawings of Bearings (Foot step Bearing, Plummer block), cross Head, connecting rod, Eccentric, lathe tail stock	15			Q.No.6	
<b>TOTAL</b>		<b>45</b>		<b>4</b>	<b>2</b>	

## **COURSE CONTENT**

### **1.0 Introduction**

Importance of Machine Drawing - Brief revision of 1<sup>st</sup> and 3<sup>rd</sup> angle projections - Understand the concepts of Orthographic projections and Sectional views.

#### **Fastening Devices**

Temporary and Permanent fastenings and their areas of application-thread nomenclature, forms of screw thread profiles, metric, B.A., Acme, Knuckle, etc.

*Bolts and Nuts:* Specification of bolts and nuts, different types of bolted joints (through bolts, studs, screws etc.) in different applications. Purpose of lock nuts and their types

*Keys and cotters:* Types of keys and cotters: Difference between key and cotter uses.

*Rivets and Riveted joints:* Types and proportions and specification of rivets: Different types of riveted joints: Lap, butt-single row, double row etc., chain and zigzag riveting – calculation of diameter of rivet: Pitch and arrangement of rivets in row – use – of standard proportions.

*Welded joints* and types. Pipe Joints

#### **Exercises: 1**

1. Thread Nomenclature and forms of screw thread profiles.
2. Exercises in drawing – bolted connections using standard proportions.
3. Drawing of various types of lock nuts & types of keys indicating their proportionate dimensions.
4. Exercise in drawing riveted joints using standard proportions: Single row, double row (chain and zigzag) in lap and butt joints (single & double strap).

### **2.0 Piping layouts**

Classification of pipes and tubes- Components of pipes lay-out.-Screw fitting bend, elbow, tee, lateral Cross-nipple, reducing socket and plug - Unions: Screwed ground and flanged - Valves: Gate valve: angle valve, check valve - Various conventional symbol used for the above components.

#### **Exercise: 2**

1. Single line diagram of pipe layout one exercises.
2. Double line diagram of pipe layout one exercise.

#### **Welded fabrication drawings**

Different types of weld and their basic symbols including sectional representation as per table of I.S. standards, fillet, square butt, single V-Butt, double V-Butt, single bevel butt, double bevel butt, stud, bead (edge or seal) spot, seam. - Elements of welding

symbol and their standard location the symbol as per IS standards reference code arrow head, weld symbol supplementary symbol dimensions of welds, method of welding process, special reference - Significance of arrow & position of arrow head significance of reference line as per I.S. standards with reference to fillet, V-Butt and stud welds.

Supplementary symbols and special instructions: surface of reference line; as per I.S. standards with reference to fillet, V-Butt and stud welds.- Dimensions of welds: length, location and spacing of welds as per I.S., B.I.S., standards with showing dimensions required on a welding - Need of special reference.

### **Exercise: 3**

1. Drawing tables and figs. Referred in the contents above taking from I.S. standards.
2. Dimensioning a given welding drawings as per I.S., SP-46-1988.
3. Preparing working drawing of welding fabrication from given data.

## **3.0 Assembly Drawings-I**

Need and functions of assembly and detailed drawings - Steps in preparing assembly drawings -. - Exercises in preparing assembly drawings of commonly available engineering components.

### **Exercise: 4**

**Draw the views / sectional views of**

1. Cotter joint
2. Jib and cotter joint assembly
3. Knuckle joint assembly
4. Assembly of muff coupling (solid & split) coupling, Flange couplings
5. Screw jack assembly
6. Stuffing box.

## **4.0 Assembly Drawings-II**

With the knowledge gained by the above exercises the students shall be able to draw exercises on bearings,

1. Protective type flanged coupling
2. Piston of petrol engine
3. Cross head
4. Connecting rod
5. Eccentric
6. flexible coupling
7. Lathe tool post
8. Foot step bearing

9. Plummer block
10. Lathe tail stock

### **REFERENCE BOOKS:**

1. T.S.M & S.S.M in respect of Technical Drawing by TTTI, Madras
2. Machine Drawing by A.C. Parkinson.
3. Machine Drawing by Jones & Jones.
4. Machine Drawing by N.D. Bhatt.

### **SUGGESTED LEARNING OUTCOMES:**

On the completion of the course the student should be able to

#### **1.0 Introduction & Fastening devices**

- 1.1 Know and draw Conventional representation of materials and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- 1.2 Know the standard specifications of Nuts & Bolts
- 1.3 Know the various temporary fastening devices
- 1.4 Know the various permanent fastening devices
- 1.5 Know the difference between Temporary and permanent joints
- 1.6 Know the standard representation of Internal and external threads of Bolts & Nuts
- 1.7 Understand the Standard proportions of various threads like V, ACME, Square, Metric , Knuckle etc.,
- 1.8 Know the standard designation and purpose of Locknut, washer, set screws.
- 1.9 Know the Applications of Keys, riveted joints
- 1.10 Understand the Standard proportions of various keys and cotters
- 1.11 Know the difference between Key & Cotter
- 1.12 Know different types of riveted joints and draw according to standard specifications

#### **2.0 Piping Layouts and Welded Joints**

- 2.1 Know the conventional symbols of various welded joints
- 2.2 Know the conventional symbols of various pipe joints.
- 2.3 Draw the Single line diagram of pipe layout
- 2.4 Know and draw Double line diagram of pipe layout

#### **3.0 Assembly drawings**

- 3.1 Know the need of assembly drawing
- 3.2 Know the functions of assembly drawing like manufacturing and functional requirements
- 3.3 Know the various steps in making assembly drawing like
  - Geometrical mapping
  - Dimensional mapping and
  - Functional matching



- 3.4 Study functional requirements of each component and their inter relationship
- 3.5 Study carefully the views of each component in the detail drawing and decide the relative location of each part for the proper functioning of the machine.
- 3.6 Decide the mating dimensions between two components which are required to be assembled
- 3.7 Know the use of bill of material and its designation

Course Outcomes		CL	Linked PO	Teaching Periods
<b>CO1</b>	Understand the machine drawing.	U/A	1,4,7	3
<b>CO2</b>	Understand need and application of different types of fasteners and draw according to specifications, keys and cotter joints welded joints, piping layout and riveted joints as per IS standards.	U/A	1,2,3,4,5,7	6
<b>CO3</b>	Understanding and draw various Welding symbols	U/A	1,4,7	3
<b>CO4</b>	Understand various pipe fittings and layouts	A	1,3,4,5,7	3
<b>CO5</b>	Proficiency In reading and interpret various drawings of a component and understand the concepts of Assembly drawings	U/A	1,2,3,4,7	30

#### CO-PO MAPPING MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
<b>CO1</b>	3	-	-	1	-	-	2
<b>CO2</b>	3	1	1	2	1	-	3
<b>CO3</b>	3	-	-	2	-	-	2
<b>CO4</b>	3	-	1	2	1	-	2
<b>CO5</b>	3	1	1	2	-	-	2

#### MID SEM-I EXAM

S.No.	Unit Name	R	U	A	Remarks
1	Unit-1		Q.No. 1,2,3		Answer any four questions
2	Unit-2		Q.No. 4,5,6		

#### MID SEM-II EXAM

S.No.	Unit Name	R	U	A	Remarks
1	Unit-3			Q.No. 1,2	Answer any one

**BOARD DIPLOMA EXAMINATIONS, (C-21)**

**CIE- MID SEM-I MODEL PAPER**

**MID –I MODEL PAPER**

**ME-306 MACHINE DRAWING**

**Time: 1 hr**

**Max.Marks:20**

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**Instructions:** Answer any **four** questions. Each question carries five marks      4 x 5=20

1. Draw the square thread profiles with proportions.
2. Draw the views of a square headed bolt.
3. Draw a hexagonal headed bolt with nut of 25 mm diameter.
4. Draw a double riveted lap joint connecting two plates of 6mm Thick.
5. Draw the symbols of the following welded joints.
  - a. Concave fillet weld
  - b. Single v-butt weld
  - c. Spot weld
  - d. Seam weld
  - e. Square butt weld
6. Draw the following piping joint symbols(single line)
  - a. T
  - b. Elbow
  - c. Gate valve
  - d. Lateral
  - e. Union

