CURRICULUM STRUCTURE

I Semester Scheme of Studies - Diploma in Automobile Engineering [C-20]

S. N	Course Category / Teaching Department	Course Code	Course Title	Hours per week			Total contact hrs /week	Credits	CIE Marks		SEE Marks		Total Marks	Min Marks for Passing (including CIE	Assigned Grade	Grade Point	SGPA and CGPA
				L	T	P			Max	Min	Max	Min					
THEORY COURSES																	Only SGPA for 1st Semester
1	BS/SC	20SC01T	Engineering Mathematics	4	0	0	4	4	50	20	50	20	100	40			
2	ES/AT	20AT11T	Mechanical Science & Engineering	4	0	0	4	4	50	20	50	20	100	40			
PRACTICAL COURSES																	
3	EG/SC/AT	20EG01P	Communication Skills	2	0	4	6	4	60	24	40	16	100	40			
4	ES/ME/AT	20ME01P	Computer Aided Engineering Drawing	2	0	4	6	4	60	24	40	16	100	40			
AUDIT COURSES																	
5	AU/SC	20AU01T	Environment Sustainability	2	0	0	2	2	50	20	-	-	50	20			
6	AU Physical Activity		Sports/NCC/NSS/Youth Red Cross/Yoga/ Technical club.	Student shall enrol in any one of these activities in 1st semester and shall participate actively. The student shall obtain 'Participation Certificate' in the activity to get eligible for the award of Diploma.													
Total				**14**	**0**	**8**	**22**	**18**	**270**	**108**	**180**	**72**	**450**	**180**			

T:- Theory P:- Practical D:- Drawing E:- Elective BS- Basic Science:: ES-Engineering Science:: HS-Humanities & Social Science:: AU-Audit Course:: EG: English ::SC: Science

Note:

1. Assigned Grade, Grade Point, SGPA and CGPA to be recorded in the Grade/Marks card.
2. AU- Physical Activity- Student participation in the selected physical activity shall be monitored and the participation record shall be maintained by the respective Programme Coordinator (Head of Section).
3. Theory course Semester End Examination (SEE) is conducted for 100 marks (3 Hours duration)
4. Practical course CIE and SEE is conducted for 100 marks (3 hours duration)

Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20SC01T	**Semester**	I/II
Course Title	**ENGINEERING MATHEMATICS**	**Course Group**	Core
No. of Credits	4	**Type of Course**	Lecture
Course Category	Theory	**Total Contact Hours**	4Hrs Per Week
			52Hrs Per Semester
Prerequisites	10thLevel Mathematics	**Teaching Scheme**	(L:T:P) = 4:0:0
CIE Marks	50	**SEE Marks**	50

RATIONALE

Engineering Mathematics specification provides students with access to important mathematical ideas to develop the mathematical knowledge and skills that they will draw on in their personal and work lives. The course enable students to develop mathematical conceptualization, inquiry, reasoning, and communication skills and the ability to use mathematics to formulate and solve problems in everyday life, as well as in mathematical contexts. At this level, the mathematics curriculum further integrates the three content areas taught in the higher grades into three main learning areas: Algebra; Measurement of angles and Trigonometry and Calculus.

1. COURSE SKILL SET

Student will be able to:

1. Solve system of linear equations arise in different engineering fields
2. Incorporate the knowledge of calculus to support their concurrent and subsequent engineering studies
3. Adept at solving quantitative problems
4. Ability to understand both concrete and abstract problems
5. Proficient in communicating mathematical ideas
6. Detail-oriented

2. COURSE OUT COMES

At the end of the course, student will be able to

CO1	Determine the inverse of a square matrix using matrix algebra. Apply the concepts of matrices and determinants to solve system of linear equations and find eigen values associated with the square matrix.
CO2	Find the equation of straight line in different forms. Determine the parallelism and perpendicularity of lines.
CO3	Calculate trigonometric ratios of allied angles and compound angles. Transform sum or difference of trigonometric ratios into product and vice versa.

CO4	Differentiate various continuous functions and apply the concept in real life situations.
CO5	Integrate various continuous functions and apply the concept in evaluating the area and volume through definite integrals.

3. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS

UNIT NO	UNIT TITLE	TEACHING HOURS	DISTRIBUTION(THEORY)			
			R LEVEL	U LEVEL	A LEVEL	TOTAL
1	Matrices and Determinants	10	8	20	12	40
2	Straight lines	10	8	20	12	40
3	Trigonometry	10	8	20	12	40
4	Differential Calculus and applications	11	8	20	12	40
5	Integral Calculus and applications	11	8	20	12	40
	Total	52	40	100	60	**200**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

4. DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets.

UNIT NO	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 MATRICES AND DETERMINANTS	➢ Use algebraic skills which are essential for the study of systems of linear equations, matrix algebra and eigen values	1.1 Matrix and types 1.2 Algebra of Matrices (addition, subtraction, scalar multiplication and multiplication) 1.3 Evaluation of determinants of a square matrix of order 2 and 3. Singular matrices 1.4 Cramer's rule for solving system of linear equations involving 2 and 3 variables 1.5 Adjoint and Inverse of the non-singular matrices of order 2 and 3 1.6 Characteristic equation and Eigen values of a square matrix of order 2	10-0-0

UNIT-2 STRAIGHT LINES	➢ Able to find the equation of a straight line in different forms ➢ Determine whether the lines are parallel or perpendicular	2.1 Slope of a straight line 2.2 Intercepts of a straight line 2.3 Intercept form of a straight line 2.4 Slope-intercept form of a straight line 2.5 Slope-point form of a straight line 2.6 Two-point form of a straight line 2.7 General form of a straight line 2.8 Angle between two lines and conditions for lines to be parallel and perpendicular 2.9 Equation of a straight line parallel to the given line 2.10 Equation of a straight line perpendicular to the given line	10-0-0
UNIT-3 TRIGONOMETRY	➢ Use basic trigonometric skills in finding the trigonometric ratios of allied and compound angles ➢ Able to find all the measurable dimensions of a triangle	3.1 Concept of angles, their measurement, Radian measure and related conversions. 3.2 Signs of trigonometric ratios in different quadrants (ASTC rule) 3.3 Trigonometric ratios of allied angles (definition and the table of trigonometric ratios of standard allied angles say $90^0 \pm \Theta$, $180^0 \pm \Theta$, $270^0 \pm \Theta$ and $360^0 \pm \Theta$) 3.4 Trigonometric ratios of compound angles (without proof) 3.5 Trigonometric ratios of multiple angles 3.6 Transformation formulae	10-0-0
UNIT-4 DIFFERENTIAL CALCULUS AND APPLICATIONS	➢ Able to differentiate algebraic, exponential, trigonometric, logarithmic and composite functions ➢ Able to find higher order derivatives ➢ Understand and work with derivatives as rates of change in mathematical models ➢ Find local maxima and minima of a function	4.1 Derivatives of continuous functions in an interval (List of formulae) 4.2 Rules of differentiation 4.3 Successive differentiation (up to second order) 4.4 Applications of differentiation	11-0-0
UNIT-5 INTEGRAL CALCULUS AND APPLICATIONS	➢ Understand the basic rules of integration and Evaluate integrals with basic integrands. 2. Identify the methods to evaluate integrands 3. Apply the skills to evaluate integrals representing areas and volumes	5.1 List of standard integrals and Basic rules of integration 5.2 Evaluation of integrals of simple function and their combination 5.3 Methods of integration 5.4 Concept of definite integrals 5.5 Applications of definite integrals	11-0-0

5. MAPPING OF CO WITH PO

CO	Course Outcome	PO Mapped	UNIT Linked	CL R/U/A	Theory in Hrs	TOTAL
CO1	Determine the inverse of a square matrix using matrix algebra. Apply the concepts of matrices and determinants to solve system of linear equations and find eigen values associated with the square matrix.	1, 7	1	R/U/A	10	**40**
CO2	Find the equation of straight line in different forms. Determine the parallelism and perpendicularity of lines.	1, 7	2	R/U/A	10	**40**
CO3	Calculate trigonometric ratios of allied angles and compound angles. Transform sum (difference) of trigonometric ratios into product and vice versa.	1, 7	3	R/U/A	10	**40**
CO4	Differentiate various continuous functions and apply the concept in real life situations.	1, 3, 7	4	R/U/A	11	**40**
CO5	Integrate various continuous functions and apply the concept in evaluating the area and volume through definite integrals.	1, 3, 7	5	R/U/A	11	**40**
					52	**200**

Course	CO's	Programme Outcomes (PO's)						
		1	**2**	**3**	**4**	**5**	**6**	**7**
ENGINEERING MATHEMATICS	CO1	3	1	0	0	0	0	3
	CO2	3	1	0	0	0	0	3
	CO3	3	1	0	0	0	0	3
	CO4	3	1	3	0	0	0	3
	CO5	3	1	3	0	0	0	3
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped								

7. INSTRUCTIONAL STRATEGY

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes

1. Explicit instruction will be provided in intervention classes or by using different differentiation strategies in the main classroom.
2. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching method and media that are employed to develop the outcomes.
3. Observing the way their more proficient peers use prior knowledge to solve current challenges and persevere in problem solving will help struggling students to improve their approach to engaging with rich contextual problems.
4. Ten minutes a day in homeroom, at the end of class, or as a station in a series of math activities will help students build speed and confidence.
5. Topics will be introduced in a multiple representation.
6. The teacher is able to show different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
7. In a perfect world, teacher would always be able to demonstrate how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. When a concept cannot be applied in that manner, we can still share how it might be applied within mathematics.

8. SUGGESTED LEARNING RESOURCES:

Sl. No.	Author	Title of Books	Publication/Year
1	B.S. Grewal	Higher Engineering Mathematics	Khanna Publishers, New Delhi, 40th Edition,2007
2	G. B. Thomas, R. L. Finney	Calculus and Analytic Geometry	Addison Wesley, 9th Edition, 1995
3	S.S. Sabharwal, Sunita Jain, Eagle Parkashan	Applied Mathematics, Vol. I & II	Jalandhar.
4	Comprehensive Mathematics	Comprehensive Mathematics Vol. I & II	Laxmi Publications, Delhi
5	ReenaGarg &Chandrika Prasad	Advanced Engineering Mathematics	Khanna Publishing House, New Delhi

9. COURSE ASSESSMENT AND EVALUATION CHART

Sl.No.	Assessment	Duration	Max marks	Conversion
1	CIE Assessment 1 (Written Test -1) At the end of 3rd week	80 minutes	30	Average of three written tests 30
2	CIE Assessment 2 (Written Test -2) At the end of 7th week	80 minutes	30	
3	CIE Assessment 3 (Written Test -3) At the end of 13th week	80 minutes	30	
4	CIE Assessment 4 (MCQ/Quiz) At the end of 5th week	60 minutes	20	Average of three 20
5	CIE Assessment 5 (Open book Test) At the end of 9th week	60 minutes	20	
6	CIE Assessment 6 (Student activity/Assignment) At the end of 11th week	60 minutes	20	
Total Continuous Internal Evaluation (CIE) Assessment				**50**
8	Semester End Examination (SEE) Assessment (Written Test)	3 Hours	100	**50**
Total Marks				**100**

Note:

1. SEE (Semester End Examination) is conducted for 100 Marks theory courses for a time duration of 3 Hours.
2. Three CIE (written test), each of 30 marks for a time duration of 80 minutes shall be conducted. Also, three CIE (MCQ or Quiz/Open book test/student activity or assignment) each of 20 marks for the time duration of 60 minutes shall be conducted. Any fraction at any stage during evaluation will be rounded off to the next higher digit
3. Assessment of assignment and student activity is evaluated through appropriate rubrics by the respective course coordinator. The secured mark in each case is rounded off to the next higher digit.

10 DETAILED COURSE CONTENT

UNIT NO AND NAME	DETAILED COURSE CONTENT	CO	PO	CONTACT HRS	TOTAL
1 MATRICES AND DETERMINANTS	Definition and types of matrices	1	1,7	1	10
	Algebra of Matrices (addition, subtraction and scalar multiplication) problems	1	1,7	1	
	Multiplication of Matrices(problems)	1	1,7	1	
	Evaluation of 2x2 ,3x3 determinants and Singular matrices and problems in finding unknown variable	1	1,7	1	
	Cramer's rule to solve system of linear equation with 2 and 3 variables	1	1,7	1	
	Cramer's rule to solve system of linear equation with 2 and 3 variables.problems	1	1,7	1	
	Minors, Cofactors of elements of square matrices of order 2 and 3	1	1,7	1	
	Adjoint of a square matrix(2x2 and 3x3),Inverse of a non singular square matrix	1	1,7	1	
	Adjoint of a square matrix(2x2 and 3x3),Inverse of a non singular square matrix and problems	1	1,7	1	
	Characteristic equation and eigen values of a 2x2 matirx and problems	1	1,7	1	
2 STRAIGHTLINES	Slope of the straight line(provided with inclination and two points on the line as well) and problems	2	1,7	1	10
	Intercepts of a straight line and problems	2	1,7	1	
	Intercept form of a straight line and problems	2	1,7	1	
	Slope-intercept form of a straight line and problems	2	1,7	1	
	Slope-point form of the straight line and problems	2	1,7	1	
	Two-point form of a straight line and problems	2	1,7	1	
	General form of a straight line.problems on finding slope and intercepts.	2	1,7	1	
	Angle between two straight lines and conditions for the lines to be parallel and perpendicular and problems	2	1,7	1	
	Equation of a line parellel to the given line and problems	2	1,7	1	
	Equation of a line perpendicular to the given line.problems	2	1,7	1	

3 TRIGONOMETRY	Concept of angles and their measurement. Radian measures and related conversions (degree to radian and vice-versa) and problems	**3**	**1,7**	**1**	**10**
	Signs of trigonometric ratios in different quadrants (ASTC rule)	**3**	**1,7**	**1**	
	Trigonometric ratios of allied angles (definition and the table of trigonometric ratios of standard allied angles say $90^0 \pm \theta$, $180^0 \pm \theta$, $270^0 \pm \theta$ and $360^0 \pm \theta$)	**3**	**1,7**	**1**	
	Problems on allied angles. (proving identities)	**3**	**1,7**	**1**	
	Problems on allied angles. (Finding values of x in an identity)	**3**	**1,7**	**1**	
	Trigonometric ratios of compound angles (without proof)	**3**	**1,7**	**1**	
	Trigonometric ratios of multiple angles (sin2A, cos2A, tan2A, sin3A, cos3A and tan3A)	**3**	**1,7**	**1**	
	Problems on multiple angles sin2A, cos2A, tan2A, sin3A, cos3A and tan3A	**3**	**1,7**	**1**	
	Transformation formulae (without proof) as sum to product. (Simple problems)	**3**	**1,7**	**1**	
	Transformation formulae (without proof) as product to sum. (Simple problems)	**3**	**1,7**	**1**	
4 DIFFERENTIAL CALCULUS AND APPLICATIONS	Definition of a derivative of a function. Listing the derivatives of standard functions. (Algebraic, trigonometric, exponential, logarithmic and inverse trigonometric functions)	**4**	**1,3,7**	**1**	**11**
	Addition and subtraction rule of differentiation and problems	**4**	**1,3,7**	**1**	
	Product rule and quotient rule of differentiation and problems	**4**	**1,3,7**	**1**	
	Product rule and quotient rule of differentiation and problems	**4**	**1,3,7**	**1**	
	Composite functions and their derivatives. (CHAIN RULE)	**4**	**1,3,7**	**1**	
	Composite functions and their derivatives. (CHAIN RULE). Problems	**4**	**1,3,7**	**1**	
	Successive differentiation up to second order	**4**	**1,3,7**	**1**	
	Slope of the tangent and normal to the given curve and their equations and problems	**4**	**1,3,7**	**1**	

	Rate measure: velocity and acceleration at a point of time and problems	**4**	**1,3,7**	**1**	
	Local Maxima and Minima of a function	**4**	**1,3,7**	**1**	
	Local Maxima and Minima of a function. Problems	**4**	**1,3,7**	**1**	
5 INTEGRAL CALCULUS AND APPLICATIONS	Definition of an indefinite integral. Listing the Integrals of standard functions. (Algebraic, trigonometric, exponential, logarithmic and inverse trigonometric functions)	**5**	**1,3,7**	**1**	11
	Rules of Integration. Evaluation of integrals with simple integrands and their combinations	**5**	**1,3,7**	**1**	
	Rules of Integration. Evaluation of integrals with simple integrands and their combinations. Problems	**5**	**1,3,7**	**1**	
	Evaluation of integrals with simple integrands and their combinations. Problems	**5**	**1,3,7**	**1**	
	Evaluation of integrals by Substitution method	**5**	**1,3,7**	**1**	
	Evaluation of integrals by Integration by parts	**5**	**1,3,7**	**1**	
	Evaluation of integrals by Integration by parts. Problems	**5**	**1,3,7**	**1**	
	Definition of definite integrals and their evaluation	**5**	**1,3,7**	**1**	
	Evaluation of Definite integrals. Problems	**5**	**1,3,7**	**1**	
	Area enclosed by the curves by integral method	**5**	**1,3,7**	**1**	
	Volume generated by the curve rotated about an axis by integral method	**5**	**1,3,7**	**1**	

First Semester Examination, Model Question Paper – 2020

Engineering Mathematics

Duration: 3Hours] Subject Code: 20SC01T [Max. Marks:100

Instruction: Answer one full question from each section. One full question carries 20 marks.