**BOARD DIPLOMA EXAMINATIONS, (C-21)**

**CIE- MID SEM-I MODEL PAPER**

**MID –II MODEL PAPER**

**ME-306 MACHINE DRAWING**

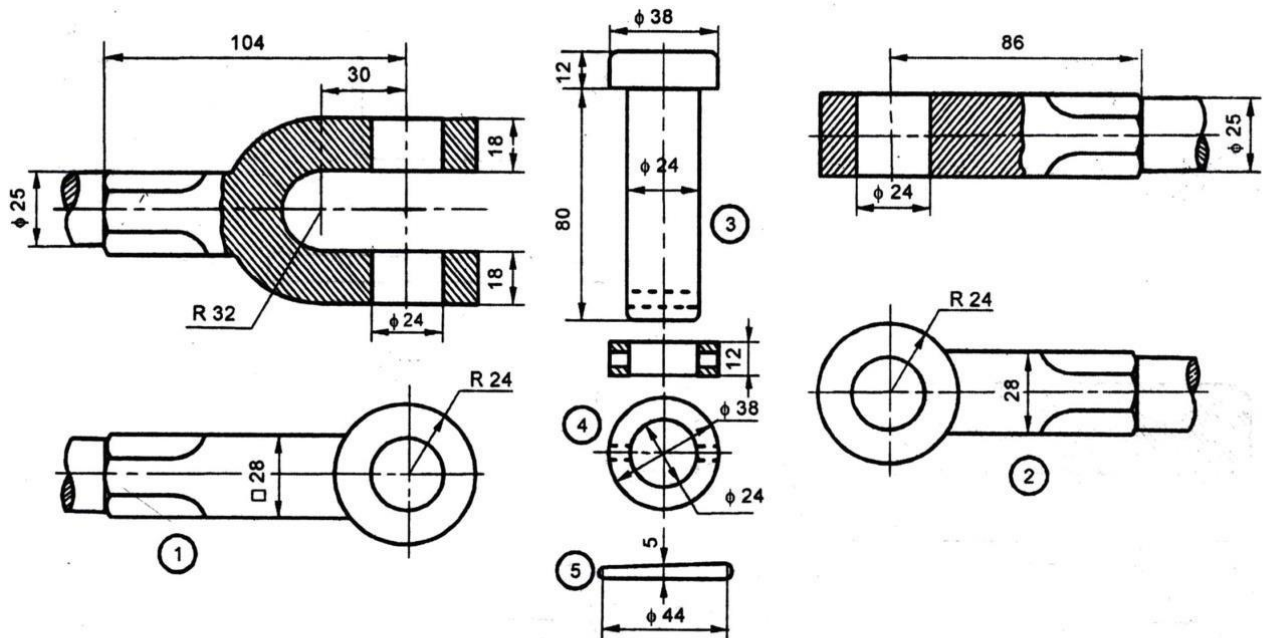
**Time: 1 hr**

**Max.Marks:20**

**Instructions:** Answer any **one** question. Each question carries twenty marks

1 x 20=20

1. Assemble all the parts of the knuckle joint and draw the sectional front view.

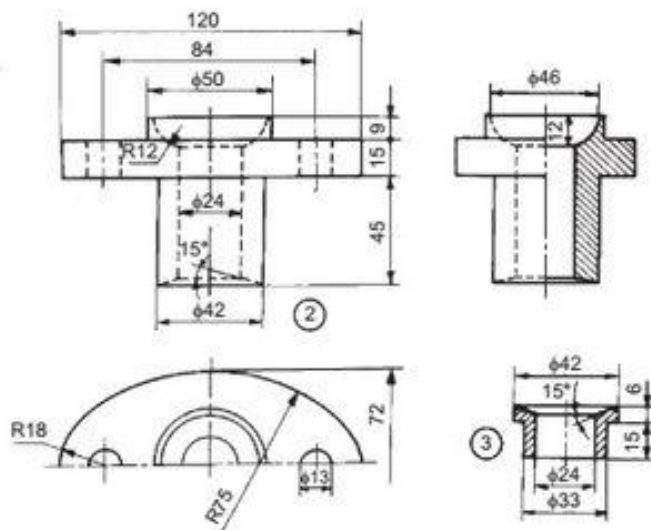
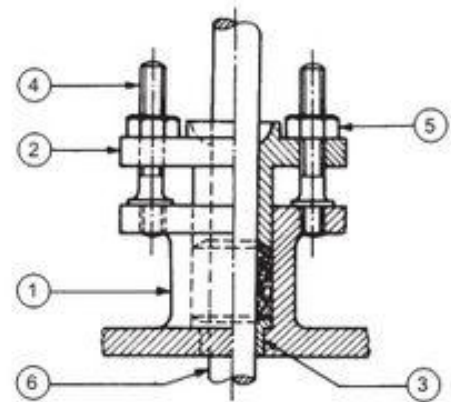
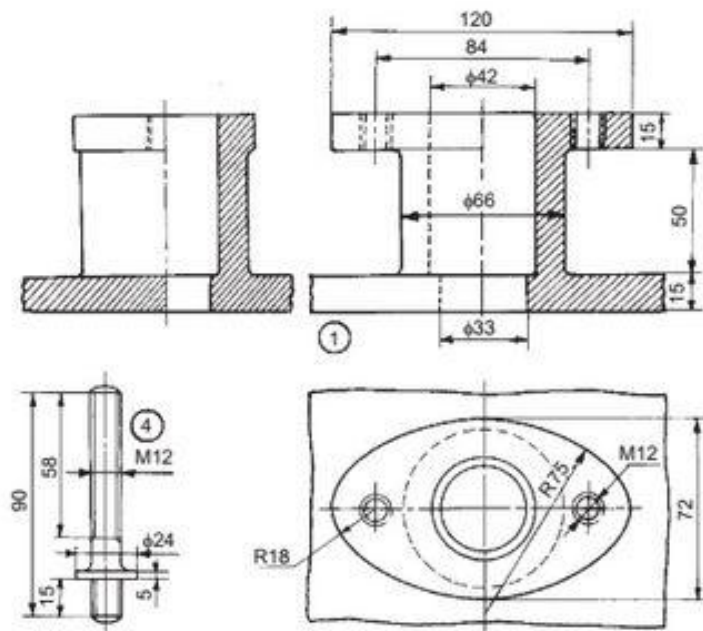


**Parts list**

No.	Name	Matl	Qty
1	Fork end	F S	1
2	Eye end	F S	1
3	Pin	M S	1
4	Collar	M S	1
5	Taper pin	M S	1

**KNUCKLE JOINT**

2. Study given part drawing of stuffing box and draw half sectional front view .



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Gland	Brass	1
3	Bush	Brass	1
4	Stud	MS	2
5	Nut, M12	MS	2

**SEMESTER END EXAMINATION MODEL QUESTION PAPER**  
**DME III ME-306 MACHINE DRAWING**

**Time: 2 hr**

**Max. Marks: 40**

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**PART-A**

3 X 4 = 12

**INSTRUCTIONS:** (1) Answer **ALL** questions

- (2) Each question carries three marks.
- (3) Answer should be neat & clear with all the necessary dimensions.
- (4) All dimensions are in 'mm'. Choose suitable scale

1. Draw the following thread profiles with proportions.  
(a) V threads                      (b) Square thread
2. Draw the views of a hexagonal headed bolt.
3. Draw a single riveted lap joint connecting two plates of 6mm Thick.
4. Draw the symbols of the following welded joints.  
(a) Concave fillet weld   (b) Double v-butt weld   (c) Spot weld  
(d) Seam Weld   (e) Square Butt Weld

**PART-B**

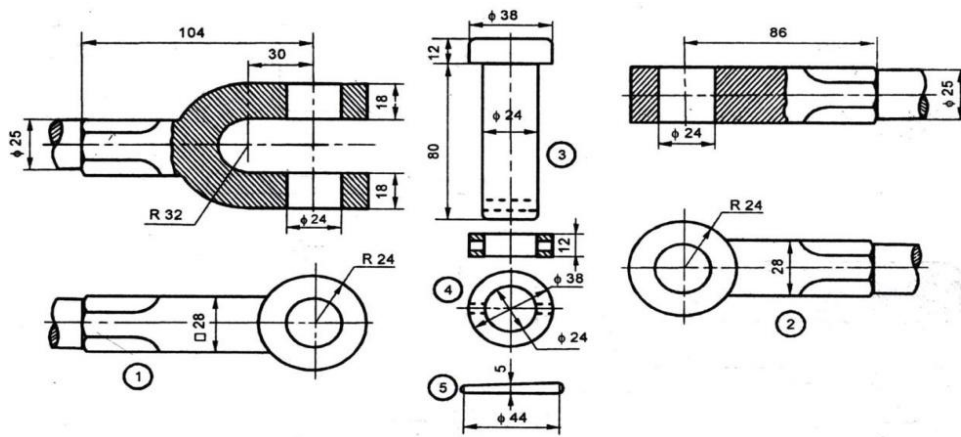
1 X 28 =

28

**INSTRUCTIONS:** (1) Answer any **ONE** question

- (2) Each question carries three marks.
- (3) Answer should be neat & clear with all the necessary dimensions.
- (4) All dimensions are in 'mm'. Choose suitable scale