SECTION – 1

1

a If the matrix $\begin{bmatrix} 2 & 4 & 6 \\ 2 & x & 2 \\ 6 & 8 & 14 \end{bmatrix}$ is singular then find x . **4**

b Find the A^2 for the matrix $\begin{bmatrix} 1 & 3 & 4 \\ -1 & 2 & 1 \\ 0 & 3 & 3 \end{bmatrix}$. **5**

c Solve $2x - y = 3$ and $x + 2y = 4$ by using determinant method. **5**

d Find the inverse ofthe matrix $\begin{bmatrix} 2 & 3 & 1 \\ -1 & 2 & 1 \\ 5 & 4 & 3 \end{bmatrix}$. **6**

2

a If $A = \begin{bmatrix} 2 & -1 \\ 4 & 0 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -3 & 4 \\ -1 & -1 & 1 \\ 0 & 4 & 2 \end{bmatrix}$ then find $(AB)^T$. **4**

b Verify whether AB=BA for the matrices $A = \begin{bmatrix} 1 & 0 & 5 \\ -1 & 2 & 1 \\ 5 & 4 & 3 \end{bmatrix}$ and

$B = \begin{bmatrix} 3 & -1 & 4 \\ 0 & -1 & 1 \\ 2 & 4 & -2 \end{bmatrix}$. **5**

c Find the Adjoint of the matrix $A = \begin{bmatrix} 1 & 3 & 4 \\ -1 & 2 & 1 \\ 0 & 3 & 3 \end{bmatrix}$. **5**

d Find the charcteristic equation and eigen values for the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$. **6**

SECTION – 2

3			
	a	If the straight line is passing through the points (1, 2) and (3, 5) then find the slope of the line.	4
	b	Write the standard intercept form of the straight line and hence find the equation of the straight line whose x and y intercepts are 2 and 3 respectively.	5
	c	Write the standard slope-intercept form of a straight line. Find the equation of the straight line passing through the point (3, 5) and slope 4 units.	5
	d	Find the equation of the straight line parallel to the line passing through the points (1, 3) and (4, 6).	6
4			
	a	i) If a line inclined at 45° with *x*-axis find its slope. ii) Write the x and y intercept of the line 2x+3y=10.	2+2
	b	Find the equation of the straight line whose angle of inclination is 45^0 and passingthrough the origin.	5
	c	Find the equation of the straight line perpendicular to the line 2x+6y=3 and with the y intercept 2 units.	5
	d	Find the acute angle between the lines 7x-4y=0 and 3x-11y +5=0.	6

SECTION – 3

5	a	Express 75° in radian measure and $3\pi/2$ in degree.	4
	b	Prove that $\cos(A+B)\cos(A-B) = \cos^2 A - \sin^2 B$.	5
	c	Show that $\cos 2\theta = 2\cos^2 \theta - 1$.	5

	d	Find the value of $\sin 120^\circ \cdot \cos 330^\circ - \sin 240^\circ \cdot \cos 390^\circ$ without using calculator.	**6**
6	**a**	Find the value of $\sin 15^\circ$.	**4**
	b	Simplify $\frac{\cos(360^\circ - A)\tan(360^\circ + A)}{\cot(270^\circ - A)\sin(90^\circ + A)}$.	**5**
	c	Prove that $\sin 3\theta = \sin 3\theta - 4\sin^3\theta$.	**5**
	d	Prove that $\sin 20^\circ \cdot \sin 40^\circ \cdot \sin 80^\circ = \frac{\sqrt{3}}{8}$.	**6**

SECTION – 4

7	**a**	Find the derivative of $y = x^2 + e^{2x} + \cos 2x - 2\log x$ with respect to x.	**4**
	b	Find dy/dx of $y = \frac{\sec x + \tan x}{\sec x - \tan x}$.	**5**
	c	Find dy/dx of $y = \tan^{-1}\left(\frac{1+x}{1-x}\right)$.	**5**
	d	If the $s = 2x^3 + 3x + 4$ repersents the displacement of the particle in motion at time x, then find the velocity of the particle at $x = 2$ secs and acceleration at $x = 3$ secs.	**6**
8	**a**	Find $\frac{dy}{dx}$ of $y = 3x^4 + 4\log x + 2e^{3x} + \tan^{-1} x$.	**4**
	b	If $y = e^{2x}\sin 3x$ then find $\frac{dy}{dx}$.	**5**
	c	Find $\frac{d^2y}{dx^2}$ if $y = 3\sin x + 4\cos x$ at $x = 1$.	**5**
	d	Find the equation of tangent and normal to the curve $y = x^2$ at the point (1, 1).	**6**

SECTION – 5

9	a	Evaluate $\int (x-1)(x+1)dx$.	4
	b	Evaluate $\int_0^{p/2} \sin^2 x \, dx$	5
	c	Evaluate $\int x \sin x dx$.	5
	d	Find the area bounded by the curve $y = 4x - x^2 - 3$, x-axis and ordinates $x = 1$ and $x = 3$.	6
10	a	Evaluate $\int_0^2 e^x dx$.	4
	b	Evaluate $\int \frac{4\cos(\log x)}{x} dx$.	5
	c	Evaluate $\int x e^x \, dx$.	5
	d	Find the volume of the solid generated by revolving the curve $y = \sqrt{x^2 + 5x}$ between $x = 1$ and $x = 2$.	6

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Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20AT11T	**Semester**	I
Course Title	**MECHANICAL SCIENCE & ENGINEERING**	**Course Group**	Core
No. of Credits	4	**Type of Course**	Lecturing & Practice
Course Category	PC	**Total Contact Hours**	4Hrs. Per Week
			52Hrs. Per Semester
Prerequisites	Basic sciences at matriculation level	**Teaching Scheme**	(L: T:P) = 4:0:0
CIE Marks	50	**SEE Marks**	50

RATIONALE:

Mechanical Sciences and Engineering play a critical role in manufacturing technologies, from cars to airplanes to refrigerators. It applies the principles of engineering to the design, analysis, manufacturing and maintenance of machines. It paves the way to have a lucrative career that benefits the society. Therefore, an engineering diploma student must be conversant with the behavior and mechanism of the materials from the point of view of reliability, sustainability and performance of the product. The study of basic concepts of mechanical sciences and engineering will help the students in understanding engineering subjects where the emphasis is laid on the application of these materials.

1. COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identified competency through various teaching –learning experiences

- **i.** Select engineering materials based on properties, behavior and environmental effect for given engineering application.
- **ii.** Explore different shafts, keys, couplings, bearings and illustrate various types of drives and fastenings used in engineering/automobile application.
- **iii.** Understand different engine terminologies and working of 2-stroke and 4-storke engine used in an automobile.

2. COURSE OUTCOMES

On successful completion of the course, the students will be able to demonstrate industry-oriented COS associated with the above-mentioned competency:

CO1	Discuss the various engineering materials with their properties and also different heat treatment processes
CO2	Explore the different types of shafts, keys, couplings and bearings
CO3	Describe different types of belt drives, chain drives and gear drives
CO4	Illustrate the different types of fastenings used in machine parts
CO5	Explain various engine terminologies of IC engines, different powers and efficiencies
CO6	Classify IC engines on various parameters and demonstrate working of 2 and 4 stroke SI and CI engines.

3. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

SL. No.	CO's	Units Mapped	Teaching Hours	Distribution of Theory Marks			
				R Level	U Level	A Level	Total
1	CO1 - Discuss the various engineering materials with their properties and also different heat treatment processes	1	12	25	10	10	45
2	CO2 - Explore the different types of shafts, keys, couplings and bearings	2	12	15	25	5	45
3	CO3 - Describe different types of belt drives, chain drives and gear drives	3	10	10	20	10	40
4	CO4 - Illustrate the different types of fastenings used in machine parts	4	06	5	10	5	20
5	CO5- Explain various engine terminologies of IC engines, different powers and efficiencies	5	06	10	10	5	25
6	CO6 - Classify IC engines on various parameters and demonstrate working of 2 and 4 stroke SI and CI engines.	6	06	5	15	5	25
		Total	**52**	**70**	**90**	**40**	**200**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

4. DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

UNIT NO.	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 **ENGINEERING MATERIALS AND THEIR PROPERTIES**	1. Classify engineering materials with their properties. 2. Identify and compare ferrous and nonferrous materials. 3. Select relevant cast iron for the given job with justification. 4. Select relevant steel for the given application. 5. Describe the properties and application of the given copper alloy. 6. Compare and explain different heat treatment processes. 7. Select relevant Heat treatment process for the given material with justification.	1.1 Classification of engineering materials. 1.2 Selection of materials for engineering purposes. 1.3 Physical properties of metals. Mechanical properties of metals. 1.4 Ferrous metals - Cast Iron- Types of Cast Iron- Alloy cast iron. Effect of impurities on cast iron. 1.5 Steel - Effect of impurities on steel- alloy steels. Stainless Steel - Types of stainless steel. 1.6 Non-ferrous Metals - Types- Aluminum - Aluminum alloys. 1.7 Copper - Copper Alloys, types. Bearing Metals – Types, properties. 1.8 Non-metallic Materials - Rubber, glass, ceramics, polymers, composite materials - properties and application of each. 1.9 Heat treatment - Aim of heat treatment. Heat treatment techniques. 1.10 Annealing and its types. Normalising, hardening, tempering. 1.11 Martempering, austempering, hardenability, surface hardening. 1.12 Carburizing, nitriding, cyaniding, flame hardening and induction hardening.	12-0-0

UNIT-2 **SHAFTS, KEYS, COUPLINGS AND BEARINGS**	1 Describe the materials used for shafts and type of shafts used for specific application. 2 Describe the applications of different types of keys used in automobile application. 3 Explain different applications of couplings used for specific application. 4 Describe the properties and application of the given bearing material. 5 Demonstrate different types of bearings used in automobile.	2.1 Introduction to shafts - Material used for shafts. Types of Shafts. Standard sizes of transmission shafts. 2.2 Introduction to Keys - Types of Keys – Sunk keys - Types of Sunk keys. 2.3 Saddle keys, tangent keys, round keys Construction and working of each type with neat sketch. 2.4 Woodruff keys and splines –Construction and working of each type with sketch. 2.5 Introduction to shaft couplings – Requirements of a good shaft coupling - Types of shaft couplings. 2.6 Sleeve or Muff couplings - Construction and working with sketch. 2.7 Flange Coupling - Construction and working with sketch. 2.8 Introduction to bearings. Classification of bearings. Types of sliding contact bearings with advantages and disadvantages. 2.9 Shell bearings - Roller contact bearings - Advantages and disadvantages. 2.10 Ball bearings - Construction and working. 2.11 Roller bearings - Construction and working. 2.12 Thrust bearings - Construction and working.	12-0-0
UNIT-3 **BELT DRIVES, CHAIN DRIVES AND GEAR DRIVES**	1. Select a belt drive system for specific application. 2. Calculate the velocity ratio for the given belt drive. 3. Describe the application of chain drive in automobile. 4. Conceptualize with sketches the different gear trains used.	3.1 Introduction to belt drives - Selection of belt drives - types of belt drives - types of belts- Materials used for belts. 3.2 Types of flat belt drives - open belt drive, crossed or twist belt drive, belt drive with idler pulleys and compound belt drive. 3.3 Velocity ratio of belt drive - Slip and creep of belt. V- belt drives 3.4 Cross section of a V-belt with sketch - advantages and disadvantages of V-belt over flat belt drives. 3.5 Chain drives - Advantages and disadvantages. 3.6 Gears or Toothed wheels- advantages and disadvantages of gear drives. 3.7 Types of gears- spur gears, bevel gears, helical gears, worm and worm wheel, rack and pinion with simple sketches. 3.8 Velocity ratio in gear drive. 3.9 Gear trains- Types of gear trains-, simple and compound gear trains 3.10 Simple line sketch-speed ratio or velocity ratio of simple and compound gear trains.	10-0-0
UNIT-4 **FASTENERS**	1. Distinguish between temporary and permanent fasteners with specific applications.	4.1 Introduction to Fasteners - Types- Temporary and permanent. Screwed joint- advantages and disadvantages of screwed joint. 4.2 Screw thread terminology or terms used in screw threads - Types of screw fastenings. 4.3 Locking devices - Types of locking devices	06-0-0

	2. Analyze the different types of locking devices used in automobiles. 3. Distinguish between Lap joint and Butt joint with their specific applications.	or lock nuts with sketches. 4.4 Permanent fastenings - Types of riveted joints. 4.5 Lap joint - types- single riveted –double riveted-simple sketch. 4.6 Butt joint-types-single strap-double strap butt joint with simple sketch.	
UNIT-5 **ENGINE TERMINOLOGIES**	1. Compare EC and IC engines with specific applications. 2. Discuss engine terminologies used in different vehicles. 3. Differentiate between speed and torque with their units. 4. Explain BP, IP, FP & Mechanical efficiency.	5.1 Definition - types - IC and EC engines-comparison. 5.2 Engine terminologies - bore – stroke– TDC – BDC - mean effective pressure. 5.3 Clearance volume - swept volume - total volume - compression ratio. 5.4 Mean effective pressure – indicated power – brake power - friction power. 5.5 Engine speed engine torque, specific fuel consumption. 5.6 Brake thermal efficiency, indicated thermal efficiency and mechanical efficiency.	06-0-0
UNIT-6 **I.C. ENGINES**	1. Classify IC engines based on different parameters. 2. Demonstrate working of 2-stroke SI engine using section model. 3. Demonstrate working of 2-stroke CI engine using section model. 4. Demonstrate working of 4-stroke SI engine using section model. 5. Demonstrate working of 4-stroke CI engine using section model. 6. Explain the advantages of 2-stroke and 4-stroke engines considering specific example.	6.1 Classification of IC engines with respect to different parameters. 6.2 Two stroke SI Engine - Construction and working. 6.3 Four stroke SI Engine - Construction and working. 6.4 Two stroke & Four stroke CI engines - construction – working. 6.5 Comparison of SI and CI engines. 6.6 Comparison of Two stroke and Four stroke engines.	06-0-0

5. SUGGESTED PRACTICAL SKILL EXERCISES

The suggested practical activities (TABLE-I) in this section are demonstrated for the attainment of the competency. These practical activities can also be used for the student assessment in portfolio mode for awarding CIE marks.

TABLE-I

SL.No.	Practical Outcomes/Practical exercises	Unit No.	PO	CO
1	Prepare specimen of a given material for Microscopic examination (Thismaybecoveredduringindustrialvisit).	1	1,4	1
2	Analyzecontentofferrous/nonferrousmaterialusingphoto spectrometer.(Thismaybecoveredduringindustrialvisit).	1	1,4	1
3	Analyze the properties of nonmetallic materials & prepare and chart by performing Google search.	1	2	1
4	Analyze the various types of shafts and keys used in an automobile (This may be covered by visiting a nearest workshop)	2	1,4	2
5	Explain different types of belt, chain and gear drives employed in different machines (This may be covered during nearby workshop visit).	3	1,4	3
6	Demonstrates various types of fastenings in an automobile (This may be demonstrated on a vehicle present in Automobile workshop).	4	1,4	4
7	Explain the different engine terminologies with the help of a given engine (This may be explained with the help of already dismantled engine/cut-section model in Automobile workshop).	5	1,4	5
8	Demonstrate working of a 2-stroke SI/CI engine with the help of a cut-section model (This may be demonstrated using a cut-section model in Automobile workshop).	6	1,4	6
9	Demonstrate working of a 4-stroke SI/CI engine with the help of a cut-section model (This may be demonstrated using a cut-section model in Automobile workshop).	6	1,4	6
10	**PROBLEM BASED LEARNING:** Group of 4-5 students will identify and collect five machine / product components which are made from different engineering materialsandwhicharealsofailedintheirapplications.Students willmeasureandsketchthecomponents(freehand-orthographic views)withdimensions.Studentsingroupwillalsodiscussthe reasons of failure and will note down the discussion and outcome.	ALL		

NOTES:

1. It is compulsory to prepare logbook of exercises. It is also required to get each exercise recorded in logbook, checked and duly dated signed by the teacher.
2. Student activities are compulsory and are also required to be performed and noted in logbook.
3. Term work report includes term work, objects taken for identification for laboratory work, student activity; parts experimented as student activity and logbook along with student activities.
4. Term work report is compulsory part to be submitted at the time of practicalESE.
5. Term work report must not include any photocopy/ printed manual/pages, lithos, etc. It must be hand written / hand drawn by studentonly.
6. For CIE, students are to be assessed for Skills/competencies achieved. Students are to be asked to identify materials, select proper materials, etc.

CO	Course Outcome	PO Mapped	UNIT Linked	Cognitive Level R/U/A	Tutorial &Practical Sessions in Hrs	TOTAL
CO1	Discuss the various engineering materials with their properties and also different heat treatment processes	PO1, PO4	1	A	12	
CO2	Explore the different types of shafts, keys, couplings and bearings	PO1, PO4	2	A	12	
CO3	Describe different types of belt drives, chain drives and gear drives	PO1, PO4	3	A	10	
CO4	Illustrate the different types of fastenings used in machine parts	PO1, PO4	4	A	6	
CO5	Explain various engine terminologies of IC engines, different powers and efficiencies	PO1, PO4	5	A	6	
CO6	Classify IC engines on various parameters and demonstrate working of 2 and 4 stroke SI and CI engines.	PO1, PO4	6	A	06	
					52	

Course	CO's	Programme Outcomes (PO's)						
		1	**2**	**3**	**4**	**5**	**6**	**7**
FUNDAMENTALS OF MECHANICAL SCIENCES AND ENGINEERING	CO1	3	0	0	0	1	0	0
	CO2	3	0	0	0	0	0	0
	CO3	3	0	0	0	0	0	0
	CO4	3	0	0	0	0	0	0
	CO5	3	0	0	0	1	0	0
	CO6	3	0	0	0	1	0	
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped								

6. INSTRUCTIONAL STRATEGY

These are sample strategies which teacher can use to accelerate the attainment of the various course outcomes:

1. Massive Open online courses (MOOCS) may be used to teach various topics/subtopics.
2. Lecturer method(L) does not mean only traditional lecture method, but different type of teaching method and media that are employed to develop the outcomes
3. About 15 to 20% of the topics/subtopics which is relative simpler or descriptive in nature is to be given to the students for self-directed learning
4. Arrange visits to nearby Industries/Workshops/Academic institution having research center facility or research labs for understanding of the workflow process/assembly/servicing/testing of vehicles.
5. Show Video/animation films to explain the construction and working of different engines.
6. Use different instructional strategies in classroom teaching.