5. Assemble all the parts of the **knuckle joint** and draw
  - a. Sectional front view
  - b. Top view

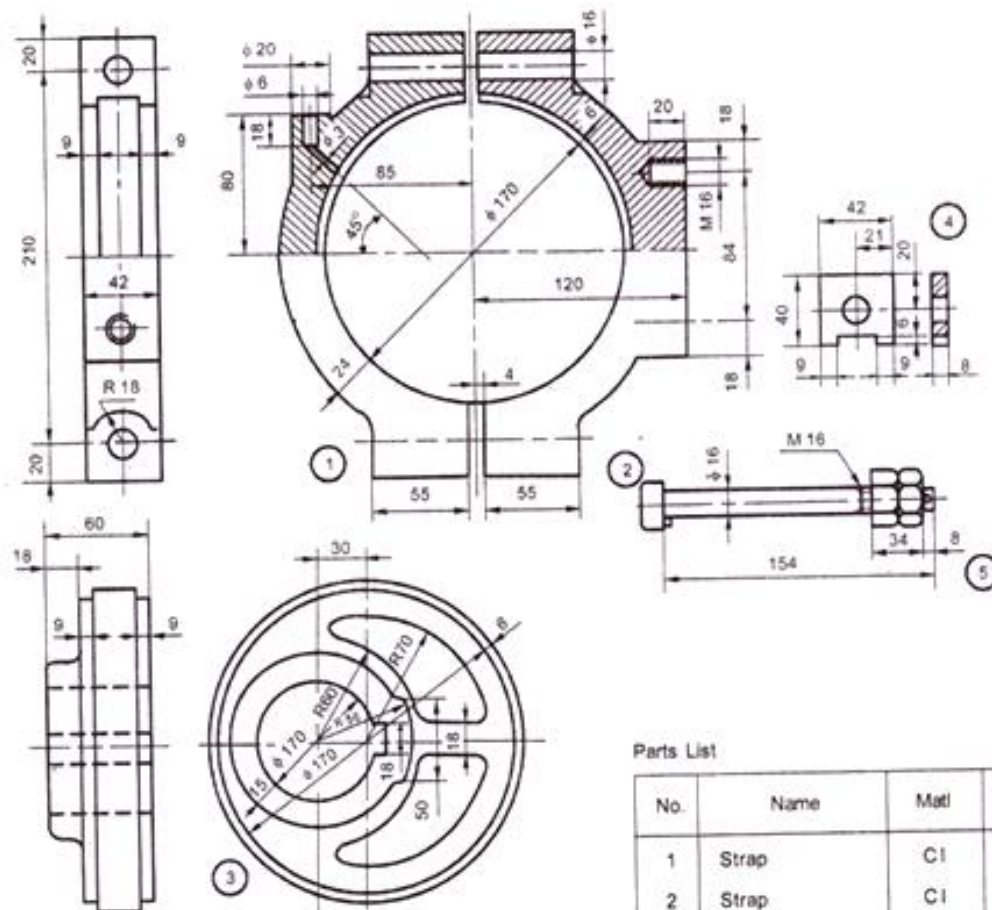


Parts list

No.	Name	Matl	Qty
1	Fork end	F S	1
2	Eye end	F S	1
3	Pin	M S	1
4	Collar	M S	1
5	Taper pin	M S	1

KNUCKLE JOINT

6. Assemble all the parts of the **eccentric** and draw the
- Half sectional front view (18 marks)
  - Right side View (10 marks)



Parts List

No.	Name	Matl	Qty
1	Strap	CI	1
2	Strap	CI	1
3	Sheave	CI	1
4	Shim	BRASS	2
5	Bolts with nuts	MS	2

## ME-307 BASIC MANUFACTURING & FABRICATION ENGINEERING LAB

Course Title	Basic Manufacturing & Fabrication Engineering Lab	Course Code	ME-307
Semester	III	Course Group	Core
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

**PRE REQUISITES:** This course requires the knowledge in basic manufacturing technology

### COURSE CONTENT:

At the end of the course, the student will have the ability to:

<b>CO1</b>	Understand integral parts of lathe and various accessories and attachments used.
<b>CO2</b>	Demonstrate machining skills with appropriate selection of tools and cutting parameters like cutting speed, feed and depth of cut for various machining operations on lathe.
<b>CO3</b>	Ability to perform certain lathe operations like Plain Turning, Step Turning, Taper Turning, Turning Collars, Knurling, Facing.
<b>CO4</b>	Understand different equipments, tools and accessories used in welding.
<b>CO5</b>	Basic knowledge in operating welding equipment and performing some welding operations.
<b>CO6</b>	Demonstrate the knowledge and necessary skills to perform sand preparation for moulds and making the moulds ready for casting operation.

### BLUE PRINT OF MARKS FOR SEE

Unit No	Unit name	Periods	Marks for SEE			Total Marks	%Weightage
			Handling	Manipulation	Precision		
1.	Hands on practice on Lathe	15	10	15	15	40	100
2.	Hands on practice in welding	15	10	15	15	40	100
3.	Hands on practice in foundry processes	15	10	15	15	40	100
<b>Total</b>		<b>45</b>					



## **COURSE CONTENT**

### **1 Foundry**

Preparation of sand Mould

- 1.1 V – Pulley
- 1.2 Gear pulley
- 1.3 Preparation of Core

### **2 Machine Shop (Turning)**

- 2.1 Facing, Plain Turning and knurling
- 2.2 Facing ,Step Turning and grooving
- 2.3 Facing, Taper Turning
- 2.4 Turning Collars

### **3. Welding**

- 3.1 Layout of Beads
- 3.2 Butt joints.
- 3.3 Lap joints.

**NOTE:** In foundry section a minimum of one demonstration per batch is to be conducted for casting involving melting, pouring and fettling

<b>Course Outcomes</b>		<b>Linked POs</b>
CO1	Understand integral parts of lathe and various accessories and attachments used.	1,2,3
CO2	Demonstrate machining skills with appropriate selection of tools and cutting parameters like cutting speed, feed and depth of cut for various machining operations on lathe.	1,2,3,7
CO3	Able to perform certain lathe operations like Plain Turning, Step Turning, Taper Turning, Turning Collars, Knurling, Facing.	1,2,3,7
CO4	Understand different equipments, tools and accessories used in welding.	1,2,3,7
CO5	Basic knowledge in operating welding equipment and performing some welding operations.	1,2,3,7
CO6	Demonstrate the knowledge and necessary skills to perform sand preparation for moulds and making the moulds ready for casting operation.	1,2,3,7

## CO-PO ATTAINMENT MATRIX

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	-	-	-	
CO2	3	3	3	-	-	-	2
CO3	3	3	3	-	-	-	2
CO4	3	3	3	-	-	-	2
CO5	3	2	3	-	-	-	2
CO6	3	3	3	-	-	-	2

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed

### SUGGESTED LEARNING OUTCOMES:

Up on the completion of the course the student shall able to

1. Practice the casting principles and operations in foundry
2. Write the sand moulding procedures in foundry.
3. Prepare a mould sand mix.
4. Identify various tools used in foundry shop.
5. Prepare mould in two boxes, three boxes.
6. Prepare a mould ready for casting with provision for runners, risers and gates
7. Place the cope over the drag without any mismatch
8. Prepare the molten metal and calculate the amount of metal to be poured in the mould
9. Core making and uses
10. Practice the operation of Lathe
11. Perform a plain turning operation on a lathe machine.
12. Select proper tool to perform the job.
13. Centre the job by dial gauge
14. Select the suitable speed for different operations
15. Use various measuring instruments for taking dimensions.
16. Perform step turning operation on lathe.
17. Calculate the taper angle.
18. Practice different taper turning methods on lathe
19. Turn the required tapers by swivelling the compound rest.
20. Produce articles of industrial application such as ring gauges, plug gauges, handle.
21. Tapper turning – Hands on experience in swivelling the compound rest method
22. Practice the joining of metals in Arc Welding, Gas welding, brazing

23. Prepare the edges for welding
24. Select the suitable electrode, voltage and current
25. Handle the Electrode Holder for laying welding beads.
26. Operate the welding transformer and generator.
27. Perform various weld joint operations.

### **Key Competencies to be achieved by the Student**

<b>Title of the Experiment</b>	<b>Key Competency</b>
Moulding and Casting of V – Pulley	<ul style="list-style-type: none"> <li>- Select the suitable sand and mix it for the mould</li> <li>- Cut gates and runners</li> <li>- Pour sufficient quantity of molten metal</li> </ul>
Moulding and Casting of Gear Pulley	<ul style="list-style-type: none"> <li>- Prepare and place the core</li> <li>- Cut the gates and runners</li> <li>- Pour the sufficient quantity of molten metal</li> </ul>
Preparation of core	<ul style="list-style-type: none"> <li>- Prepare suitable core sand mix</li> <li>- Select wooden mould box</li> <li>- Pour the core sand into the mould box and proper ramming of the sand</li> </ul>
Plain turning	<ul style="list-style-type: none"> <li>- Check the centering of the work piece using dial gauge</li> <li>- Fix the cutting tool at proper inclination</li> <li>- Select the suitable speed, feed and depth of cut for rough and finishing operations</li> <li>- Check the dimensions</li> </ul>
Step turning	<ul style="list-style-type: none"> <li>- Check the centering of the work piece using dial gauge</li> <li>- Fix the cutting tool at proper inclination</li> <li>- Select the suitable speed, feed and depth of cut for rough and finishing operations</li> <li>- Check the dimensions</li> </ul>
Taper turning	<ul style="list-style-type: none"> <li>- Just an introduction of 4 methods. Student is expected to show how they work on machine.</li> <li>- Hands on exposure to swiveling compound rest method</li> </ul>
Collar turning	<ul style="list-style-type: none"> <li>- Check the centering of the work piece using dial gauge</li> <li>- Fix the cutting tool at proper inclination to turn the work piece</li> <li>- Select the suitable speed, feed and depth of cut for rough and finishing operations</li> <li>- Check the dimensions</li> </ul>
Knurling	<ul style="list-style-type: none"> <li>- Check the centering of the work piece using dial gauge</li> <li>- Fix the cutting tool at proper inclination to turn the work piece</li> <li>- Select the suitable speed, feed and depth of cut for rough and finishing operations</li> <li>- Check the dimensions</li> <li>- Fix the knurling tool and selecting the suitable speed and feed</li> </ul>