7. SUGGESTED LEARNING RESOURCES:

A. List ofBooks:

S. No.	Author	Title of Books	Publication/Year
1	R.S.Khurmi J.K.Gupta	A Textbook of Machine Design	S. Chand & Co
2	R.S.Khurmi J.K.Gupta	Theory of Machines	S. Chand & Co
3	Dr. Kirpal Singh	Automobile Engineering vol 2	Standard publishers Distributors
4	Mathur &Sharma	I C Engines	Danapat Rai & Sons
5	V. Ganeshan	I C Engines	Tata McGraw-Hill
6	K.R.Gopalkrishana	Mechanical engineering Science	
7	K.R.Gopalkrishana	Machine Drawing	
8	Anil chikara	Automobile Engineering Vol I	Satya Prakashan
9	K.M.Gupta	Automobile Engineering Vol I	Umesh publications
10	Er.A.K.BabuEr.Aj itpal Singh	Automobile Engineering	S. Chand & Co

B. List of Major Equipment/Instruments:

1. MetallurgicalMicroscope.
2. Standardspecimens.
3. Furnaces to perform heat treatmentprocess.
4. Hardness testers-to check Rockwell hardness-scales A,B andC.
5. Cut-section models of 2-stroke and 4-stroke (Diesel and Petrol) engines.
6. A dismantled 2-stroke/4-stroke engine.
7. Otherconsumables.

C. List of Software/Learning Websites

1. http://vimeo.com/32224002
2. http://www.substech.com/dokuwiki/doku.php?id=iron-carbon_phase_diagram
3. https://www.youtube.com/watch?v=S8Qmy4fGnnE
4. https://www.youtube.com/watch?v=Mybf-XCA4H4
5. https://www.youtube.com/watch?v=WoWzUPlR8i0
6. https://www.youtube.com/watch?v=cFdmnvlP-PI
7. https://www.youtube.com/watch?v=SvJM4e1OotE
8. https://www.youtube.com/watch?v=rlK7JIAz9WY
9. https://www.youtube.com/watch?v=xiGlMmB2NyE
10. https://www.youtube.com/watch?v=rlK7JIAz9WY
11. https://www.youtube.com/watch?v=KFIw_zVKspQ

8. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Note: the following activities or similar activities for assessing CIE (IA)

1. Select any five objects (3 metallic and 2 non-metallic) which will be used in laboratory and list the material of selected objects.
2. Prepare the material list of given tools and commonly used consumable items such as spanners, screw drivers, various types pliers, cotton waste, oil, grease, etc. Also give reason(s) for using such material and discuss your answers with the teacher.
3. Take dilute acid which is commonly used at our home for cleaning purpose and put one scrap iron piece and one nonferrous metal piece in it for minimum 12 hours. Take out these two pieces by following all safety norms/steps (without touching acid) and observe the changes. Discuss with your teacher.
4. Group of 3-5 students will visit LOCAL AUTOMOBILE REPAIR SHOP and will identify at least 5 different types of fasteners and locking devices used for a given AUTOMOBILE / assembly. Also list the material of identified machine / assembly components.
5. List atleast three questions individually which you would like to ask for followings:
    i. Comparison of iron and fiber reinforced plastic.
    ii. Comparison for strength of wood and cast iron.
    iii. Technical specification of any vehicle.
    iv. Materials used for construction of any two-wheeler.
    v. Materials used for construction of any automobile.
    vi. Any other relevant activity added by teacher including preparing industrial visit report.

9. COURSE ASSESSMENT AND EVALUATION CHART

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
DIRECT ASSESSMENT	CIE (Continuous Internal Evaluation)	Models	Students	Three Unit Tests (Average of all units will be Computed)	30	Blue Books	1,2,3,4,5,6
				MCQ/Quiz + Open book test + Activity	20	-	-
				TOTAL	50		
	SEE (Semester End Examination)	End Exam		End of the course	50	Answer Scripts by BTE	1,2,3,4,5,6
INDIRECT ASSESSMENT	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2,3,4,5,6 delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5,6 Effectiveness of demonstrations& Assessment Methods

Assessment Methodology

Lecture: Practice sessions shall begin only after two weeks of Induction Program in First semester. The schedule of assessment week shall be counted only after 2 weeks of Induction Program.

Sl.No	Assessment	Mode of Assessment	Schedule of Assessment	Duration	Max marks	Conversion after taking Average
1	CIE Assessment 1	Written Test-1	End of 3rd week	80 minutes	30	30
2	CIE Assessment 2	Written Test-2	End of 7th week	80 minutes	30	
3	CIE Assessment 3	Written Test-3	End of 13th week	80 minutes	30	
4	CIE Assessment 4	MCQ/Quiz	End of 5th week	60 minutes	20	20
5	CIE Assessment 5	Open Book Test	End of 9th week	60 minutes	20	
6	CIE Assessment 6	Student Activity / Assignment	End of 11th week	-	20	
Total Continuous Internal Assessment (CIE) Marks						50
7	SEE- Semester End Examination	Written Examination	As per BTE	3 Hours	100	50
Total Marks						100

Note:

1. Assessment of student activity / Assignment is to be evaluated through appropriate rubrics by the respective course coordinator.

RUBRICS FOR ACTIVITY -Example only (Faculty need to develop appropriate rubrics for assessment)						
Dimension	**Unsatisfactory**	**Developing**	**Satisfactory**	**Good**	**Exemplary**	**Student Score**
	2	**4**	**6**	**8**	**10**	
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collect much information; but very limited relate to the topic	Collects some basic information; most refer to the topic	Collects a great deal of information; all refer to the topic	8
Fulfil team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties but unreliable.	Performs very little duties	Performs nearly all duties	Performs all duties of assigned team roles	6
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded.	8
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening others	Listens, but sometimes talk too much	Listens and speaks a fair amount	8
					Average / Total Marks: (8+6+8+8)/4	**7.5 = 8 marks**

Model Question Paper
I A Test (CIE)

Programme: **Semester: I**
Course : **Max Marks : 30**
Course Code : **Duration : 1 Hr 20 minutes**
Name of the course coordinator: **Test : I/II/III**

Note: Answer one full question from each section. One full question carries 10 marks.

Qn.No	Question	CL	CO	PO	Marks
	Section-1				
1.a)					
b)					
c)					
2.a)					
b)					
c)					
	Section-2				
3.a)					
b)					
c)					
4.a)					
b)					
c)					
	Section-3				
5.a)					

b)					
c)					
6.a)					
b)					
c)					

Model Question Paper
Semester End Examination

Programme: Semester: I
Course : **Max Marks: 100**
Course Code: **Duration: 3 Hrs**

Instruction to the Candidate:
Answer one full question from each section. One full question carries 20 marks.

Qn.No	Question	CL	CO	Marks
Section-1				
1.a)				
b)				
2.a)				
b)				
Section-2				
3.a)				
b)				
4.a)				
b)				
Section- 3				
5.a)				
b)				
6.a)				
b)				
Section-4				
7.a)				
b)				
8.a)				
b)				
Section-5				
9.a)				
b)				
10.a)				
b)				

Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20EG01P	**Semester**	I/II
Course Title	**COMMUNICATION SKILLS**	**Course Group**	Core
No. of Credits	4	**Type of Course**	Lecture + Practice
Course Category	Workplace Skills / Humanities & Social Sciences	**Total Contact Hours**	6Hrs Per Week 78Hrs Per Semester
Prerequisites	Nil	**Teaching Scheme**	(L: T:P) = 0:1:2
CIE Marks	60	**SEE Marks**	40

Preamble

Today, Communication is a very important skill for the success of every millennial student. Millennials affinity to use digital media for communication, changing career and working landscapes, and greater competition in colleges and workplaces makes enhancing student communication skills beyond language a must. Rote learning a few tips or tricks the night before an interview or performance review won't do the job if students are trying to make an impression in highly collaborative workplaces of the future. Expectations from students aspiring to be part of such future workplaces are that they have not just good verbal and non-verbal communication skills but also a good understanding of how to use modern tools for effective communication.

Scope

To enable students to communicate clearly and effectively, by improving their verbal and non-verbal communication skills, as well as enhancing interpersonal skills and knowledge of appropriate tools for specific communication strategies.

Course Objectives

The objectives of communication skills course are:

- Build better communication skills: oral and written expressions and body language
- Enable critical thinking
- Empower with active listening skills
- Enable team work/collaboration

Instructional Strategy

To achieve course objectives, it is important to provide the blended mode of instruction for each of the concepts. This blended mode of instruction enables and empowers students with:

- **Understanding of Concept (Theory):**
  - Through definitions, discussions, explanation, conclusions.
  - Through demonstrations: Show films or other workplace clips that model various conversation skills. This provides greater clarity of the concept by

        - Enabling observation skills
        - Helping in expression of gesture
        - building confidence
- **Application of Concept (Learning by doing):** It is imperative that to become a good communicator, the skills have to be built by applying the concept in the hypothetically created real life situations. Students are encouraged to participate in each of these activities during lab session to help build the effective communication skills.
    - Use of technology tools like audio books, apps like voice thread or paper telephone, etc.
        - To help in workplace conversions.
        - To increase active listening, pronunciation
        - To help in voice modulation
    - Group discussion
        - Reinforce active listening
        - Enable group debate to imbibe healthy communication strategies
        - Sharpen the skills of "Asking clarifying questions"
        - Sharpen Feedback / Response skills
        - Time management skills
    - Group presentations/peer reviews
        - Enable team work
        - Assess concept understanding
        - Sharpen both oral and written communication skills
    - Group activities:
        - foster critical thinking
        - enable reflective learning
    - Tools usage:
        - Understand the difference between a Dictionary and a Thesaurus
        - Understand "When" and "How" to use these tools for communication

Course Outcomes

After completion of this course, the student shall be able to;

- Communicate
    - Identify audience (colleagues, management, customers/vendors)and use the right methodologies for communication using the right terminology, names, grades and other nomenclature pertaining to the trade, tools and specific equipment.
- Write
    - in at least one language correctly
    - basic level notes and observations
    - job cards, work sheets, basic report writing and responding to emails, simple presentations, job applications, resume
- Read
    - Technical manuals, task sheets/job orders, policies and regulations pertinent to the job, including OEM guidelines.
    - all instructions given in memos, manuals, documents or those put up as posters across the premises
    - safety precautions mentioned in equipment manuals and panels to understand the potential risks associated
- Question
    - Ask right questions
    - Use different ways of asking questions
        - Clarifying/Open ended (What, Why, When, Who, Where, How)

        - Close ended
- Present
    - With right Posture & Gesture
    - With greater concept/content clarity
    - With high confidence
    - With voice modulation to capture the attention of audience

- Use technology tools
    - Office productivity
        - Word : Report writing
        - PowerPoint : Creating effective presentations
        - Excel : Data handling/Charts

Course Content

The following are the various units to be taught and assessed in order to ensure the student is able to demonstrate the Course Outcomes mentioned in the **Course Outcome** section.

Pre-assessment:

Teachers are required to administer pre-assessment before starting the actual instruction. This helps in gathering information about students' like their attitude, beliefs, interests, and learning abilities.

Pre assessment expectations:

- To assess current language skill (Pronunciation, usage, sentence formation)
- To assess their ability to comprehend and respond to the instruction
- To assess their interest towards accepting ideas and learning
- To assess their current communication skills: asking questions, listening, communicating with confidence

UNIT 1: English – Introduction **Learning outcome:** Learn English pronunciation, functional grammar concepts& Reading. To gain confidence in spoken English.This section also covers phonemic awareness, grammar rules to set a strong base for application mode of communication.			
Phonemic awareness	**Going over 42 sounds**	***Examining the understanding of sounds*** ***Spelling patterns (Consonant and Vowel blending: CVC words)*** ***Pronunciation*** o List of words given above (Commonly used words) o Diction (speech)	0:2:2
Functional Grammar Concepts	**Revision of Grammar concepts**	***Parts of speech*** ***Sentence structure*** ***Examples of right sentences*** ***Gender, Singular, Plural*** ***Usage of voice (active and passive) and tenses***	2:0:0 0:1:0 0:1:0 0:2:0

Comprehension activities	**Reading conversations (check the unit wise activity table)**	***Written test for each comprehension***	0:0:2
UNIT 2: Communication **Lesson outcome:** At the end of the session: • Students should be able to o Understand the communication process, influence of voice/tone, logical organization of thought, comprehension, listening skills. o Understand the basic building blocks of communication and strategies for working with each of these blocks. o Learn about carrying self, etiquettes of communication. o Build positive attitude about self and towards handling communication. o Learn the process for effective communication, problem solving techniques, to be confident communicator.			
INTRODUCTION:	**What is communication?** **Why communication?** **How do we communicate?** **Communication Theory and Process**	***How communication happens?*** • Pictorial representation of communication framework • Elements of communication: sender, receiver, message • Refer to activity in Unit activity section.	1: 2:0 0:2:2
	Barriers to communication	***Language*** • Lack of linguistic ability • Grammar ***Context*** • Psychology • Physiology ***Systematic*** • inefficient or inappropriate information systems • Lack of communication channel	0:2:2 (video clip play, content tutorial, role play)

		• lack of understanding of the roles and responsibilities ***Attitude*** • Perceptions • Preconceived notions	
Building blocks of communication	**People** **Message** **Context** **Listening**	***People:*** • Empathising with sender's or receiver's perception • Intent & Impact on the sender/receiver • Think – Feel – Do model ***Message:*** Message channels: o Inperson, **email**, memo, report Be aware of Mental Filters o Level of understanding/knowledge o Personal concerns o Pre conceived notions Organize message: o Critical thinking: organize your thoughts? Use following strategy: ▪ Who ▪ What ▪ When ▪ Why ▪ How o Bundle Primary and Secondary information o Mindful about non-verbal message o Tone of voice Examples of Types of messages: o Inform o Persuade o Cyclical Avoiding Miscommunication: • Evaluate (Checking for) understanding of the intent of the message with the receiver – by asking clarifying questions? ***Context:***	0:4:4

		Define context Importance of context Tune into context • Timing • Location • Relationship ***Listening:*** Importance of listening Barrier to listening: • Mental filters • Multitasking • Information overload Strategies for listening: • Recall • Acknowledge • Summarize • Listen with eyes for connecting to non-verbal connection • Empathize • Pay attention • Ask clarifying questions Effective Listening Behaviors: • Maintaining relaxed body posture • Leaning slightly forward if sitting • Facing person squarely at eye level • Maintaining an open posture • Maintaining appropriate distance • Offering simple acknowledgements • Reflecting meaning (paraphrase) • Reflecting emotions • Using eye contact • Providing non-distracting environment Behaviors that hinder effective listening • Acting distracted • Autobiographical (Telling your own story without acknowledging theirs first) • No response • Invalidating response, put downs • Interrupting • Criticizing • Judging • Giving advice/solutions • Changing the subject • Reassuring without acknowledgment	

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">UNIT 3: Verbal Communication
Lesson outcome:
At the end of this session, Students should be able to:
• Understand and define the communication framework structure for each of the verbal communication (in person/telephonic/video conference).
• Understand and apply the verbal communication techniques.
• Use technical jargons in communication.
• Use right body language during verbal communication
• Understand and practice the Active Listening techniques
• Confidently articulate or present the content</td></tr>
<tr><td>Different types of verbal communication:

Listening Skills</td><td>In person

Telephonic

Video conference

Effective Listening behaviours

Behaviours that hinder effective listening</td><td>Use ABC’s: Accuracy, Brevity, Clarity
o Introduction
o Main body of the content
o Summary
• Use voice/tone effectively
• Reinforcement of Listening skills: Active and Empathetic listening skills
• Body language
o Eye contact
o Body posture
o Gesture
o Facial expression
o Space
Effective Listening Behaviours:
• Maintaining relaxed body posture
• Leaning slightly forward if sitting
• Facing person squarely at eye level
• Maintaining an open posture
• Maintaining appropriate distance
• Offering simple acknowledgements
• Reflecting meaning (paraphrase)
• Reflecting emotions
• Using eye contact
• Providing non-distracting environment

Behaviours that hinder effective listening
• Acting distracted
• Autobiographical (Telling your own story without acknowledging theirs first)
• No response
• Invalidating response, put downs
• Interrupting
• Criticizing</td><td>0:2:4</td></tr>
</table>

Using technical Jargons:	*Assignment based project encouraging pupil to use the technical terms in the written and verbal communication.* This requires understanding of the core concepts (from subject teacher) and integrating the concept with communication concepts to gain the real time application knowledge.	• Judging • Giving advice/solutions • Changing the subject • Reassuring without acknowledgment	
UNIT4: Non-Verbal Communication: **Lesson outcome:** At the end of this unit, students should be able to: • Understand the importance of Body language and its impact. • Use the strategies for effective body language. • Understand the relevance of different elements of emails and how to use them. • Develop the confidence in presenting written content in logical and organized manner with a definitive email framework. • Write different email formats confidently: Job application, Request email, apology email, email responses/feedback. • Confidently write Resume/Curriculum-vitae, Reports, Formal letters and portfolio. • Confidently communicate using technical jargons and with increased vocabulary.			
Body Language	***Strategies***	Body language tips: • Keep appropriate distance • Take care of your appearance • Maintain eye contact • Smile genuinely Do's and Don'ts:	0:3:4

Art of Professional writing:	***Written communication*** ***Emails:*** • Structured framework for writing formal emails to emphasize on professional communication in English	dos: • smile • stand up confident and straight • use appropriate hand gestures • Make eye contact with audience • Hold neat note cards while presenting content Don'ts • point at anyone • rock backwards and forwards • pace across front of room • read off slides read off notes Different types of emails: Job application, request letter, letter writing and quick notes Structure of email text: • Introduction – Beginning of the letter and this plays crucial role as it provides first impression to the reader. o Who: author (name + position and organisation) o what: purpose - controlling idea (what author does or feels) • Development: Expand on the Controlling Idea/purpose of the email by answering relevant WH questions o what, when, where, who, whom, which, whose, why, and how • Conclusion: Positive words o Verb: thank, appreciate, hope, wish o Phrases: be glad about, look forward to Email writing samples and practice content in the activity section.	0:2:4

		Additional essential writing skills – Framework will be provided and assignments will be advised: • Resume writing /CurriculumVitae • Report Writing • Portfolio writing • Formal letters	
UNIT5: English - Reading Skills, Grammar & Vocabulary **Lesson Outcome:** At the end of the session, student should be able to: • Read sentences with punctuation. • Understand the techniques of reading complex words. • Understand and apply the reading techniques for efficient reading. • Understand the usage of communication tools like Thesaurus and Dictionary that aids in improving vocabulary and reading. • Understand and apply the functional grammar aspects in day today communication.			
Reading skills **Functional Grammar** **Vocabulary**	***Comprehension activities*** ***Techniques for smart reading*** ***List of Commonly confused words and how to use/avoid them*** ***Sentences:*** ○ Declarative sentence ○ Imperative sentence ○ Interrogative sentence ○ Exclamatory sentence	Passage comprehension Conversation comprehension Strategies for smart reading: • Skimming and scanning through the text, inferring the meaning • Questioning, summarizing Set of words to accelerate the English language learning and usage. Strategies to use these words effectively Techniques of categorizing sentences, understanding how to build with punctuation and effectively use in the verbal and non-verbal communication. This involves more of hands on activities.	0:2: 2 0:1: 2 0:1: 2

	Punctuation, Content organization and Comprehension ***Techniques:*** • Learning new words from comprehension by way of repetition and usage of these words in communication • Listing technical jargons and repeatedly using in the communication with peers and teachers • Chunking and reading words ***Tools*** • Understand the difference between a Dictionary and a Thesaurus • Understand "When" and "How" to use these tools for communication	Comprehension remains as a main activity to accelerate the learning of spoken and written English language Increases vocabulary, builds confidence and helps in becoming a good communicator. Activities are done, tips are provided to efficiently implement these strategies.	0:1: 2 0:1:0
Unit 6 - Communication Tools **Lesson Outcome:** At the end of the session, student should be able to: • Use Email technology efficiently for communication • Present content in the PPT format efficiently • Understand different platforms available for web conferencing and efficiently work with them. • Create reports and data management.			
Introduction	Evolution of communication tools	Traditional vs. modern communication tools Advantages and Disadvantages	1:0:0
One-to-One	***Email using Gmail***	How to use the tools effectively? Formatting, layout Including attachment	0:1:1

		Working with "To, CC, BCC" and Subject fields effectively Using signature	
One-to-Many	***Presentation using PowerPoint***	Creating, Editing, Saving slides Using Animation Formatting options	0:1:2
	Webinar / Web Presentation (zoom, Google meet, Skype)	Hosting online meeting using online meeting tools Inviting people Sharing screen	0:1:1
Other	***Reports using MS Word***	Open, close, Edit and Save usage with documents Layout and strategies for creating report Sample report creation demo with follow on assignment Core subject project report submission assignment	0:1: 2
	Data & Graphs using MS Excel	Open, close, save and edit the excel document Creating data Using basic maths operation in Excel for working with data Creating simple graphs Assignment: For example, creating statistics of subject wise activities completed for 6 months in the credit course	0:1: 2
			4:34:40

Course Class Activity List (Unit-wise)

The following are the various activities that faculty could conduct for each unit are presented below;

Unit No.	Unit Title	Unit Activities
UNIT 1: Activities:	**English – Introduction**	1. 42 sounds revision: 1. s, a, t, i, p, n 2. c k, e, h, r, m, d 3. g, o, u, l, f, b 4. ai, j, oa, ie, ee, or 5. z, w, ng, v, oo, oo 6. y, x, ch, sh, th, th 7. qu, ou, oi, ue, er, ar

		• This helps in reducing the native language impact • Helps in understanding Short and Long vowel words • Helps in spelling • Helps in pronunciation 2. Reading commonly used words loud from the list (list will be provided in the workbook): • This helps in getting familiarity with the word pronunciation and helps in reading. 3. Blending words activity: • Write simple three letter words (CVC/CVCC/CVCV) pattern words: Can, Cap, Snap, cape (list will be provided in the workbook) • Show how to blend with the sound. • Starting with 3 letter words and continuing to 6 to 8 letter words. *Note: Remember before going through big words, it is always important to assess and ensure the student is aware of all the 42 sounds and are comfortable making small words.* Parts of Speech: building sentence using parts of speech: Demonstration by teacher: (Will be explained in the book as an example) Jumbled parts of speech: Student should pick the right order to build meaningful sentence: (More samples will be provided in the workbook) • College go to youeveryday. • Makes spider web the a Gender, Singular and Plurals: • Match the following activity for singular and plural • Fill in the blanks activity for genders Reading & Comprehension: Conversation • Conversation at the bank (provided in the workbook along with few more conversation samples) • Questions based on this conversation will be provided in the workbook
		Oral: • Introduce yourself?

Unit 2	**Communication**	Visual: • Video clip on communication etiquette • Pictures (in addendum section): do's and don'ts of communication Group of students, one participant whispers in another participant's ear, and this message has to be passed on in a circle until it reaches back the sender. Making a note of process of message conveyed and how it was perceived. ○ Identify the communication gap if any. ○ Discuss and conclude the communication framework importance ○ Discuss/reiterate how to make communication framework strong. 1. Role play to assess the understanding of building blocks of communication: (can be tapered to the core skills of diploma courses, following are just few of the examples) a. Announcing the result of students in the class or b. Announcing the job placement of students (people, context, message, form of message) c. Discussing the guidelines of examination (listening skills) d. Listening to the weather forecast without seeing and making note of the listening ability (play video of weather forecast) – Assess based on how much the student is able to recall. 2. Run National geography/Discovery Video clip/subject related technical video clip on YouTube: Check: ○ if the student has not understood what a speaker expressed

		○ about work or safety related issues ○ seeking clarification or advice appropriately from colleague, customer, management or vendor
Unit 3	**Verbal communication**	1. Voice/tone modulation: Showcase video Discussion: What was right? What was wrong? How it should have been better? 2. Picture description activity (memory test): Class split into groups A, B C,D: (two or four groups of at least 5 people each): Teacher shows different picture to each group for three minutes. Now each group has to remember what was on the picture and discuss with each other, write down the elements on a piece of sheet and share it with the teacher. Group that remembers more will be the winner. Teacher to observe the body language of a student in the group, listening skills of a student, presentation skill, comprehension skill, content delivery skill, confidence level, team work. And reiterate the concepts, dos and don'ts, and discuss what could have been done better. (details of pictures will be given in the workbook) 3. Telephonic conversation: Role play by a teacher: Call Airtel/Vodafone department and asking for the phone number portability process. After teacher demonstrates, teacher divides the class in to small groups of three people. • Each group will be given a different telephone conversation assignment (samples will be provided in workbook). • Two people in the group pretend to converse over the phone, and the third person makes a note of right and wrong approaches during the communication.

Unit 4:	**Non-verbal communication**	Body language Simon Says: Instructions and set up : 1. Series of instructions to the group that are to be copied/reproduced. Start slowly and increase the pace 2. State the following actions as YOU do them: o Put your hand to your nose o Clap your hands o Stand up o Turn around o Touch your shoulder o Sit down o Stamp your foot o Cross your arms o Put your hand to your forehead – <u>BUT WHILE SAYING THIS PUT YOUR HAND TO YOUR NOSE</u> 3. Observe the number of group members who copy what you did rather than what you said. **Outcome of this activity:** Discuss how body language can reinforce/influence verbal communication and drive the importance of body language and how to work on it • Email communication & Using technical jargons: Sample letter writing as assignment to students. (list will be provided in the text book – Request, apology, job application and relevant email formats that are useful for students post diploma course) • There will be at least one assignment that utilizes technical jargons in email communication.
UNIT 5:	**English - Reading Skills, Grammar & Vocabulary**	• Reading passage (Provided in workbook) • Reading passage from the text book • Comprehension: Passage & Conversation (will be provided in workbook) • Chunking words and reading activities

Unit 6:	**Communication tools**	• Email writing activities: Writing emails using email provider. Theme based email writing • Report writing assignment Writing about a machinery tool/interior designing plan? Related to the diploma stream. • Resume writing assignment • Data handling: Collecting data about machines/number of students passed out of college for last three years and creating graph about it. • Presentation: o About learning in the communication class o Concept presentation

Course Assessment Strategies

Assessment Methodology

a. Observation (role play activities, team activities, demonstration)
b. Questions & Answer – Periodic Assessment

Assessment Grading RUBRICS

Language Basics	
Beginner	Doesn't know / understand
Intermediate	can read and identify commonly used words
Good	Confident , able to communicate well with known people
Advanced	Confident , able to communicate well with anyone using a English
Expert	Can read, understand; Also comprehend & can train others
Reading	
Beginner	Beginning to read, has native language impact
Intermediate	can read, identify words, build simple 3/4/5 letter words easily
Good	Can read, understand, build words, read simple sentences ; Also comprehend
Advanced	Can read, understand, build words, read simple sentences ; Also comprehend
Expert	Confident , read simple and complex sentences with punctuation, comprehend, spell also build words
Inter personal communication	
Beginner	is shy, doesn't talk/express
Intermediate	hesitates to communicate – due to lack of confidence / ability, can talk to known people

Good	can talk to unknown people, less confident, does not express, has hard time working as a team
Advanced	can talk to unknown people, confident, can't express, has hard time working as a team
Expert	confident, can talk to anyone, express well, works well in the team
Body language	
Beginner	Is shy, not open to communicate, has hard time making friends
Intermediate	Knows basics of Body language, practices sometimes
Good	Knows basics of Body language, practices most times, has less confidence in presenting content
Advanced	Knows and practices good body language all times, can present content
Expert	Knows and practices good body language all times, is an example, Leads the pack to get better
Listening Skills	
Beginner	Just hears, no attention
Intermediate	Listens, pays attention, does not ask any question
Good	Listens, pays attention, ask questions
Advanced	listens, pays attention, asks questions, cannot empathize
Expert	Listens, pays attention, asks clarifying questions, able to understand the message communicated
Acceptability to Learn	
Low	is not receiving to information
Average	receives information but resists to implement
Good , Above Average	receives information and implements per instructions
Strong	receives information and proactively implements and seeks feedback
Verbal Communication	
Beginner	Does not communicate, shy, low on confidence: has problem expressing in his/her native language or English language
Intermediate	Can communicate in native language, low confidence, shy, yet to try in English language
Good	Can communicate in native language, good confidence, tries to communicate in English language
Advanced	Can communicate in native language, express view points, good confidence, comfortable talking to people in the team, tries to communicate in English language aswell
Expert	Can communicate in native language, express view points, very good confidence, can communicate with anyone without any fear, asks clarifying questions, communicates well in English, or tries hard to communicate in English language as well
Non-Verbal Communication	
Beginner	Struggles to understand the non-verbal cues, has to work on body language, has hard time understanding the written communication aspects

Intermediate	Can understand the non-verbal cues, has to practice, tries to apply written communication aspects
Good	Can understand non-verbal cues, practices well, works hard to get hold on written communication skills, exhibits confidence in whatever task is given
Advanced	Can understand non-verbal cues, can work on written communication aspects, exhibits confidence, practices well, help others to identify non-verbal cues
Expert	Can understand non-verbal cues, train others, confident, exhibits good non-verbal cues at all times, can train the pack, has good hold on written communication as well.
Comprehension	
Beginner	Tries to read the passage, has hard time to comprehend
Intermediate	Can read the conversation passage, has hard time understanding the regular passage
Good	Can read the conversation passage, regular passage, but stutters in answering questions if there are technical jargons
Advanced	Can read the conversation passage, comprehend but regular passage comprehension is good
Expert	Can read the conversation passage, comprehend but regular passage comprehension is good, explain better to others, help others, lead the pack
Writing Communication	
Beginner	Has trouble forming right sentences for written communication
Intermediate	Can form sentences, has problem with the layout, gets confused between layout for different form of written communication
Good	Can form sentences, has fair understanding of the layout to be used for particular type of written communication, but stutters for words and expression
Advanced	Can form sentences, has good understanding of the layout to be used for particular type of written communication, confident, can express thoughts well
Expert	Can form sentences, has good understanding of the layout to be used for particular type of written communication, confident, can express thoughts well and train others and lead the pack

Recommended Learning Resources

https://www.englishclub.com/grammar/parts-of-speech.htm
Watch Amy Cuddy's TED Talk: Your Body Language Shapes Who You Are
Additional Reading: http://money.cnn.com/2000/05/03/career/q_body_language/

Pre-assessment:

Activity 1:
Make a group, read random words from the list, build sentence for few words from the list.

Create a group of 3 or 5 students. Randomly pick 5 words from the word list write down on the board/show them as a chart if you have created a word chart/make chit of words and ask them to pick one chit and READ the word.

Main idea: Testing the pronunciation ability, language ability, confidence in speaking, ability to understand and accept the instruction

Activity 2:
Simple reading test – Reading passages (Simple passage from the current course book)
Show the reading passage, let each one of them read 2 lines, after first student is done with reading two lines, then the next student must pick up from there and read next two lines. This process has to be followed until the entire class is done with reading or at least ten students are done with reading.

Main idea: Testing listening skills, attentiveness, language ability, pronunciation ability

Activity 3:
Students getting to know each other. Create a group of 3 or 5 students. Each student gets chance to talk to another student, introduce him/herself to the student, ask question, make a note of the answer against the name of the student who is answering the question on a sheet of paper.

Main idea: To assess current communication level, body language when students talk with each other, and confidence.

Commonly Used Word List

When	Today	For	Off	Her	Thought		So	Into	
Give	Stop	There	Often	Time	Better	Them	Away		
Again	Little	Than	Myself	Long	Many	Does	No		
Do	Large	At	Over	Had	Get	Always	Other		
From	Both	Like	Along	Word	Please	These	With		
Him	Name	Said	Why	Very	Ask	Last	An		
Can	Few	They	Has	Your	Say	Got	What		
Go	Home	Look	Bring	Make	Ten	Next	Come		
But	Big	Know	Part	Day	I	Those	Would		
Old	Should	Done	By	Each	Show	Play	Who		
Not	Once	High	As	Yes	To	Girl	This		
				On	Am	A	Could		

Been	Where	You	Now	
Of	Way	Be	Fun	
He	Which	Were	Only	
It	Write	Or	Much	
More	Goes	One	Tell	
My	Great	All	Out	
Any	Number		That	Fast
Their	First	Cat	Is	
We	Find	His	Small	
She	Me	Have	Dog	
Did	In	How	See	
Went	Before	Water	Here	
Full	Saw	And	People	
Some	Never	Use	School	
Then	Boy	Take	Two	
If	Right	The	Call	
Night	After	Will	Might	
Made	About	Was	May	
Up	Far	Are	Walk	

To assess current communication skill: Activity based

Activity 3:

Making a group of students and getting to know each other with a predefined expectation for example:

Name:
I have performed on stage:
I'm good at sports:
I can speak more than 3 languages:
I'm always cheerful:
I like my mother tongue:

Course Assessment and Evaluation

Continuous Internal Evaluation (CIE)

Sl.No	Assessment	Schedule	Duration	Max. Test marks
1	Skill Test 1	At the end of 3rd week of the sem	2 Hrs	20
2	Skill Test 2	At the end of 7th week of the sem	2 Hrs	20
3	Skill Test 3	At the end of 13th week of the sem	2 Hrs	20
			Total	60

Scheme of Valuation for CIE

Serial no	Assessment	Marks
1	**Portfolio Evaluation of activities / exercises conducted upto the schedule of Skill Test. (Work Book Based)**	**10**
2	**Assessment of any one through qualitative assessment (Rubrics)**	**10**
	TOTAL	**20**

RUBRICS FOR ASSESSMENT OF ACTIVITY (10marks) (Qualitative Assessment)						
Dimension	Beginner	Intermediate	Good	Advanced	Expert	**Student Score**
	2	**4**	**6**	**8**	**10**	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	
					Average / Total Marks:	

Example Only **RUBRICS FOR ASSESSMENT OF ACTIVITY (10marks)** **Faculty need to develop appropriate rubrics as per the assigned activity for assessment**						
Dimension	Beginner	Intermediate	Good	Advanced	Expert	**Student Score**
	2	**4**	**6**	**8**	**10**	
Language Basics	Doesn't know / understand	Can read and identify commonly used words	Confident , able to communicate well with known people	Confident , able to communicate well with anyone using a English	Can read, understand; Also comprehend & can train others	8
Reading	Beginning to read, has native language impact	Can read, identify words, build simple 3/4/5 letter words easily	Can read, understand, build words, read simple sentences ; Also comprehend	Can read, understand, build words, read simple sentences ; Also comprehend	Confident , read simple and complex sentences with punctuation, comprehend, spell also build words	6
Inter personal communication	Is shy, doesn't talk/express	Hesitates to communicate – due to lack of confidence / ability, can talk to known people	Can talk to unknown people, less confident, does not express, has hard time working as a team	Can talk to unknown people, confident, can't express, has hard time working as a team	Confident, can talk to anyone, express well, works well in the team	8
Body language	Is shy, not open to communicate, has hard time making friends	Knows basics of Body language, practices sometimes	Knows basics of Body language, practices most times, has less confidence in presenting content	Knows and practices good body language all times, can present content	Knows and practices good body language all times, is an example, Leads the pack to get better	8
					Average / Total Marks: (8+6+8+8)/4	**7.5 = 8 marks**

Scheme of Valuation for Semester End Examination (SEE)

Serial no	Assessment	Evidence	Marks	Conversion
1	**Portfolio Evaluation- UNIT 1: English – Introduction**	**Work Book**	**15**	**40 Marks**
2	**Portfolio Evaluation- UNIT 2: Communication**	**Work Book**	**15**	
3	**Portfolio Evaluation- UNIT 3: Verbal Communication**	**Work Book**	**15**	
4	**Portfolio Evaluation- UNIT-4: Non-Verbal Communication:**	**Work Book**	**15**	
5	**Portfolio Evaluation- UNIT-5: English - Reading Skills, Grammar & Vocabulary**	**Work Book**	**15**	
6	**Any one activity through communication tools- By qualitative assessment (Rubrics).**	**BTE Answer scripts**	**25**	
		TOTAL	**100**	

Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20ME01P	**Semester**	I/II
Course Title	**Computer Aided Engineering Drawing**	**Course Group**	Mechanical and Allied courses
No. of Credits	4	**Type of Course**	Lecture & Practice
Course Category	PC	78Hrs Per Semester (L:T:P)= 1:0:2	6Hrs Per Week
Prerequisites	Enthusiasm to learn the subject/Visualizing/Creativity	**Teaching Scheme**	Practical
CIE Marks	60	**SEE Marks**	40

1. COURSE RATIONALE:

Engineering Drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization.