Title of the Experiment	Key Competency
Welding Layout of beads	<ul style="list-style-type: none"> <li>- Perform Edge preparation</li> <li>- Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc</li> <li>- Check the bead</li> </ul>
Lap joint	<ul style="list-style-type: none"> <li>- Perform Edge preparation</li> <li>- Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc</li> <li>- Check the bead</li> </ul>
Butt joint	<ul style="list-style-type: none"> <li>- Perform Edge preparation</li> <li>- Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc</li> <li>- Check the bead</li> </ul>

**State Board of Technical Education, Telangana State**

**Model Paper**

**ME-307-BASIC MANUFACTURING & FABRICATION ENGINEERING LAB**

**Mid Sem-I (CEE)**

**Time : 1 Hour**

**Total Marks : 20 M**

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**Note: Answer any one question.**

1. Prepare the plain turning as per the given figure.
2. Prepare the step turning as per the given figure.
3. Prepare the taper turning as per the given figure.
4. Prepare Lap joint as per the given figure.
5. Prepare Butt joint as per the given figure.
6. Prepare mould for given pattern V-Pulley
7. Prepare mould for given pattern Gear Pulley
8. Prepare a core for making hallow section.

- Note:** 1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record and 2 marks for Viva voice
2. Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

**State Board of Technical Education, Telangana State**

**Model Paper**

**ME-307-BASIC MANUFACTURING & FABRICATION ENGINEERING LAB**

**Mid Sem-II (CEE)**

**Time : 1 Hour**

**Total Marks : 20 M**

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**Note: Answer any one question.**

1. Prepare the plain turning as per the given figure.
2. Prepare the step turning as per the given figure.
3. Prepare the taper turning as per the given figure.
4. Prepare Lap joint as per the given figure.
5. Prepare Butt joint as per the given figure.
6. Prepare mould for given pattern V-Pulley
7. Prepare mould for given pattern Gear Pulley
8. Prepare a core for making hallow section.

**Note:**

1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record and 2 marks for Viva voice
2. Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

**State Board of Technical Education, Telangana State**

**Model Paper**

**ME-307-BASIC MANUFACTURING & FABRICATION ENGINEERING LAB**

**(SEE)**

**Time : 2 Hours**

**Total Marks : 40 M**

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**Note: Answer any one question.**

1. Prepare the plain turning as per the given figure.
2. Prepare the step turning as per the given figure.
3. Prepare the taper turning as per the given figure.
4. Prepare Lap joint as per the given figure.
5. Prepare Butt joint as per the given figure.
6. Prepare mould for given pattern V-Pulley
7. Prepare mould for given pattern Gear Pulley
8. Prepare a core for making hallow section.

**Note:** 30 marks are to be awarded for the experiment and 10 marks for Viva voice

**AU-308-SOLID MODELING LAB**  
**(Common with ME-409)**

Course Title	Solid Modeling Lab	Course Code	AU-308
Semester	III	Course Group	Practical
Teaching Scheme in Periods(L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods	45 Pds
CIE	60 Marks	SEE	40 Marks

**Pre requisites**

This course requires the basic knowledge of manufacturing process and Auto CAD

**COURSE OUTCOMES**

At the end of the course the students will have the ability to	
CO 1	List the commands of 3D
CO2	Create three-dimensional entities using different methods
CO3	Practice on Primitives with 3d Basics
CO4	Apply edit tools on Primitives
CO5	Apply the selection of material from library
CO6	Create the part drawing with a given geometry using Solid Modeling software

**COURSE CONTENT**

**Viewing entities in three dimensions**

- Setting a new viewing direction
- Dynamically setting a view direction

**Creation of three-dimensional entities using different methods**

- Drawing of two dimensional entities in three dimensional space
- Converting two dimensional planar entities into three dimensional entities by applying elevation and thickness
- Converting two dimensional planar entities into three dimensional entities by revolving or extruding.

Creation of three-dimensional faces, rectangular meshes, ruled surface meshes, extruded surface meshes, revolved surface meshes, three dimensional entities such as boxes, Cylinders, Cones, Spheres, wedges, torus, Regions, extruded solids, revolved solids, composite solids, intersect solids.

**Editing in three dimensions**

Rotating in three dimensions, Array in three dimensions (Rectangular and polar)

Mirroring in three dimensions, aligning in three dimensions



## **Editing of three dimensional solids**

Sectioning and Slicing of solids, hiding, shading and rendering

## **Selection of material from library**

Enable the material library, editing materials and material library

## **The importance of Solid Modeling software like CREO/ SOLID EDGE/SOLID WORKS.**

Use any of the solid modelling packages stated above and generate a solid model of a machine component for different 3D components.

### **A) Solid Modeling Lab**

**Suggested learning outcomes:**

**Upon completion of the course the student shall be able to understand the concepts of 3D**

- View entities in three dimensions
- To set a new viewing direction
- To dynamically set a view direction

### **Create three-dimensional entities using different methods**

- Draw two dimensional entities in three dimensional space
- Convert two dimensional planar entities into three dimensional entities by applying elevation and thickness
- Convert two dimensional planar entities into three dimensional entities by revolving or extruding.
- Create three-dimensional faces
- Create rectangular meshes
- Create ruled surface meshes
- Create extruded surface meshes
- Create revolved surface meshes
- Create three dimensional entities such as boxes, Cylinders, Cones, Spheres, wedges, torus, Regions,
- Create extruded solids.
- Create revolved solids.
- Create composite solids.
- Create intersect solids.

### **Edit in three dimensions**

- Rotate in three dimensions.
- Array in three dimensions (Rectangular and polar).
- Mirror in three dimensions.
- Align in three dimensions.

### **Edit three dimensional solids**

- Practice Sectioning and Slicing solids.
- Practice hiding, shading and rendering.

### **Practice the selection of material from library**

- Enable material library.
- Edit materials and material library.
- Use any of the solid modeling packages stated above and generate a solid model of a machine component for different 3D components.

<b>Exercise</b>	<b>Key components</b>	<b>Periods</b>
1.0 View entities in three dimensions	Set a new viewing direction. Set dynamically view direction.	<b>02</b>
2.0 Create three-dimensional entities	Create three-dimensional faces Create rectangular meshes, ruled surface meshes, extruded surface meshes, revolved surface meshes. Create three dimensional entities such as boxes, Cylinders.	<b>18</b>
3.0 Edit in three dimensions	Rotate in three dimensions. Array in three dimensions (Rectangular and polar). Mirror in three dimensions. Align in three dimensions.	<b>06</b>
4.0 Edit three dimensional solids	Practice Sectioning and Slicing solids. Practice hiding, shading and rendering.	<b>10</b>
5.0 Practice the selection of material from library	Enable material library. Edit materials and material library.	<b>03</b>
6.0 Appreciate the importance of Solid Modeling softwares like Pro-E / Uni-Graphics / Catia	Use any of the solid modelling packages stated above and Generate a solid model of a machine component for different 3D components using Solid modelling packages	<b>06</b>
<b>Total</b>		<b>45</b>



**AU-308- SOLID MODELLING LAB  
MODEL PAPER FOR MID -1 (CIE)**

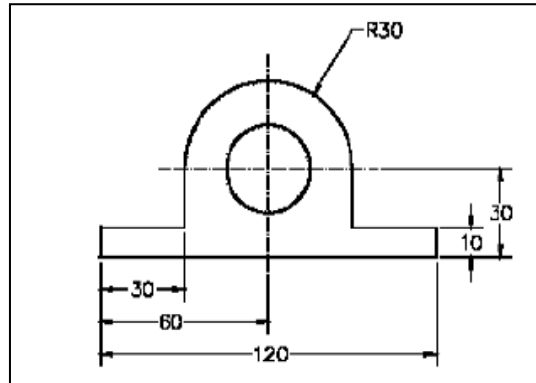
**TIME: 2hr**

**Marks: 20 Marks**

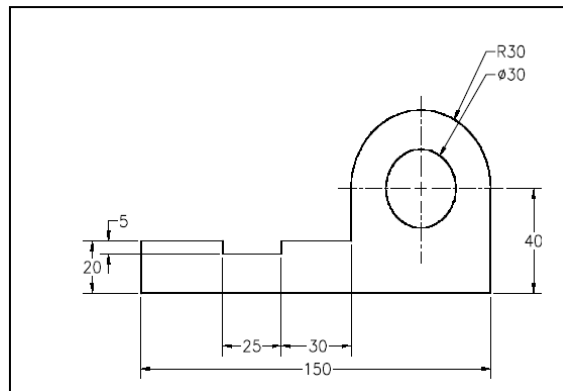
**NOTE: Answer any one of the following**