2. LIST OF COMPETENCIES:

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies:

1. Prepare engineering drawings both manually and using CAD with given geometrical dimensions using prevailing drawing standards and drafting instruments.
2. Visualize the shape of simple object from orthographic views and vice versa

3. COURSE OUT COMES:

CO1	Able to use drawing instruments and Adopt the standards, dimensioning and construct appropriate drawing scales, in technical drawing development.
CO2	Able to draw the projections of objects in all planes and learn displaying techniques for graphical communication in design process.
CO3	Able to Sketch orthographic projections into isometric projections and vice versa.
CO4	Use computer software and Apply computer aided drafting tools to create 2D /3 D engineering drawings

4. INSTRUCTIONAL STRATEGY:

1. Teacher should show model of real of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet.
2. Focus should be on proper selection of drawing instruments and their proper use.
3. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings.
4. Separate labs for practice on Engineering graphics Software should be established.

5-a CONTENTS:

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

5-b COURSE CONTENT DETAILS:

Unit	Major Learning Topics and Sub- Topics	Outcomes (in cognitive domain)	Hours L-T-P
UNIT-1 Basic elements of Drawing	1.1 List the different drawing instruments and application 1.2 Convention of lines and its application (Thick, Thin, Axis etc.,) 1.3 Practice use of drawing instruments 1.4 Representative fraction 1.5 Scales - Full Scale, Reduced Scale and Enlarged Scale 1.6 Dimensioning a. Aligned system and Unidirectional system in the Sketches b. Chain dimensioning and Parallel dimensioning 1.7 Construct different polygons	1. Drawing equipments, instruments and materials. 2. Equipments-types, specifications, method to use them, applications. 3. Instruments-types, specifications, methods to use those and applications. 4. Pencils-grades, applications, Different types of lines. 5. Scaling technique used in drawing. 6. Dimensioning methods.- Aligned method. Unilateral with chain, parallel dimensioning. 7. Constructions of geometrical figures	**4-0-8**
UNIT-2 Introduction to Projections	2.1 Introduction to Projections-Principle Planes of Projection and Principle Views 2.2 Introduction to First angle and Third angle method, their symbols 2.3 Projection of points in All 4 Quadrants	1. Reference planes, orthographic projections. 2. Concept of quadrant, 1st angle and 3rd angle projection and their symbols. 3. Projection of points.	**8-0-16**
	2.4 Projection of Lines a) Parallel to both the planes b) Parallel to one and Perpendicular to another c) Parallel to one and Inclined to another	1. Projection of lines determination of true length and inclinations for following cases. (a) Line parallel to one or both the plane. (b) Line perpendicular to one of the plane. (c) Line inclined to one plane and parallel to another.	
	2.5 Projection of plane surfaces. a) Parallel to one plane and Perpendicular to other two b) Planes Perpendicular to one plane and inclined to the other (Resting on Edge, Corner, Inclined to HP And VP)	1. Projection of Planes. (a) Types of planes. (b) Projection of planes parallel to one of the reference planes. (c) Projection of plane inclined to one reference plane and perpendicular to another. Note: *Triangle, Square / rectangle, pentagon, hexagon and circle shape should be included in various plane problems.*	

	2.6 Projection of Solids for the above conditions	1. Projections of solids in various positions with respect to the reference planes. (Parallel, perpendicular and inclined to HP and / or VP.)	
UNIT-3 EXPOSURE TO CAD	3.1 Introduction to CAD- Hardware requirements. 3.2 Various CAD software available 3.3 Familiarization of CAD window - Commands like New file, Saving the file, Opening an existing drawing file, Creating templates 3.4 Setting up new drawing: Units, Limits, Grid, Snap. Standard sizes of sheet. 3.5 Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview 3.6 Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Dimensioning, Inserting text Applying constraints - horizontal, vertical, parallel, concentric, perpendicular, symmetric equal, collinear 3.7 Insert title block for the drawing and take the Print out 3.8 Create objects by applying constraints and convert the objects to full scale , reduced scale and enlarged scale 3.9 Apply copy, mirroring, array, fillet and trim on the object created	1. Computer graphics & its terminology. 2. CAD definition, concept & need. 3. Commands used in CAD 4. Functional areas of CAD. - Coordinate systems. 5. Familiarization of Cad commands 6. Draw simple Geometrical figures using CAD	**3-0-6**

UNIT-4 Orthographic projections	4.1 Introduction to orthographic, Isometric projections 4.2 Conversion of pictorial view into Orthographic Views (USING SKETCH BOOK AND CAD)	1. Types of projections-orthographic, isometric projections: concept and applications. 2 Various term associated with orthographic projections. (a) Theory of projection. (b) Methods of projection. (c) Orthographic projection. (d) Planes of projection. 3. Conversion of simple pictorial views into Orthographic views. Illustrative problems on orthographic projection. Note : (1) Problem should be restricted up to - Front view/Elevation, Top view/Plan and Side views only. Use First Angle Method only.	**2-0-4**
UNIT-5 Isometric projections	5.1 Introduction to Isometric Projections 5.2 Isometric Scales and Natural Scale 5.3 Isometric View and Isometric Projection 5.4 Conversion of Orthographic Views into Isometric (USING SKETCH BOOK AND CAD)	1. Isometric axis, lines and planes. 2. Isometric scales. 3. Isometric view and isometric drawing. 4. Difference between isometric projection and isometric drawing. 5. Illustrative problems limited to Simple elements	**2-0-4**
UNIT-6 CAD Drafting	6.1 Draw different types of 2D/3D modeling entities using viewing commands, to view them (Problems solved in chapter no 3 and 4 i.e Orthographic, isometric projection). 6.2 2D/3D modeling for Thread profiles,nuts,bolts,studs,setscrews,washer,Locking arrangements. (USING CAD)	1 Difference between 2D & 3D models. 2.2D/3D modeling – concept, Simple objects	**7-0-14**
		TOTAL	**26-0-52**

6. LIST OF PRACTICAL EXERCISES:

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

Sl. No	Unit No	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	1	1. Teacher will demonstrate a: Use of a. Drawing instruments. b. Planning and layout as per IS. c: Scaling technique.	**1-0-2**

		2. Draw following. Problem – 1 Drawing horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter.(Drawing sheet)	
		Problem – 2 Indicate different convention of lines on the drawing. .(Drawing sheet)	**1-0-2**
		Problem – 3 Copy the sketch to the required scale and dimensioning adopting right system and positioning of dimensions using Tee and Set squares / drafter.(Drawing sheet)	**1-0-2**
		Problem 4. Draw regular geometric constructions Pentagon, Hexagon, Square, circle, Triangle and other shapes. .(Drawing sheet)	**1-0-2**
2	2	First angle Projection symbol Problem 5: Draw Projection of points in 1St, 2nd ,3rd and 4th Quadrants.(Drawing sheet)	**2-0-4**
		Problem 6: Draw Projection of Lines a) Parallel to both the planes b)Parallel to one and Perpendicular to another c) Parallel to one and Inclined to another. .(Drawing sheet)	**1-0-2**
		Problem 7: Draw Projection of plane surfaces. a) Parallel to one plane and Perpendicular to other two (Resting on Edge, Corner, Inclined to HP And VP)	**1-0-2**
		Problem 8: Planes Perpendicular to one plane and inclined to the other (Resting on Edge, Corner, Inclined to HP And VP) (Drawing sheets)	**1-0-2**
2	2	Problem 9: Draw Projection of Solids for the above conditions (Resting on Edge, Corner, Inclined to HP And VP) (Drawing sheet)	**3-0-6**
3	3	Use of CAD commands , plotting the drawing	**1-0-2**
		Problem 10:Drawing basic entities : Circle, Arc, Polygon, Ellipse, Rectangle, Multiline	**1-0-2**
		Applying constrains draw basic entities Insert title Block (CAD Drawings and Printout)	**1-0-2**
4	4	Problem 11: Draw Orthographic views for the given object. (Sketch book and CAD Drawing)	**2-0-4**
5	5	Problem 12: Draw Isometric projections for the given Orthographic views (Sketch book and CAD Drawing)	**2-0-4**
6	6	Problem 13:Produce Orthographic (2D) Drawings in CAD-Chap 3 Problem 14:Produce Isometric and 3D Drawings in CAD – Chap 4(CAD Drawings and Printout)	**5-0- 10**
		Problem 15:create 3D models of Mechanical Elements such as Hexagonal headed bolt, Simple toy, ball bearing (CAD Drawings and Printout)	**2-0-4**
		TOTAL	**26-0-52**

Note: Use both sides of sheet. For example, draw sheet number 2 on back side of sheet number 1, 4 on back of 3, and likewise.

1 Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.
2 The dimensions of line, axes, distances, angle, side of polygon, diameter, etc. must be varied for each student in batch so that each student will have same problems, but with different dimensions.
3 The sketchbook has to contain data of all problems, solutions of all problems and student activities performed.
4 Students' activities are compulsory to be performed. A hand out containing applicable standards from IS codes including title block as per IS standard should be given to each student by concerned teacher.
5 End Semester Examination will be conducted in practical mode for 100marks and wieghtage is reduced for 40 marks.
6 Students are to be assessed for competencies achieved.

7.SUGGESTED LIST OF STUDENT ACTIVITIES:

SL.NO.	ACTIVITY
1	Sketch the combinations of set squares to draw angles in step of 15^0.(15^0, 30^0, 45^0, 60^0, 75^0, 90^0, 105^0, 120^0, 135^0, 150^0, 165^0, 180^0).
2	Take two simple objects. Sketch isometric of them. Also draw orthographic projections of them (all views).
3	Take one circular shape. Assume one point on circumference and mark it. Roll that shape on flat and circular surface. Observe the path of point.
4	List at least two questions individually which you would like to ask for followings:
5	Prepare a 2D drawing using AutoCAD and 2D parametric sketcher environment.
6	Prepare 3D solid models using AutoCAD any on e mechanical component (Four components).

8. SUGGESTED LEARNING RESOURCES:

1. Bureau of Indian Standards. *Engineering Drawing Practice for Schools and Colleges IS: Sp-46.* BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. Bhatt, N. D. *Engineering Drawing*. Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93-80358-17-8.
3. Jain &Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi (ISBN: 978- 93-86173-478)
4. Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07-064837-1
5. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.
6. Shah, P. J. *Engineering Drawing*. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.
7. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. *Engineering Graphics with AutoCAD* . PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
8. Jeyapoovan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. Vikas Publishing HousePvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
9. Autodesk. *AutoCAD User Guide*. Autodesk Press, USA, 2015.

10. Sham, Tickoo. *AutoCAD 2016 for Engineers and Designers* .Dreamtech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.

9.SOFTWARE/LEARNING WEBSITES :

1. https://www.youtube.com/watch?v=TJ4jGyDWCw
2. https://www.youtube.com/watch?v=dmt6_n7Sgcg
3. https://www.youtube.com/watch?v=_MQScnLXL0M
4. https://www.youtube.com/watch?v=3WXPanCq9LI
5. https://www.youtube.com/watch?v=fvjk7PlxAuo
6. http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf
7. https://www.machinedesignonline.com

10.Mapping of Course Outcomes with Programme Outcomes (Suggestive only):

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
Engineering Graphics	CO1	3	0	0	3	0	0	0
	CO2	3	0	0	3	0	0	0
	CO3	3	0	0	3	0	0	0
	CO4	3	0	0	3	0	0	0

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Method is to relate the level of PO with the number of hours devoted to the CO's which maps the given PO.
If ≥50% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 3
If 30 to 50% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 2
If 5 to 30% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 1
If < 5% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is considered not-mapped i.e.; Level 0

11. COURSE ASSESSMENT AND EVALUATION CHART:

Sl. No	Assessment	Time frame in semester	Duration	Max marks	Conversion
1.	Portfolio Evaluation of Drawings(Manual Drawings - drawing sheet mode)	**Semester**	-	20	**20**
2	Skill Test-1 (unit 1 and 2- Manual based)	At the end of 4th week	3 Hrs	100	**Skill tests-1 is to be reduced to wieghtage of 20**
3	Skill Test-2 (Skill test 2 is of CAD based from Unit 4,5)	At the end of 8th week	3 Hrs	100	**Average of two skill tests 2 and 3 (Both skill tests are to**
4	Skill Test-3	- At the end of 13th week	3 Hrs	100	

	(Skill test 3 is CAD based-Unit 6)				**be reduced to wieghtage of 20 indepen dently) 20**
5	Total Continuous Internal Evaluation (CIE) Assessment				**60**
6	Semester End Examination(SEE) Assessment conducted for 100 marks, finally reduced to 40 marks wieghtage		3 Hrs	100	**40**
				TOTAL	**100**

Scheme of Valuation for End Examination

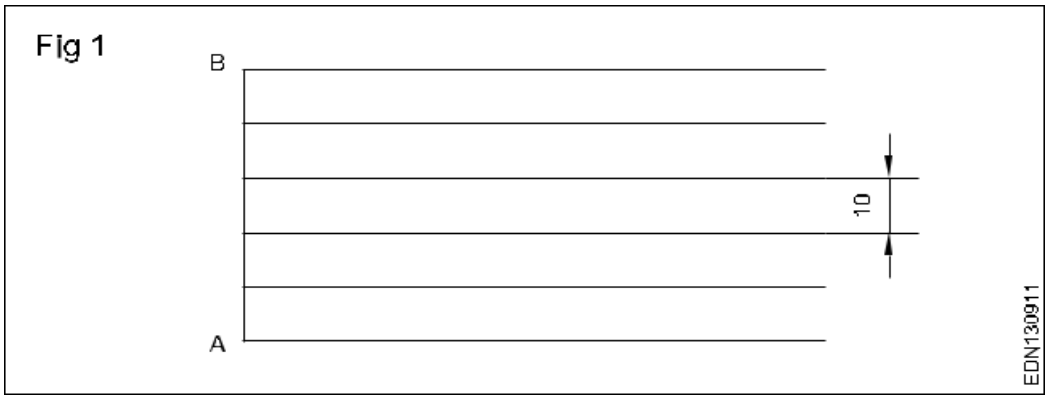
SL NO	QUESTIONS	MARKS
1.	One Problems from Geometrical constructions/Projection of points (Answer Sheet)	**25**
	OR	
	One Problems from Projection of lines (Answer Sheet)	**25**
2.	One Problems from Projection of planes (Answer Sheet)	**25**
	OR	
	One Problems from Projection of solids (Answer Sheet)	**25**
3	Create 3D drawing for the given Sketch and Dimensioning(CAD)	**40+10=50**
	TOTAL	**100**

12.CAD Laboratory and Other Requirements to Conduct Engineering Graphics Course

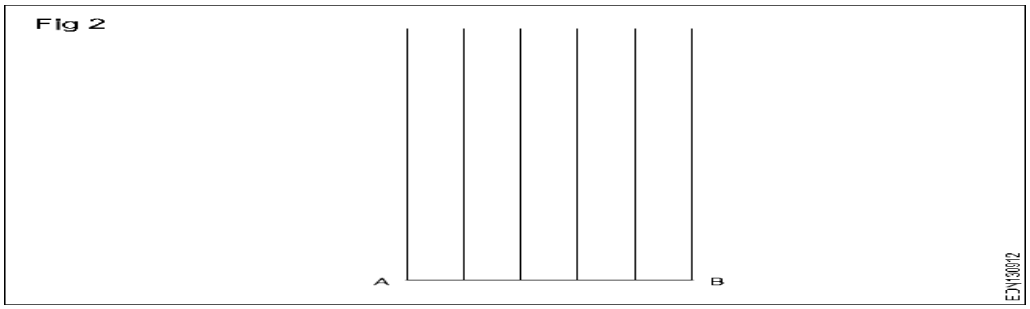
1. Latest Configuration Computers which can be able to run latest any Computer Aided Drafting Software. (At least One Computer per student in practical session.)-30 no
2. Any latest Authorized Computer Aided Drafting Software (30 user licenses)
3. Plotter of size A2/A3
4. LCD Projector

MODEL QUESTION BANK (Suggestive only)

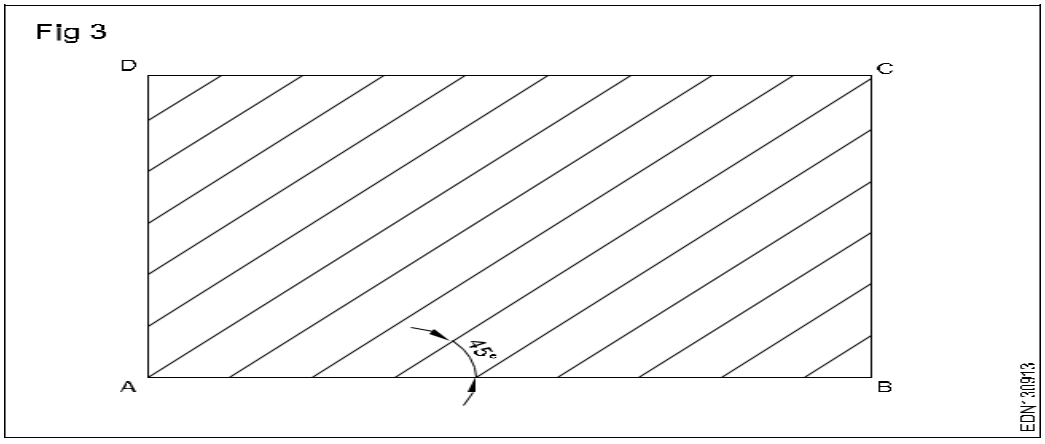
1. a) Illustrate the elements of dimensioning with the help of a sketch.
   b) Illustrate the dimensioning of given common features: diameter, radius, chord, Arc and angle.
2. a) Mention the uses of the following drawing instruments.
   i) T-square ii) Set square iii) Bow compass iv) Clinograph v) Minidrafter
   b) Mention the uses of the following drawing instruments.
   i) French curves ii) Protractor iii) Clips iv) Erasing Shield v) Drafting machine
3. Define RF. Mention the types of scales based on RF.
4. Draw the conventional representation of lines
5 Draw six horizontal parallel lines of 50 mm long with 10 mm intervals (Fig 1).



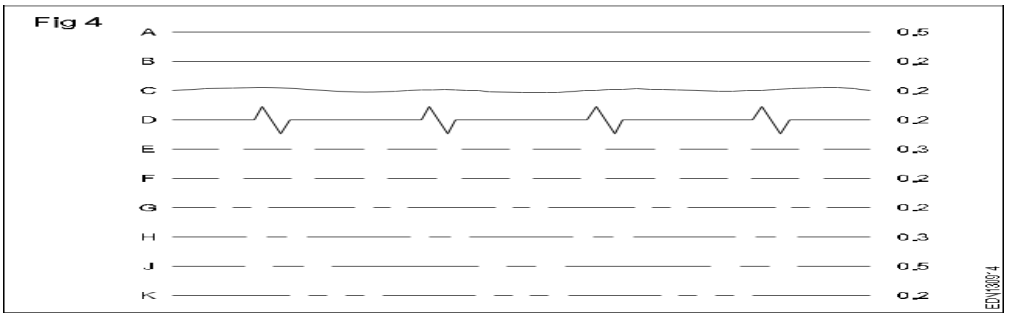
6 Draw six vertical parallel lines of 50 mm length with 10 mm intervals (Fig 2)



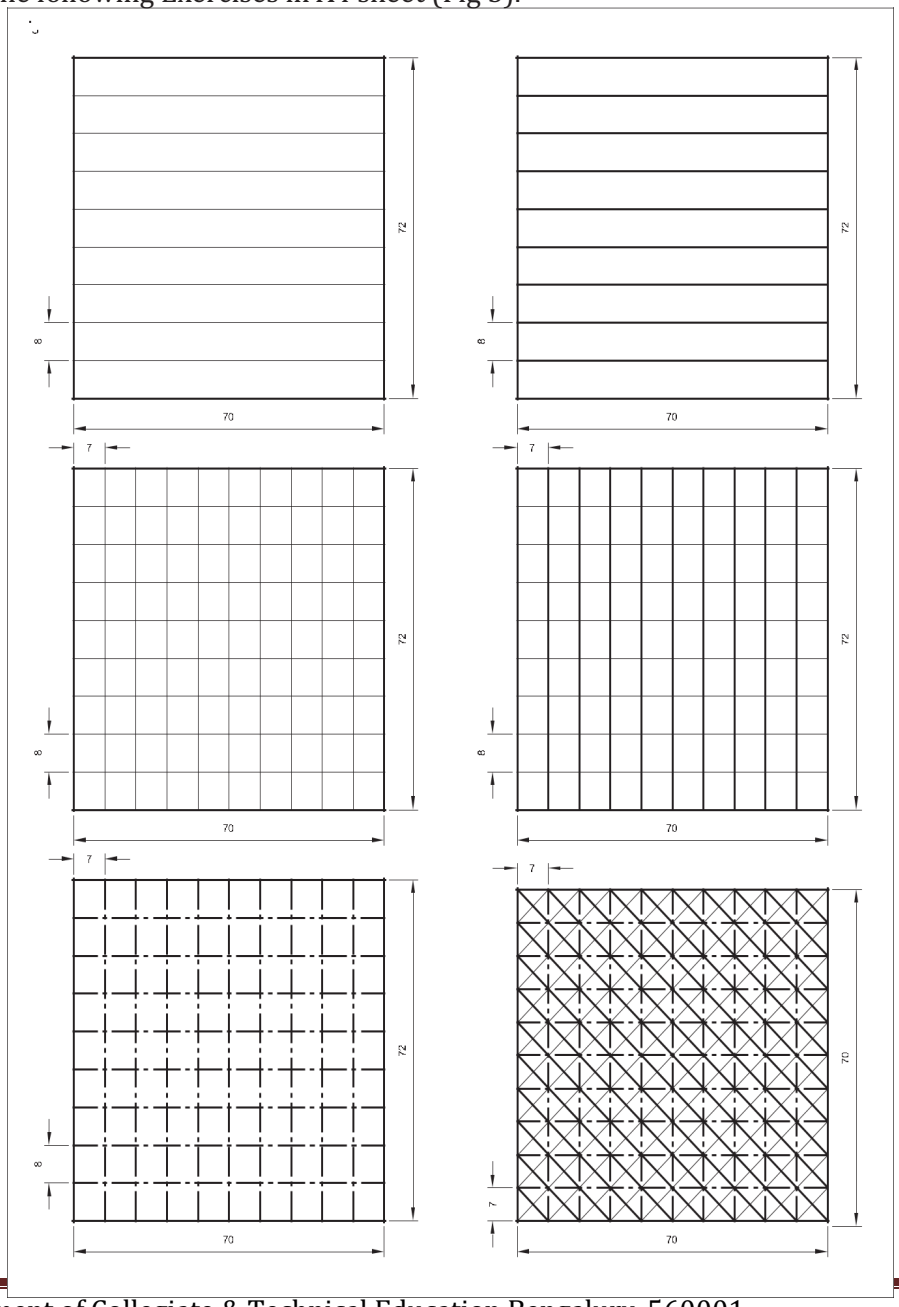
7 Draw 45° inclined lines (Fig 3).



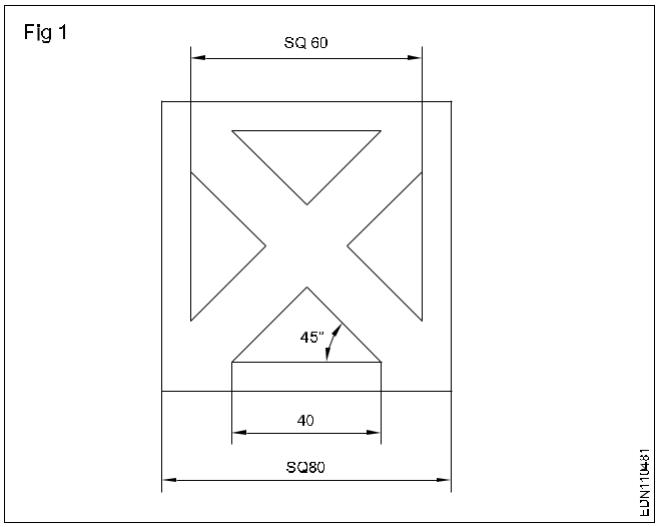
8 Draw the given types of lines using 0.5 range thickness of line according to the specification (Fig 4)

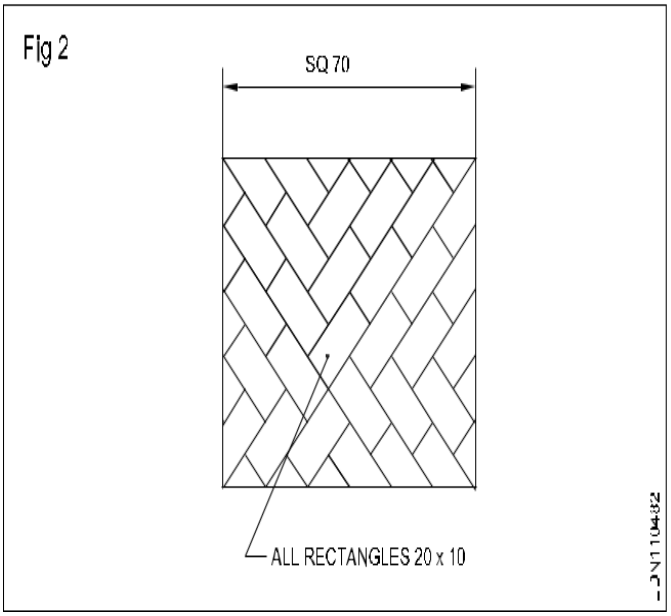


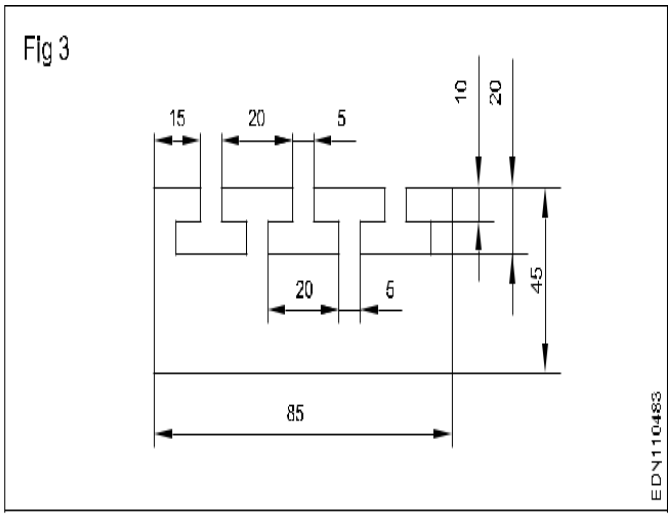
Draw the following Exercises in A4 sheet (Fig 5).



10 Draw the pattern drawing given Figure1,2,3



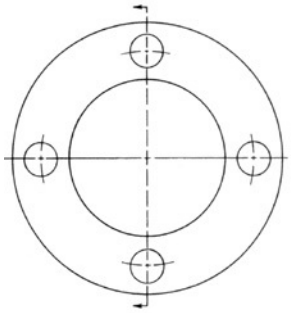




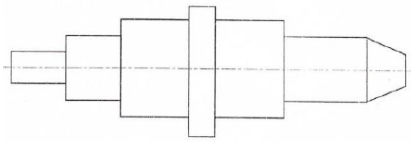
11 a) Illustrate the elements of dimensioning with the help of a sketch.

b) Illustrate the dimensioning of given common features: diameter, radius, chord, Arc and angle.

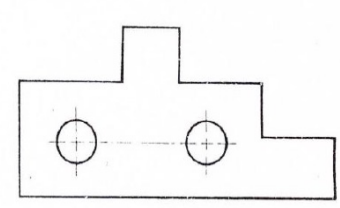
12 Copy the sketch to 1:1 scale and dimension it using Aligned system.



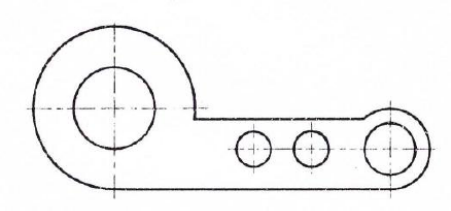
13 Copy the sketch to 1:1 scale and dimension it using unidirectional system with Parallel dimensioning method.



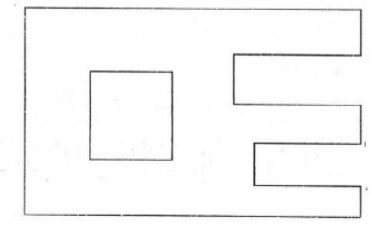
14 Copy the sketch to 1:1 scale and dimension it using Aligned system with Chain dimensioning method.



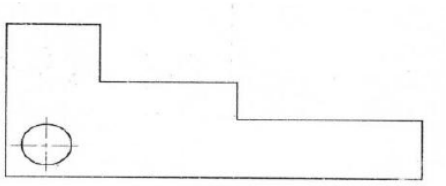
15 Copy the sketch to 1:1 scale and dimension it using Aligned system with Parallel dimensioning method.



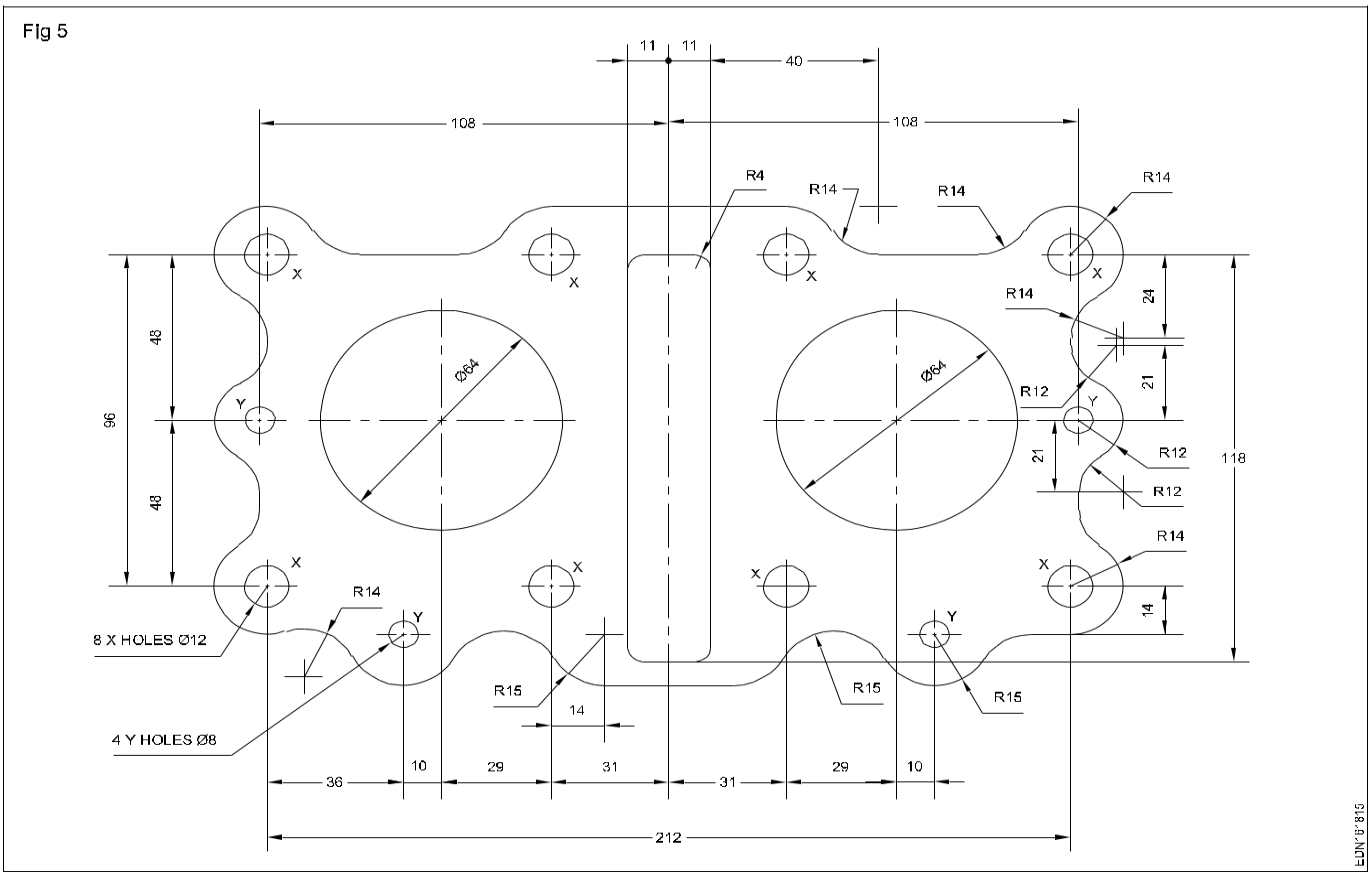
16 Copy the sketch to 1:1 scale and dimension it using unidirectional system with Chain dimensioning method



17 Copy the sketch to 1:1 scale and dimension it using unidirectional system with Parallel dimensioning method.



15 Copy the sketch as shown in figure below dimension it in a Chain and parallel dimensioning



UNIT 2 PROJECTIONS

PROJECTIONS OF POINTS

Draw the symbolic representation of First and Third angle projection method.

1. Draw the projections of the following points:
   i. A is 25mm above the HP and 30mm in front of the VP.
   ii. B is lying on HP and 45mm in front of VP.
   iii. C is lying on VP and 50mm above HP.
   iv. D lies in both HP and VP.
2. A point P is 40 mm in front of VP; 50 mm above HP and 30 mm in front of left PP. Draw the three principal views of the point.
3. A point Q is 30mm in front of VP, 40mm above HP and 35mm in front of right PP. Draw the three principal views of the point.
4. Draw the projections of the following points on a common reference line:

   a)Point P is 25mm above the HP and 40mm behind the VP
   b)Point Q is 30mm below the HP and 40mm behind the VP
   c) Point R is 25mm above the HP and in the VP.
   d)Point S is 30mm below the HP and in the VP
   e)Point T is 35mm in front of the VP and in the HP.