**PART-A**

1. Create the below 2D drawing and dimension it using any solid modeling software.



2. Create the below 2D drawing and dimension it using any solid modeling software.



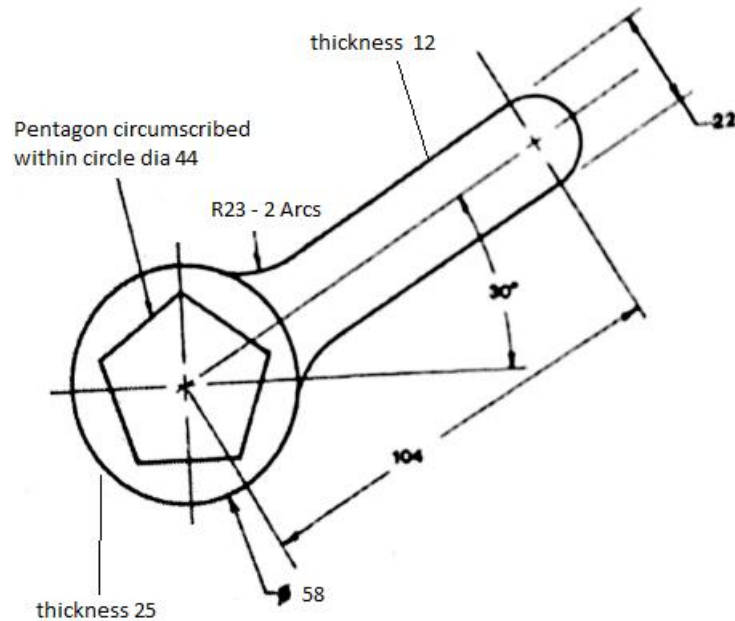
**AU-308- SOLID MODELLING LAB**  
**MODEL PAPER FOR MID -2 (CIE)**

**TIME: 2hr**

**Marks: 20 Marks**

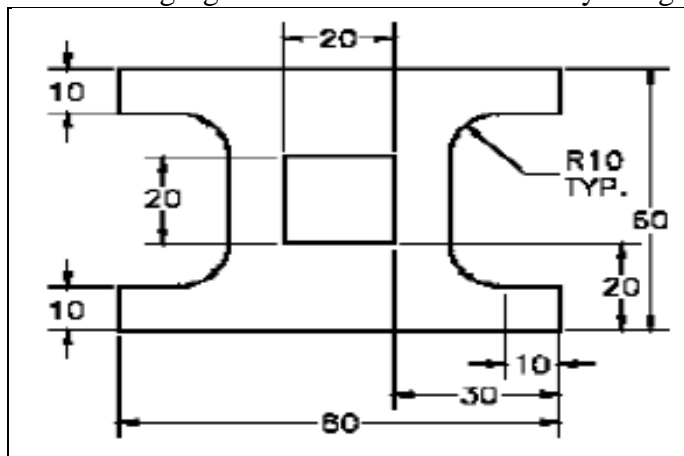
NOTE: Answer any one of the following

1. Draw the following figure by using solid modeling software.



Note: All dimensions are in mm

2. Draw the following figure for thickness of 25mm by using solid modeling software.



Note: All dimensions are in mm

**BOARD DIPLOMA EXAMINATION**  
**AU-308- SOLID MODELLING LAB**  
**MODEL PAPER FOR SEE**

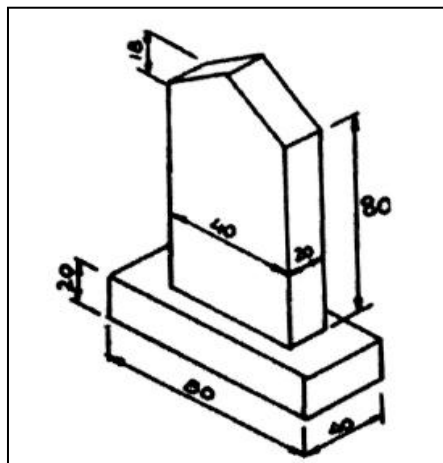
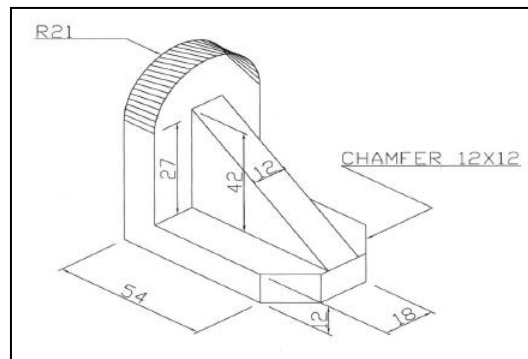
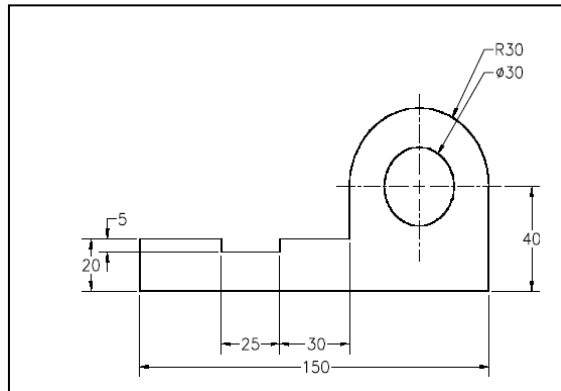
**Time: 03 Hour**

**Total Marks: 40**

Answer any ONE question.

**01×40=40 M**

3. 1. Draw the following figure by using solid modeling software.



Marks breakup

1. Model creation – 25M
2. Viva – 10M
3. For writing answer – 5M

**AU-309- BASIC AUTOMOBILE ENGINEERING LAB**

Course Title	Basic Automobile Engineering Lab	Course Code	AU-309
Semester	III	Course Group	Core
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Assignments	Total Contact Hours :	45 Periods
CIE	60 Marks	SEE	40 Marks

**Pre requisites:**

This course requires the basic knowledge of Basic Automobile Engineering theory.

**Course Content and Blue Print of Marks for SEE**

Unit No	Unit name	Hours/ Period s	Questions for SEE			Marks weightage	% Weightage
			Handli ng	Manip ulation	Precis ion		
1.	Tools, gauges & safety precautions	6	10	10	20	40	100
2.	major components in Four-wheeler	3	10	10	20	40	100
3.	dismantling and assembling of Two-stroke single cylinder petrol engine	3	10	10	20	40	100
4.	dismantling and assembling of Four-stroke single cylinder petrol engine	3	10	10	20	40	100
5.	Check the compression pressure of a given petrol engine	6	10	10	20	40	100
6.	Measuring the wheel base, wheel track and ground clearance	3	10	10	20	40	100
7.	High pressure washing	3	10	10	20	40	100
8.	fuel system of a multi cylinder engine	3	10	10	20	40	100
9.	Inlet and Exhaust system of a multi cylinder engine	3	10	10	20	40	100
10.	Dismantling and Assembling of A.C. Mechanical fuel pump	3	10	10	20	40	100
11.	Dismantling and Assembling of Carburettor	3	10	10	20	40	100
12.	Dismantling and Assembling of a single plate clutch and multi plate clutch	6	10	10	20	40	100

**Course Contents:****LIST OF EXPERIMENTS**

1. Identification of different tools, gauges and various instruments and Safety precautions in automobile Laboratory.
2. Identification of major components in Four-wheeler.
3. Practice on dismantling and assembling of Two-stroke single cylinder petrol engine.  
Calculate the swept volume & compression ratio
4. Practice on dismantling and assembling of Four-stroke single cylinder petrol engine.  
Calculate the swept volume & compression ratio
5. Check the compression pressure of a given petrol engine using Compression gauge.
6. Measuring the wheel base, wheel track and ground clearance of LMV.
7. Practice on High pressure washing of different vehicles.
8. Demonstrate the fuel system of a multi cylinder engine with the aid of a chart
9. Demonstrate the Inlet and Exhaust system of a multi cylinder engine with the aid of a chart
10. Dismantling and Assembling of A.C. Mechanical fuel pump.
11. Dismantling and Assembling of Carburetor
12. Dismantling and Assembling of a single plate clutch and multi plate clutch

**Course Outcomes:**

CO1	Measure the dimensions of Engine cylinder and calculate Engine specifications.
CO2	List various tools and gauges used in Automobile laboratory.
CO3	Name various safety equipments used in Automobile workshop.
CO4	Dismantle and assemble two stroke Engine as a group.
CO5	Dismantle and assemble four stroke Engine as a group.
CO6	Dismantle and assemble clutch as a group.

**Suggested Student Activities:**

1. Visit library to refer manuals / browse on internet to collect the data of various two wheelers and compare data on like parameters and submit a report.
2. Visit your institutional laboratory and list the tools and available equipment, note the purpose of each and submit a report.
3. Visit nearby workshop / service station and submit the report on the various activities taken up there.
4. Browse on internet to collect the data of various cars and compare data on like parameters and submit a report.
5. Give a seminar on the need of energy conservation for the future generations.
6. Prepare a chart indicating the complete constructional details, general description and working of an automobile component or system.



7. Quiz before Mid Sem-1 and Mod Sem-2.
8. Group discussion any topic relevant to the course with the approval of Head of section.
9. Surprise test-1(Descriptive type)
10. Surprise test (Objective type)

**Suggested E-Learning references:**

1. [www.learnengineering.org](http://www.learnengineering.org)
2. [www.sae.org](http://www.sae.org)
3. [www.nptel.ac.in](http://www.nptel.ac.in)
4. **HEAT ENGINES:**  
<https://www.youtube.com/watch?v=e5h4sIZlmUo>  
<https://www.youtube.com/watch?v=IHnTKsHuJQw>  
<https://www.youtube.com/watch?v=ASJmVNcJqk4>  
<https://www.youtube.com/watch?v=vIJ50aUiBgM>
5. **ENGINE CONSTRUCTION:**  
<https://www.youtube.com/watch?v=BJYSyA-u6lU>  
[https://www.youtube.com/watch?v=zA\\_19bHxEYg](https://www.youtube.com/watch?v=zA_19bHxEYg)  
<https://www.youtube.com/watch?v=dfFvtpbjdow>
6. **BASIC FUEL SYSTEM:**  
[https://www.youtube.com/watch?v=4O3nC9l\\_1F0](https://www.youtube.com/watch?v=4O3nC9l_1F0)  
[https://www.youtube.com/watch?v=Z5\\_vfZhMWog](https://www.youtube.com/watch?v=Z5_vfZhMWog)  
<https://www.youtube.com/watch?v=m6-KZS19HDU>  
<https://www.youtube.com/watch?v=l6qMhwyLUHA>  
<https://www.youtube.com/watch?v=mhPP6pnisL4>  
<https://www.youtube.com/watch?v=6YzIki62ga8>  
<https://www.youtube.com/watch?v=U6XGjYuX8ys>
7. **TRANSMISSION BASICS:**  
<https://www.youtube.com/watch?v=G04Fthmue1A>  
<https://www.youtube.com/watch?v=kTSBwYvm7u8>  
<https://www.youtube.com/watch?v=6BaECAbapRg>  
<https://www.youtube.com/watch?v=pqF-aBtTBnY>  
<https://www.youtube.com/watch?v=devo3kdSPQY>  
<https://www.youtube.com/watch?v=SQvFg4WbdZ4>  
[https://www.youtube.com/watch?v=\\_7K3q9Qd1QM](https://www.youtube.com/watch?v=_7K3q9Qd1QM)  
<https://www.youtube.com/watch?v=TcYsV063lk8>
8. **CHASSIS AND BODY BASICS:**  
<https://www.youtube.com/watch?v=tRojSObUWgQ>  
<https://www.youtube.com/watch?v=PjenO8nihaM>  
[https://www.youtube.com/watch?v=hY\\_Nuchbmaw](https://www.youtube.com/watch?v=hY_Nuchbmaw)  
<https://www.youtube.com/watch?v=IhbXPzPlzNI>  
<https://www.youtube.com/watch?v=gTnhRiMQSME>  
<https://www.youtube.com/watch?v=aptBwDKSPFg>
9. **COOLING AND LUBRICATING SYSTEMS:**  
[https://www.youtube.com/watch?v=y5p31F\\_dVJU](https://www.youtube.com/watch?v=y5p31F_dVJU)  
<https://www.youtube.com/watch?v=V7inC4lOpGs>  
<https://www.youtube.com/watch?v=D9dYx9lF5uw>  
<https://www.youtube.com/watch?v=mmmcj53TNic>  
[https://www.youtube.com/watch?v=Rt\\_AWy4tsN0](https://www.youtube.com/watch?v=Rt_AWy4tsN0)  
<https://www.youtube.com/watch?v=loY8-tgl8q4>  
<https://www.youtube.com/watch?v=V6x19pFplJw>

### The competencies and key competencies to be achieved by the student

S. No	Title of the Experiment	Key Competencies	Competencies
1	Identification of Tools, gauges, Instruments and Safety precautions in automobile Laboratory	a. Identify the tools required for a particular task. b. Identify the gauges required for a particular task and also able to identify the ranges. c. Identify the measuring Instrument required for a particular task. d. Identify various safety measures.	i. State different types of tools and their applications. ii. State different types of gauges. iii. State different types of measuring Instruments and also use of each instrument iv. State various safety devices and equipments.
2	Identification of major components in Four-wheeler	Identify the various 4-wheelers	Identify the various components of 4-wheelers
3	Practice on dismantling and assembling of Two-stroke single cylinder petrol engine. Calculate the swept volume & compression ratio	Dismantle the component	i. Identify the tools required for dismantling ii. Identify the components of the engine
4	Practice on dismantling and assembling of Four-stroke single cylinder petrol engine. Calculate the swept volume & compression ratio	Dismantle the component	i. Identify the tools required for dismantling ii. Identify the components of the engine.
5	Check the compression pressure of a given petrol engine using Compression gauge	Connect the compression pressure gauge	Note the reading of compression pressure gauge
6	Measuring the wheel base, wheel track and ground clearance of LMV	Identify wheel base , wheel track and ground clearance	Measure and report the wheel base, wheel track and ground clearance of the given vehicle

7	Practice on High pressure washing of different vehicles	Lift the vehicle on hoist	<ul style="list-style-type: none"> <li>i. Identify the controls of the machine</li> <li>ii. Adjust the water spray suitable to various components of the vehicle.</li> <li>iii. Ability to use various controls of the machine</li> </ul>
8	Fuel System of a Multi Cylinder Engine.	Identify the components and their functions	<ul style="list-style-type: none"> <li>i. Draw a line diagram of a fuel System of a given Multi Cylinder Engine and label the parts.</li> <li>ii. Explain the function of each component</li> </ul>
9	Inlet and Exhaust System of a Multi Cylinder Engine.	Identify the need of inlet and exhaust system of an automobile	<ul style="list-style-type: none"> <li>i. Draw a line diagram of a Inlet and Exhaust System of a given Multi Cylinder Engine</li> <li>ii. Explain the function of each component</li> </ul>
10	A.C Mechanical Pump	<ul style="list-style-type: none"> <li>a) Disassembling the given component</li> <li>b) Identification and to know the function of each component</li> </ul>	<ul style="list-style-type: none"> <li>i. Identify the tools required for disassembling.</li> <li>ii. Identification of components</li> <li>iii. Explain the function of each component of the pump</li> </ul>
11	Carburetor	Identification and know the function of each component of the given carburetor	<ul style="list-style-type: none"> <li>i. Use of appropriate tools dismantle the component</li> <li>ii. List the components of the given carburetor</li> <li>iii. Explain the working of the carburetor</li> </ul>
12	Single plate clutch	Identification and know the function of each component of the given single plate clutch	<ul style="list-style-type: none"> <li>i. Use of appropriate tools dismantle the component</li> <li>ii. List the components of the given clutch</li> <li>iii. Explain the working of the Clutch</li> </ul>

## CO PO Mapping Matrix

At the end of the course the student will have the ability to attain CO

Course Outcome		CL	Linked PO
CO1	Measure the dimensions of Engine cylinder and calculate Engine specifications.	U/A	1,4,6,7
CO2	List various tools and gauges used in Automobile laboratory.	R/U	1,4,7
CO3	Name various safety equipments used in Automobile workshop.	U	1,5,7
CO4	Dismantle and assemble two stroke Engine as a group.	U/A	1,6,7
CO5	Dismantle and assemble four strokes Engine as a group.	U/A	1,6,7
CO6	Dismantle and assemble carburetor as a group.	U/A	1,6,7

**Model Question Paper**  
**C-21, Diploma in Automobile Engineering, 2<sup>nd</sup> Semester**  
**AU-309: Basic Automobile Engineering Lab**  
**Mid Sem -1 / Mid Sem-2 / Semester End Examination**

**Time: 3 Hour**

**Total Marks: 20 / 20 / 40**

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**Note:**

- i. Answer any **one** of the following.
- ii. Use lottery system for allocation of the experiment for the examination.

\*\*\*\*\*

1. Identification of different tools, gauges and various instruments and Safety precautions in automobile Laboratory.
2. Identification of major components in Four-wheeler.
3. Practice on dismantling and assembling of Two-stroke single cylinder petrol engine.  
Calculate the swept volume & compression ratio
4. Practice on dismantling and assembling of Four-stroke single cylinder petrol engine.  
Calculate the swept volume & compression ratio
5. Check the compression pressure of a given petrol engine using Compression gauge.
6. Measuring the wheel base, wheel track and ground clearance of a LMV.
7. Practice on High pressure washing of different vehicles.
8. Demonstrate the fuel system of a multi cylinder engine with the aid of a chart
9. Demonstrate the Inlet and Exhaust system of a multi cylinder engine with the aid of a chart
10. Dismantling and Assembling of A.C. Mechanical fuel pump.
11. Dismantling and Assembling of Carburetor
12. Dismantling and Assembling of a single plate clutch and multi plate clutch

### **HU-310 - Communication and Life Skills Lab**

Course Title	Communication and Life Skills Lab	Course Code	HU-310
Semester	III	Course Group	Practical
Teaching Scheme in Periods- L: T:P	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Hours	45
CIE	60 Marks	SEE	40 Marks

#### **Rationale:**

The course is designed to impart listening skills and life skills to the students of diploma which will help them a great deal in personal and professional fronts.