PROJECTIONS OF LINES

1. Draw the three views of a line 70mm long when it is parallel to both HP and VP.
   The line is 20mm in front of VP and 30mm above HP.
1. Draw the three views of a line 80mm long is perpendicular to VP and parallel to HP. The end nearer to VP is 20mm above HP and 25mm in front of VP.
2. Draw the projections of a line 80mm long placed parallel to VP, perpendicular to HP. The line is 70mm in front of VP and 60mm in front of right PP. the lower end of the line is 30mm above HP. (Ref: KRG Ed 2018 P151)
3. Draw the projections of a line 80mm long placed parallel to HP, perpendicular to VP with the rear end of the line 30mm in front of it. The line is 55mm above HP and 50mm in front of the right PP. (Ref: KRG Ed 2018 P152)
4. Draw the three principal views of a line 80 mm long placed parallel to VP and perpendicular to HP. The line is 70mm in front of VP and 60mm in front of right PP. The lower end of the line is 30mm above HP.
5. Draw the three principal views of a line 80 mm long when it is placed parallel to both HP & VP. One of the ends of the line is 70 mm above HP, 60 mm in front of VP and 30mm in front of the right PP.
6. A line AB 80 mm long is inclined at 30° to HP and parallel to VP. The line is 90 mm in front of VP. The lower end A is 35 mm above HP,110 mm in front of the right PP and is away from it than the higher end. Draw the three principal views of the line.
7. Draw the projections of a line AB, 80 mm long inclined at 30° to HP and parallel to VP. The line is 40 mm in front of VP. The lower end A is 20 mm above HP.

PROJECTIONS OF PLANE SURFACE

1. A regular triangular lamina of side 30mm is placed with one its corner on HP such that the surface is inclined at 40° to HP and perpendicular to VP. Draw its Top and Front views.
2. A regular square lamina of side 40mm is placed with one its side on HP such that the surface is inclined at 30° to HP and perpendicular to VP. Draw its Top and Front views.
3. A regular pentagonal lamina of side 30mm is placed with one its side on HP such that the surface is inclined at 45° to HP and perpendicular to VP. Draw its Top and Front views.
4. A regular hexagonal lamina of side 30mm is placed with one its corner on HP such that the surface is inclined at 45° to HP and perpendicular to VP. Draw its Top and Front views.
5. A circular lamina of 40mm diameter lies on HP such that its surface is inclined at 40° to HP. Draw its front and top.
6. An equilateral triangular lamina of side 40mm rests with one its sides on HP so that the surface of the lamina is inclined at 30° to HP. The side on which the lamina rests is inclined at 45° to VP. Draw the projections of the lamina.
7. An equilateral triangular lamina of sides 30mm is resting with one of its corners on HP. The surface of the lamina is inclined at 45° to HP and the side opposite to the corner on which the lamina rests is inclined at 45° to VP. Draw the projections of the lamina.
8. A square lamina of 40mm side rests with one of its sides on HP so that the surface of the lamina is inclined at 30° to HP. The side on which the lamina rests is inclined at 45° to VP. Draw the top and front views of the square lamina in this position.
9. A square lamina of 40mm sides rests with one of its corner on HP. The diagonal passing through this corner is inclined at 45° to HP and appears to be inclined at 45° to VP. Draw its projections.

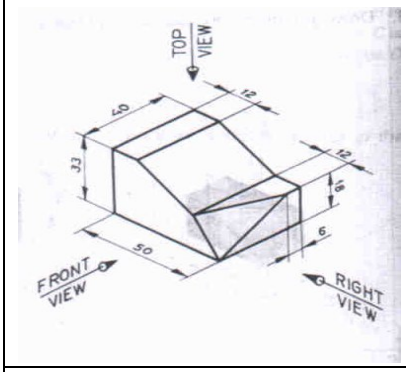
PROJECTIONS OF SOLIDS

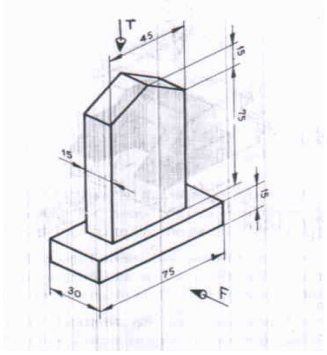
1. A triangular prism of base edge 40mm and height 65mm rests with one of its base edges on HP so that the axis of the prism is inclined at 30° with HP. Draw the top and front views when the axis of the prism is parallel to VP.
2. A square prism of base edge 40mm and height 70mm rests with one of its base edges on HP. The axis of the prism is inclined at 45° to HP and parallel to VP. Draw the top and the front views of the prism.
3. A pentagonal prism of base 35mm and height 60mm has its base edge on HP. Draw the top and front views, if the base of the prism is inclined at 30° to the HP. The axis of the prism is parallel to the VP.
4. A Hexagonal prism of base 35mm and height 60mm is resting with its base edge on HP so that the axis is inclined at 45° and parallel to VP. Draw its top and front views.
5. A triangular pyramid of base edge 40mm and height 65mm is resting with one of its base corner on HP so that the axis of the pyramid is parallel to VP and inclined at 45° to HP. Draw the top and front views.
6. Draw the top and front views of a hexagonal pyramid resting with one of its base corner on HP such that the axis of the pyramid is inclined at 30° to HP. The hexagonal pyramid has its base edges as 30mm and axis height as 60mm.
7. A pentagonal pyramid of base edge 30mm and axis height 65mm rests with one of its base corners on HP so that the base of the pyramid is inclined at 45° to the HP. Draw the projections if the axis of the pyramid is parallel to the VP.

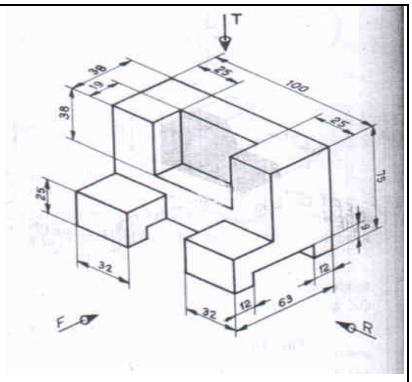
8. A cylinder of 40mm diameter and axis height 65mm rests with its points of the circumference on HP so that the axis is inclined at 45° to the HP and parallel to the VP. Draw the top and front views.
9. A cone of 40mm diameter and axis height 65mm is resting with points of the circumference on HP. Draw the top and front views, if the axis of the cone is inclined at 30° with HP and parallel to VP.

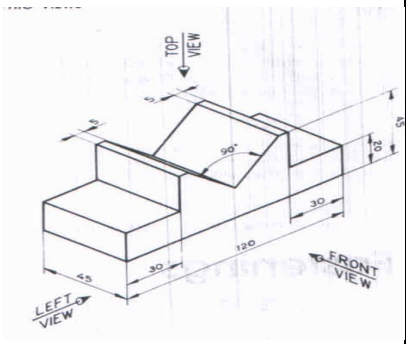
UNIT 3 ORTHOGRAPHIC ROJECTIONS

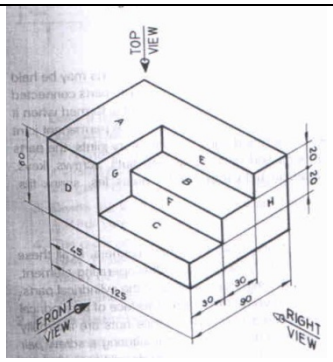
Draw the three principal views of the component as shown in the figure.

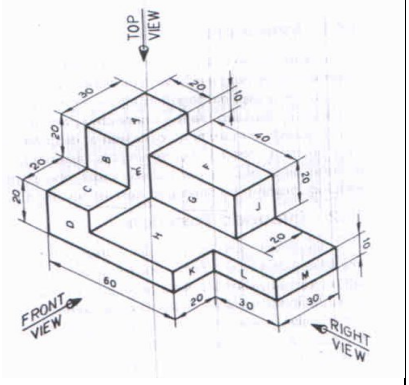


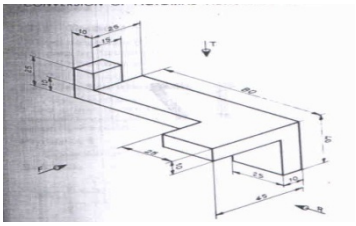


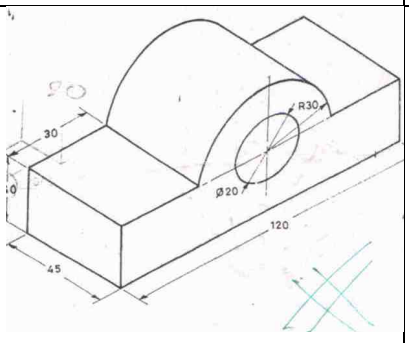


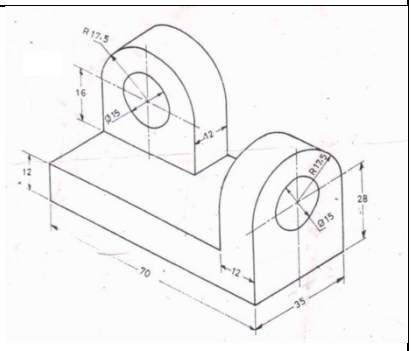


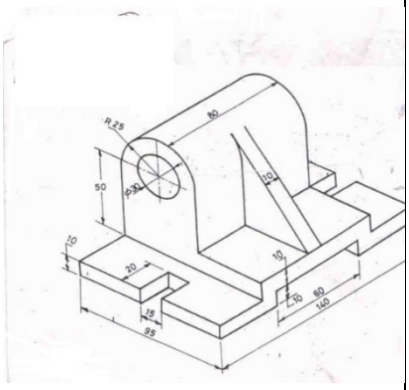


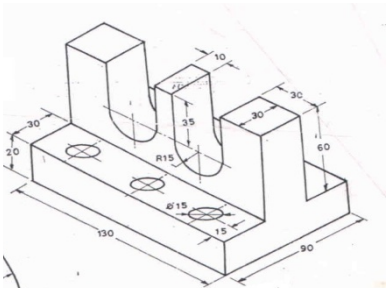


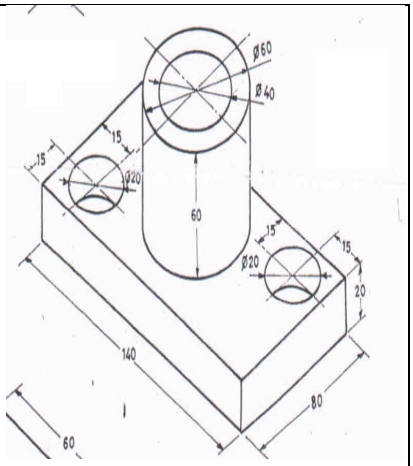


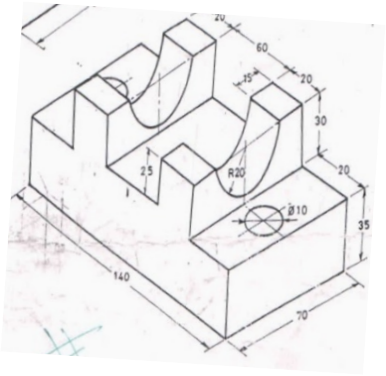


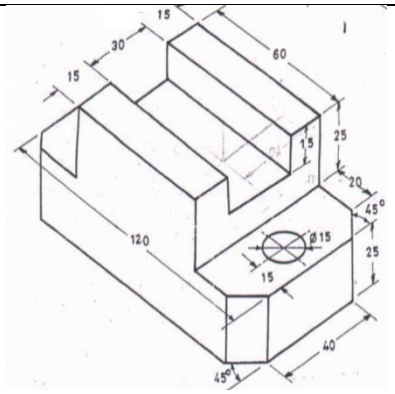


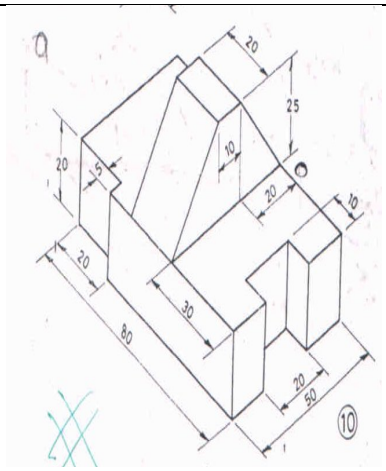








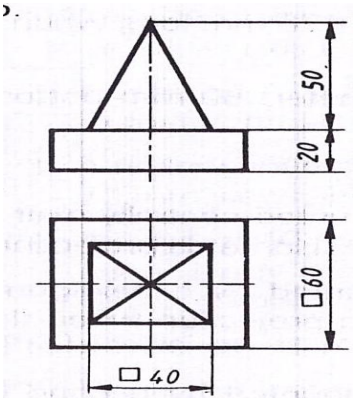




UNIT 4 ISOMETRIC PROJECTIONS

1. .Draw the isometric view of the machine component whose orthographic views are given below:

1.



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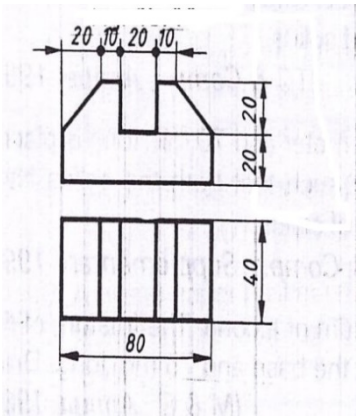

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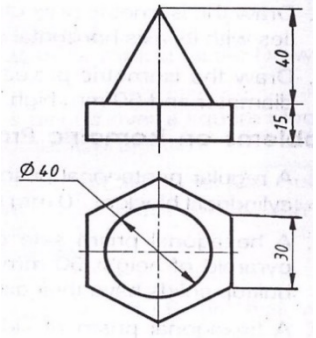

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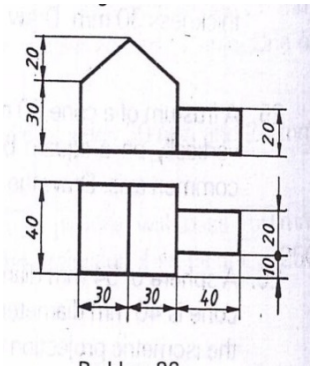

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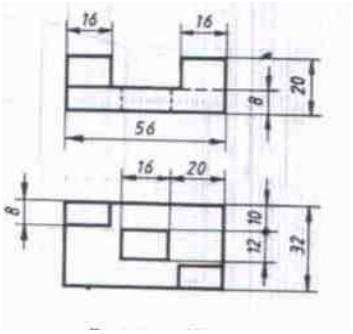

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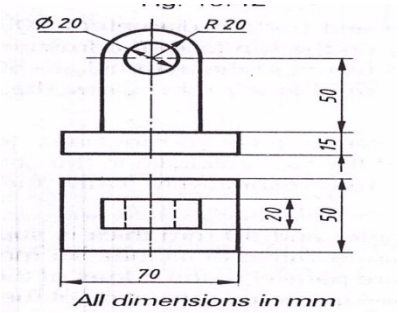

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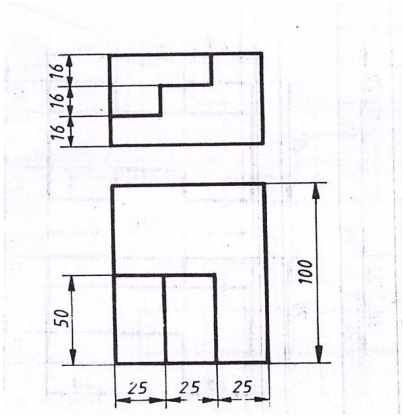

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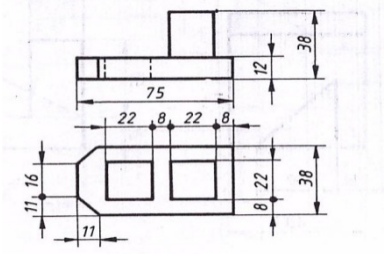