#### **Prerequisites:**

The course requires the basic knowledge of vocabulary, grammar, and four language learning skills, viz. Listening, Speaking, Reading and Writing.

### **Course Contents**

#### **I. Listening Skills-I**

**Duration: 6 (L 2 P 4)**

- A paragraph
- A song
- A recipe
- A dialogue

#### **II. Life Skills – I**

**Duration: 6 (L2 P 4)**

##### **1. Introduction to Life Skills**

- What are life skills?
- Importance of life skills
- Practicing life skills

##### **2. Attitude**

- Features of attitude
- Attitude and behaviour
- Attitude formation
- Positive attitude
- Negative attitude
- Overcoming negative attitude
- Attitude at workplace

##### **3. Adaptability**

- Need for adaptability
- Willingness to experiment
- Fear of failure

- Think ahead
- Stay positive
- Open mind
- Curiosity
- Being in present

### **III. Listening Skills – II**

**Duration: 9 (L 3 P 6)**

- Biography
- Interview
- A Report
- Telephone Conversation

### **IV. Life Skills – II**

**Duration: 9 (L 3 P 6)**

#### **4. Goal setting**

- Importance of setting goals
- What is goal setting
- Short term goals
- Long term goals
- Achieve goals using SMART

#### **5. Motivation**

- Why motivation
- Characteristics of motivation
- Extrinsic motivation
- Intrinsic motivation

#### **6. Time Management**

- Features of time
- Secrets of time management
- Time wasters
- Prioritisation
- Productive time
- Time Quadrant

### **V. Life Skills – III**

**Duration: 6 (L 2 P 4)**

#### **7. Creativity**

- Flexibility
- Curiosity
- Determination
- Innovative ideas

#### **8. Critical Thinking**

- Observation
- Curiosity
- Introspection
- Identify biases
- Critical Analysis

#### **9. Problem Solving and Decision Making**

- Define the problem
- Generate Options
- Evaluate and choose an option
- Implement Solution
- Monitoring and seeking feedback

## **VI. Life Skills – IV**

**Duration: 9 (L 3 P 6)**

### **10. Leadership Qualities and Teamwork**

- Significance of Leadership
- Factors of leadership
- Leadership styles
- Leadership Skills
- Importance of Teamwork
- Characteristics of a good team
- Benefits of teamwork
- Problems of teamwork
- Qualities of team player

### **11. Stress Management/Managing Emotions**

- Components of Emotions
- Stress busters
- Managing Emotions
- Emotions at workplace

### **12. Core Human Values / Forming Values**

- Honesty and integrity
- Work Ethics
- Ego and Respect
- Trust and Truthfulness
- Social Responsibility
- Character formation
- Designing Destiny



**Course Outcomes:**

	At the end of the course the students will have the ability to:
<b>Listening Skills - I</b>	Identify the main or the central idea. Listen for specific details. Learn the pronunciation.
<b>Listening Skills - II</b>	Listen for drawing inferences. Listen for accuracy. Listen to convey ideas.
<b>Life Skills – I</b>	Know the Life Skills. Practice life skills for a better life. Think positively. Develop positive attitude. Overcome negative attitude. Develop adaptability in any situation.
<b>Life Skills – II</b>	Know the importance of setting goals. Set goals using SMART features. Get inspired to get success. Get personal and professional success. Manage time effectively. Learn various time management techniques. Learn the importance of prioritisation.
<b>Life Skills – III</b>	Learn to be creative. Think innovatively. Know the reasons for a problem. Learn to overcome problems. Learn the various techniques to solve the problems. Learn to make proper decisions on time. Think ‘out of the box’. Think critically.
<b>Life Skills – IV</b>	Develop trust and confidence. To develop healthy and wealthy life. Know how to be a leader. Learn the qualities of a good leader. Learn the qualities of a good team. Learn the advantages and disadvantages of a team. Differentiate between Eu-stress and Distress. Manage stress effectively.

### CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
310.1	-	-	-	-	3		3	5,7
310.2	-	-	-	-	3	2	3	5,6,7
310.3	-	-	-	-	3	3	3	5,6,7
310.4	-	-	-	-	2	2	3	5,6,7
310.5	-	-	-	-	2	2	3	5,6,7
310.6		-	--	--	2		3	5,7

#### Suggested Student Activities:

- Listening Comprehension
- Seminars
- Presentations
- Games using Online Dictionaries
- Sharing the information using emails, chats and groups
- Find a solution to the problem
- Making innovative things through recycling
- Creating advertisements
- Five-minute activities on Life Skills
- Watching videos on life skills and making presentations
- Case studies
- Role Plays
- Dialogues

#### **Evaluation Pattern:**

##### **I. Continuous Internal Examination:**

**60 Marks**

- |                                |          |
|--------------------------------|----------|
| a. <b>Mid Sem- I</b>           | 20 marks |
| Syllabus:                      |          |
| i. Listening Skills - I        |          |
| ii. Life Skills - I            |          |
| b. <b>Mid Sem – II</b>         | 20 Marks |
| Syllabus:                      |          |
| i. Listening Skills - II       |          |
| ii. Life Skills - II           |          |
| c. <b>Internal assessment:</b> | 20 marks |
| i. Seminars:                   | 10 marks |
| ii. Assignments:               | 5 marks  |
| iii. Lab record submission:    | 5 marks  |

## II. Semester End Examination :

40 Marks

- |                        |          |
|------------------------|----------|
| a. Listening:          | 10 Marks |
| b. Life Skills topics: | 15 Marks |
| c. Viva Voce :         | 15 Marks |

### References:

- a. Flint, Chris and Jamie Flockhart *Listening: A2 (Collins English for Life: Skills)* Collins. 2013
- b. Brown, Stephen E. *English in Everyday Life*. McGraw-Hill Education. 2008
- c. Mohanraj, Jayashree. *Let Us Hear Them Speak: Developing Speaking-Listening Skills in English*. Sage. 2015
- d. Susan Earle – Carlin. *Q Skills for Success: Listening and Speaking 5: Student Book with Online Practice*. Oxford University Press. 2013
- e. Kumar, Sanjay and Pushpa Latha. *Communication Skills: A Work Book*. Oxford University Press. 2018
- f. Carnegie, Dale. *The Leader in You*. Simon & Schuster: 1995
- g. Carnegie, Dale. *The Art of Public Speaking*. Prabhat Prakashan. New Delhi. 2013
- h. Kaye, Martin. *Goal Setting (Workbook Included): Goals & Motivation: Introduction To A Complete & Proven Step-By-Step Blueprint For Reaching Your Goals (Goal Setting Master Plan 1)*. Kindle Edition. MK Coaching. 2016.
- i. West, Steven. *Critical Thinking Skills: Practical Strategies for Better Decision making, Problem-Solving and Goal Setting*. Kindle Edition. 2018
- j. Tracy, Brian. *Goals*. Berrett-Koehler Publishers Inc. San Francisco. 2017
- k. Tracy, Brian. *Master your Time Master your Life*. Penguin Random House Inc. New York. 2017
- l. Sean Covey. *The 7 Habits of Highly Effective Teens*. Simon and Schuster, 2011

### E-Learning Resources:

- a. <http://www.bbc.co.uk/worldservice/learningenglish/youmeus/learnit/learnitv39.shtml>
- b. [https://www.examenglish.com/leveltest/listening\\_level\\_test.htm](https://www.examenglish.com/leveltest/listening_level_test.htm)
- c. [https://www.oxfordonlineenglish.com/listening?utm\\_referrer=https%3A%2F%2Fwww.google.co.in%2F](https://www.oxfordonlineenglish.com/listening?utm_referrer=https%3A%2F%2Fwww.google.co.in%2F)
- d. <https://takeielts.britishcouncil.org/prepare-test/free-ielts-practice-tests/listening-practice-test-1>
- e. <https://learnenglish.britishcouncil.org/en/listening>
- f. <https://www.cambridgeenglish.org/learning-english/activities-for-learners/?skill=listening>
- g. <https://www.businessenglishsite.com/business-english-listening.html>

**BOARD DIPLOMA EXAMINATION (C-21)**  
**MID SEMESTER EXAMINATION - I**  
**HU-310- COMMUNICATION AND LIFE SKILLS LAB**

**Time : 1 Hour**

**Total Marks: 20**

**Marks**

**Part – A**

**10 marks**

1. Listening Comprehension:

5 X 2 = 10

*(Teacher should give the questions before reading the passage given below)*

There are two problems which cause great worry to our educationists – the problem of religious and moral instruction in a land of many faiths and the problem arising out of a large variety of languages.

Taking up the education of children we see that they should be trained to love one another, to be kind and helpful to all, to be tender to the lower animals and to observe and think right. The task of teaching them how to read and write and to count and calculate is important, but it should not make us lose sight of the primary aim of moulding personality in the right way.

For this it is necessary to call into aid, culture, tradition and religion. But in our country, we have in the same school, to look after boys and girls born in different faiths and belonging to families that live diverse ways of life and follow different forms of worship associated with different denominations of religion. It will not do to tread the easy path of evading the difficulty by attending solely to physical culture and intellectual education.

It is not right for us in India to be dissuaded from this by considerations as to overtaking the young mind. What is necessary must be done and it is not in the fact too great a burden. On the basis of reading the above passage, answer the following questions:

1. Which two problems have our educations to face?
2. What is the primary aim of the education of children?
3. How should the problem of religious and moral instruction be dealt with?
4. Which basic training is the writer talking about?
5. How can we serve the spiritual needs of school children?

**PART- B**

**10 Marks**

***Instruction: Answer any one of the questions in 150 words.***

2. What are the benefits of developing an optimistic sense towards your life?
3. Give an instance from your life when you adapted yourself to a new situation.

**BOARD DIPLOMA EXAMINATION (C-21)**  
**MID SEMESTER EXAMINATION - II**  
**HU-310- COMMUNICATION AND LIFE SKILLS LAB**

**Time : 1 Hour**

**Total Marks: 20 Marks**

**Part – A**

**10 marks**

1. Listening Comprehension:

5 X 2 = 10

*(Teacher should give the questions before reading the passage given below)*

Isaac Newton figured out why objects fall to the ground and why the planets move the way they do. Isaac Newton was born in Lincolnshire, England, in 1643. His father died before he was born but, despite having a difficult childhood, he gained a place at Cambridge University. When the plague broke out he was forced to stay at home and, with so much free time on his hands, Newton started to wonder about what made things fall.

Newton said that he was inspired to think about forces when he saw an apple fall from a tree. He came up with the theory of gravity, an invisible force that pulls all of the objects in the Universe together, and the reason things don't float off into the sky.

In 1685, Newton described his Laws of Motion – a mathematical guide to how an object's movement is affected by speed and mass. Two years later, Newton published his ideas about gravity in a book which contains many of the foundations of modern science.

Newton also invented a new kind of telescope called a reflector. It used a mirror to collect light instead of lenses, and was much more powerful than existing telescopes. He also showed that white light was made up of all the colours of the rainbow.

1. What did Isaac Newton find?
2. Where did Isaac Newton born?
3. Which disease broke out in his childhood?
4. What was the telescope that Isaac Newton invented?
5. From which colour rainbow is made up of?

**PART- B**

**10 Marks**

Instruction: Answer any one of the questions in 150 words.

2. What were the short term goals which you set to yourself and how you managed to achieve them in the recent past?
3. Explain -
  - i) how you prioritise your tasks.
  - ii) how you manage your time in the best possible way.

**BOARD DIPLOMA EXAMINATION (C-21)**  
**SEMESTER END EXAMINATION**  
**HU-310- COMMUNICATION AND LIFE SKILLS LAB**

**Time: 3 Hours**

**Total Marks: 40**

**Marks**

**Part – A**

**10 marks**

- 1. Listen to the following passage and answer the questions give below it. 5 X 2 = 10**  
*(Teacher should give the questions before reading the passage)*

Some of us think that writing is only for writers. But writing is for all of us. As Julia Cameron notes in her book *The Right to Write: An Invitation and Initiation into the Writing Life*, “I believe we all come into life as writers.” Writing can be beneficial for all of us, because it can be therapeutic. One of the most powerful parts of therapy is cultivating the ability to observe our thoughts and feelings, said Elizabeth Sullivan, a licensed marriage and family therapist in San Francisco. And that’s what writing helps us do.

“Most of us do not think in complete sentences but in self-interrupted, looping, impressionistic cacophony,” she said. Writing helps us track our spinning thoughts and feelings, which can lead to key insights (e.g., I don’t want to go to that party; I think I’m falling for this person; I’m no longer passionate about my job; I realize how I can solve that problem; I’m really scared about that situation.) Writing is “speaking to another consciousness – ‘the reader’ or another part of the self. We come to know who we really are in the present moment,” she said. Writing also creates a mind-body-spirit connection, she said. “When you use your hands to pen or type something directly from your brain, you are creating a powerful connection between your inner experience and your body’s movement out in the world.” We hold worries, fears and memories in our bodies, Sullivan said. When we use the body in positive ways – such as dancing or writing — we stay in the present moment, we inhabit our bodies, and we can heal ourselves, she said. “Writing is a small movement but it is incredibly powerful when you are writing down what is in your mind.”

Free writing or journaling is simply writing what’s on your mind. It’s letting it all hang out without censoring yourself. According to Sullivan, this could be: “Today I woke up and found the car window smashed and I wondered if the glass replacement guys go out at night and do it.”

“Poetry is a natural medicine; it is like a homeopathic tincture derived from the stuff of life itself—your experience,” writes John Fox in *Poetic Medicine: The Healing Art of Poem-Making*.

Sullivan suggested writing a short letter to a loved one. Imagine this person has written to you and asked you: “How are you doing, really?” Another exercise is to “write to someone with whom you have ‘unfinished business’ without sending it.” The goal is for you to gain a clearer understanding of your own thoughts and feelings about the person, she said.

*Answer the following questions:*

1. Why does Julia Cameron believe that we all come into life as writers
2. What is the most important therapeutic quality of writing?
3. Whose consciousness does a writer touch through his or her writing?
4. How does Elizabeth Sullivan describe our thinking? Why does she say so?
5. Which word in the passage means ‘a coarse unpleasant noise’?

**Part – B**

**15 marks**

2. Seminar Presentations on Life Skills topics:

**Part – C**

**15 marks**

3. Viva Voce.

## AU-311 SKILL UPGRADATION

Course Title	Skill Upgradation	Course Code	AU-311
Semester	III	Course Group	Core
Teaching Scheme in Hrs(L:T:P)	0:0:8	Credits	2.5
Methodology	Lecture + Practice	Total Contact Hours	120

### Applied Engineering Mathematics Model Rubric

#### Suggested Student Activities:

1. Prepare a presentation to describe various types of integrals.
2. Prepare a detailed study report on integration using different methods.
3. List out and explain the applications of integration.
4. Apply the integration to determine areas, volumes of regular & irregular shapes.
5. List out and explain the practical applications of mean & RMS values.
6. Prepare a presentation to describe various types of differential equations.
7. List out and explain different practical applications of 1<sup>st</sup> order differential equations

### AU-302

#### Suggested Student Activities:

1. Student visits Library to refer to manual of Engineering Materials to find their properties.
2. Student inspects the available equipment in the Laboratory to identify the components.
3. The students can visit nearby workshops/Industries and collect information like which type of materials are used for particular purpose and their mechanical properties, design features of various machine components.
4. The students can visit nearby workshops/Industries and collect information about different
5. Types of welding processes and welding techniques used for different materials according to their properties and observe the recent developments.
6. The students can visit nearby workshops/Industries and collect information about various manufacturing processes by using different machine tools and observe their specifications.
7. The student should Download and present various presentations related to design of Machine elements.
8. The student should prepare the different products as mini-project.



### **AU-303**

#### **Suggested student's activity:**

1. Students visits library to refer various reference books
2. Students visits nearby industries to familiarize with machines and devices.
3. Quiz
4. Group discussion
5. Surprise test
6. Write the mechanisms which you are using in your day to day life. Sketch any three forms of mechanisms. Study and submit handwritten report of 500 words.
7. Take a photo of a actual kinematic mechanism used in an automobile, study and submit handwritten report of 500 words.
8. Analyse the effect of friction in real situation and submit handwritten report of 500 words.
9. List the mechanism used in a typical car. study and submit handwritten report of 500words.
10. Identify and name different simple machines used in day to day life. study and submit hand written report of 500 words.
11. Identify the types of belts, gears and gear trains used in different automobiles and also the type of chains in automobile and bicycle. Study and submit handwritten report of 500 words.
12. Visit the market/industry and collect the data of items which are used in any mechanisms. Data includes specifications, cost, applications, etc. Also name the mechanism/s in which such item/s is/are use. Study and submit handwritten report of 500 words.

### **AU-304**

#### **Suggested Student Activities:**

1. Visit library to refer manuals / browse on internet to collect the data of various two wheelers and compare data like parameters and submit a report.
2. Visit your institutional laboratory and list the tools and available equipment, note the purpose of each and submit a report.
3. Visit nearby workshop / service station and submit the report on the various activities taken up there.
4. Browse on internet to collect the data of various cars and compare data on parameters and submit a report.
5. Give a seminar on the need of energy conservation for the future generations.

6. Prepare a chart indicating the complete constructional details, general description and working of an automobile component or system.
7. Quiz before Mid Sem-1 and Mid Sem-2.
8. Group discussion on any topic relevant to the course with the approval of Head of section.
9. Surprise test-1 (Descriptive type)
10. Surprise test -2 (Objective type)

### **AU-305**

#### **Suggested Student Activities:**

1. Demonstrate the Concept of Zeroth law of thermodynamics using a glass tube mercury thermometer.
2. List the combustion products of an automobile engine and their effects on human health.
3. Compare Brake Power of two wheelers engines of same cubic capacity.
4. Prepare a data sheet for comparing Brake Power of four wheelers engines of same cubic capacity.
5. Quiz on energy and its conservation.
6. Group discussion responsibility of engineers in building the society.
7. Prepare a leaflet narrating the effects of vehicular pollutants on the environment.
8. Group discussion on energy addition to the universe.