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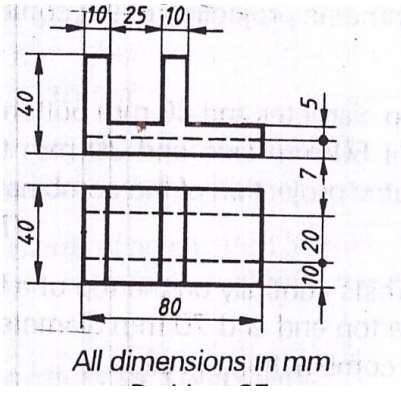
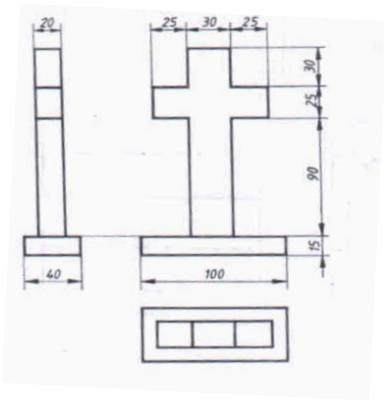
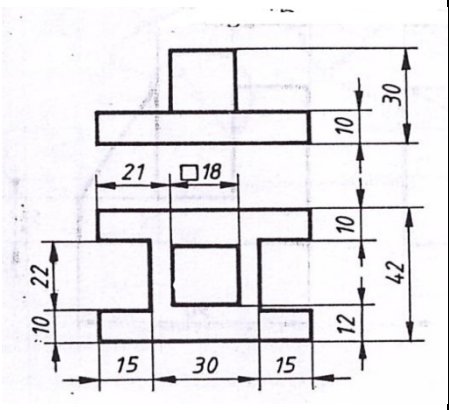
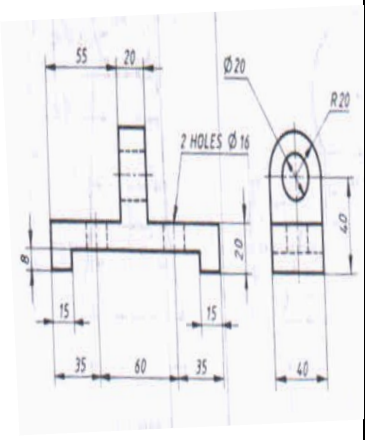
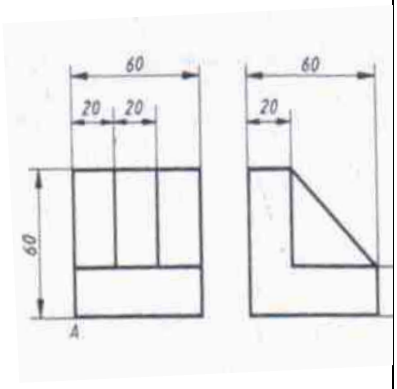
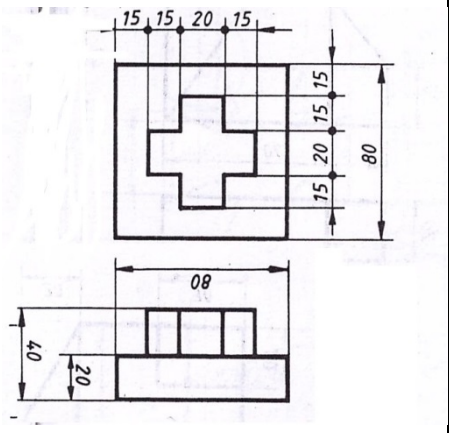
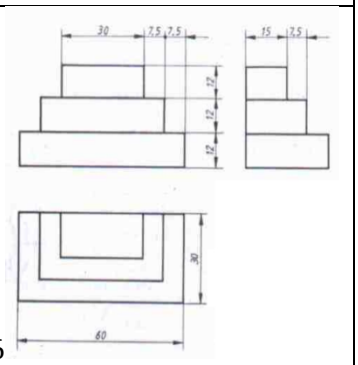
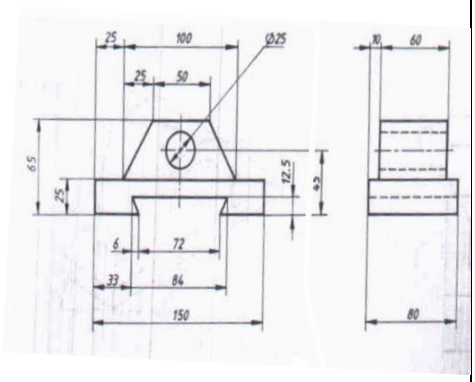
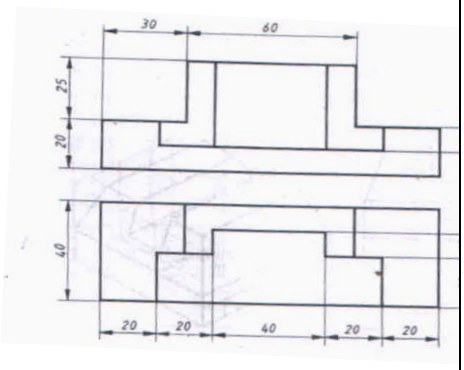
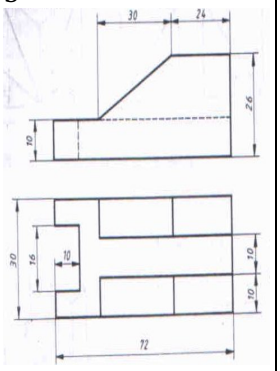
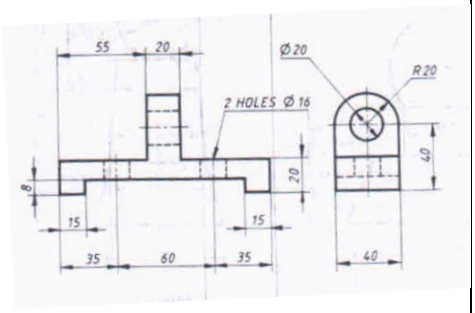
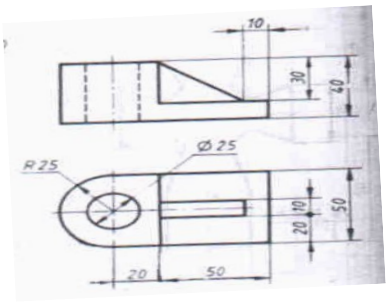
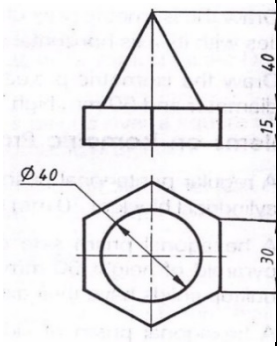


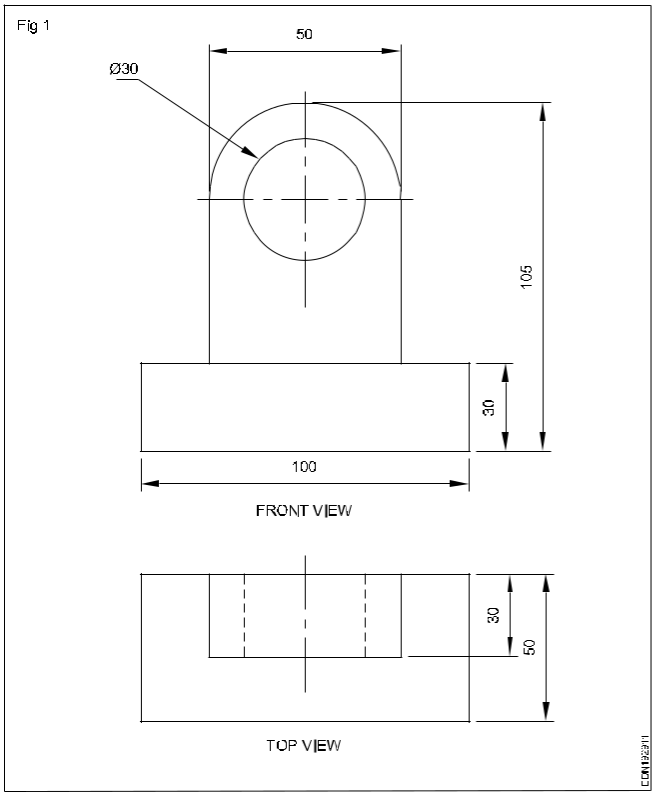
2. Draw the isometric Projection of the machine component whose orthographic views are given below:

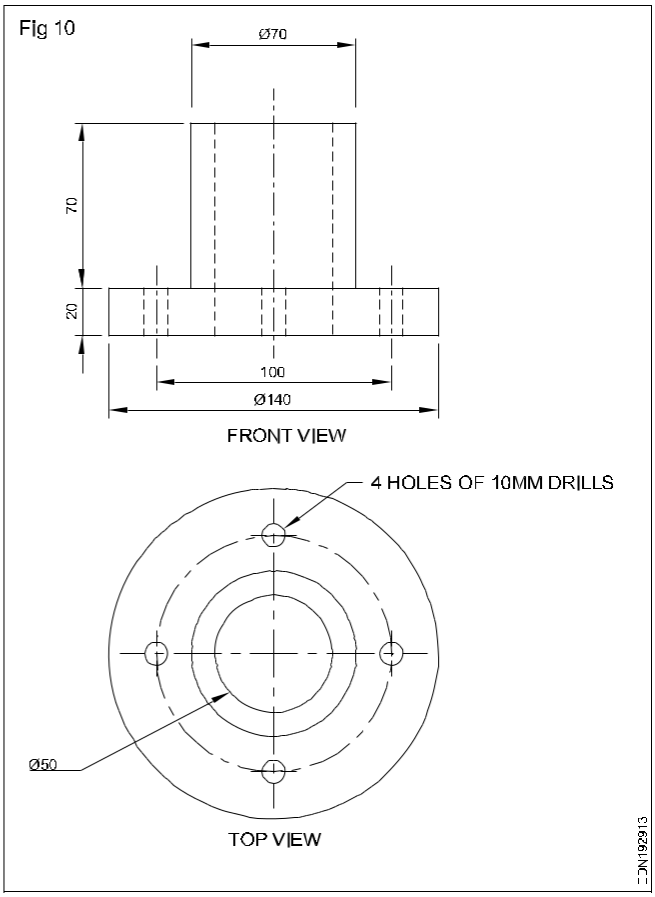
1 	2 	3 
4 	5 	6 

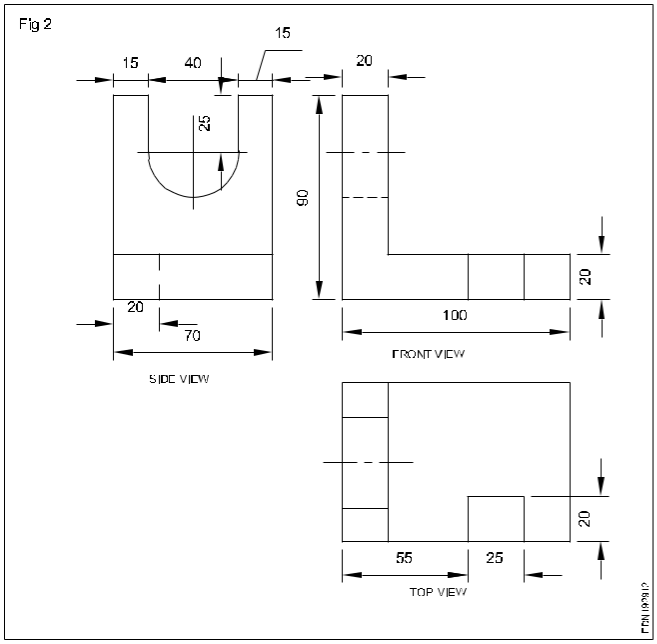
3. Draw the isometric Projection of the machine component whose orthographic views are given below

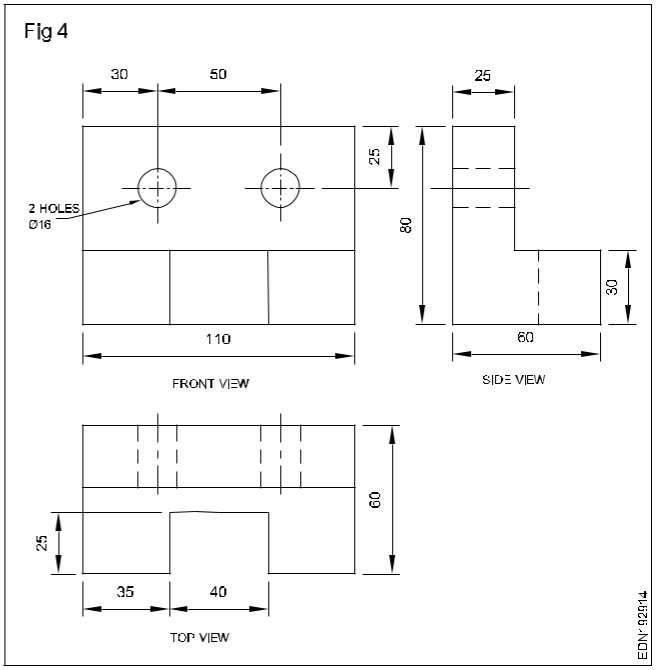
1 	2 	3 
4 	5 	6 

4. Create 3D model using CAD of the machine component whose orthographic views are given below









Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20AU01T	**Semester**	I
Course Title	**ENVIRONMENTAL SUSTAINABILITY**	**Course Group**	Audit
No. of Credits	2	**Type of Course**	Lecture
Course Category	AU	**Total Contact Hours**	2Hrs Per Week
			26Hrs Per Semester
Prerequisites	Basic Environmental Science	**Teaching Scheme**	(L: T:P) = 2:0:0
CIE Marks	50	**SEE Marks**	No

COURSE OBJECTIVES:

Technicians working in industries or elsewhere essentially require the knowledge of environmental science so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

1. Solve various engineering problems applying ecosystem to produce eco – friendly products.
2. Use relevant air and noise control methods to solve domestic and industrial problems.
3. Use relevant water and soil control methods to solve domestic and industrial problems.
4. To recognize relevant energy sources required for domestic and industrial applications.
5. Solve local solid and e-waste problems.

COURSE OUTCOMES:

At the end of the course student will be able to know :

CO1	Importance of ecosystem and terminology.
CO2	The extent of air pollution, effects, control measures and acts.
CO3	The extent of noise pollution, effects, control measures and acts.
CO4	The water and soil pollution, effects, control measures and acts
CO5	Different renewable energy resources and efficient process of harvesting.
CO6	Solid Waste Management and Environmental acts.

COURSE CONTENT:

Marks: 15	***Unit-1 Ecosystem***	*Allotted Hrs: 03*
Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem. Global warming - Causes, effects, Green House Effect, Ozone depletion.		
Marks: 20	***Unit-2Air Pollution***	*Allotted Hrs: 03*
Air pollution, Natural and manmade sources of air pollution, Effects of air pollution. Air Pollutants and Types. Control of air pollutants by Cyclone separator and Electrostatic Precipitator, Air (prevention and control of pollution) act 1981		
Marks: 10	***Unit-3 Noise Pollution:***	*Allotted Hrs: 02*
Noise pollution: sources of pollution, measurement of pollution level, Effects and Control of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000		
Marks: 20	***Unit- 4Water and Soil Pollution:***	*Allotted Hrs: 06*
Water pollution and Sources of water pollution, Types of water pollutants, Characteristics of water pollutants,control measures of water pollution. Definition and list unit operations in water and Wastewater Treatment process, Water (prevention and control of pollution) act 1974, Water conservation – Importance of Rainwater Harvesting. Soil pollution, Causes, Effects and Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides		
Marks: 20	***Unit-5 Renewable sources of Energy***	*Allotted Hrs: 07*
Solar Energy: Basics of Solar energy. Definition and advantages of advanced solar collectors. Solar water heater and Solar stills and their uses. *Biomass:* Overview of biomass as energy source. Thermal characteristics of biomass as fuel. *Wind energy:* Current status and future prospects of wind energy. Wind energy in India. Need of new Energy sources, Different type's new energy sources. Environmental benefits of New Energy Sources-Hydrogen energy, Ocean energy resources, Tidal energy conversion.		
Marks: 15	***Unit-6 Solid Waste Management and Environmental Acts***	*Allotted Hrs: 05*
Solid waste generation, Sources and characteristics of Municipal solid waste, Solid Waste Management rules 2016- 3R in SWM. E- Waste generation, Sources and characteristics, E waste management rules 2016 Plastic Waste generation, Sources and characteristics, Recycled plastic rules 2016 Importance of Environment (protection) act 1986 Occupational health and safety measures.		

Unit No & Name	Detailed Course Content	CO	PO	Contact Hrs
1. Ecosystem	Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem.	CO1	1,5,7	1
	Global warming - Causes, effects.	CO1	1,5,7	2
	Green House Effect, Ozone depletion - Causes, effects	CO1	1,5,7	3
2. Air and Pollution	Air pollution, Natural sources of air pollution, Man Made sources of air pollution	CO2	1,5,7	4
	Air pollutants and Types, Effects of Particulate Pollutants and control by Cyclone separator	CO2	1,5,7	5
	Effects of Particulate Pollutants and control by Electrostatic Precipitator, Air (prevention and control of pollution) act 1981.	CO2	1,5,7	6
3. Noise Pollution	Noise pollution: sources of pollution, Measurement of Noise pollution level.	CO3	1,5,7	7
	Effects and Control of Noise pollution. Noise pollution (Regulation and Control) Rules, 2000	CO3	1,5,7	8
4. Water and Soil Pollution:	Sources of water pollution. Types of water pollutants, Characteristics of water pollutants.	CO4	1,5,7	9
	Control measures of water pollution.	CO4	1,5,7	10
	Definition and list unit operations in water and Wastewater Treatment process, Water (prevention and control of pollution) act 1974.	CO4	1,5,7	11
	Water conservation – Importance of Rainwater Harvesting	CO4	1,5,7	12
	Soil pollution, Causes and Effects due to Fertilizers, Pesticides and Insecticides	CO4	1,5,7	13
	Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides.	CO4	1,5,7	14
5. Renewable sources of Energy	Solar Energy: Basics of Solar energy. Solar collectors and advantages of Advanced solar collectors.	CO5	1,5,7	15
	Solar water heater, Solar stills and their uses.	CO5	1,5,7	16
	Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel.			17
	Wind energy: Current status and future prospects of wind energy. Wind energy in India.	CO5	1,5,7	18
	Need of new Energy sources, Different type's new energy sources. Environmental benefits of New Energy Sources-Hydrogen energy	CO5	1,5,7	19
	Environmental benefits of New Energy Sources- Ocean energy resources	CO5	1,5,7	20
	Environmental benefits of New Energy Sources-Tidal energy conversion.	CO5	1,5,7	21
6. Solid Waste Management and Environmental Acts	Solid waste generation, Sources, Characteristics of solid waste Solid Waste Management rules 2016	CO6	1,5,7	22
	E- Waste generation Sources and characteristics, E waste management rules 2016	CO6	1,5,7	23
	Plastic Waste generation Sources and characteristics, Plastic Waste Sources and characteristics	CO6	1,5,7	24

	Recycled plastic rules 2016, Importance of Environment (protection) act 1986,	CO6	1,5,7	25
	Occupational health and safety measures.	CO6	1,5,7	26
			Total	**26**

References:

(a) Suggested Learning Resources:

Books:

1. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,New Delhi
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Wastewater Treatment for Pollution Control and Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099.
4. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
5. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
6. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
8. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New Delhi, 1988, ISBN: 0-07- 451871-8.
9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978, ISBN: 9780070354760.
7. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
10. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6
11. Metcalf & Eddy, Wastewater Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
12. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

(b) Open source software and website address:

1) www.eco-prayer.org
2) www.teriin.org
3) www.cpcp.nic.in
4) www.cpcp.gov.in
5) www.indiaenvironmentportal.org.in
6) www.whatis.techtarget.com
7) www.sustainabledevelopment.un.org
8) www.conserve-energy-future.com

Teachers should use the following strategies to achieve the various outcomes of the course.

• Different methods of teaching and media to be used to attain classroom attention.

• Massive open online courses (MOOCs) may be used to teach various topics/subtopics.

• 15-20% of the topics which are relatively simpler or descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.

• Micro-projects may be given to group of students for hand-on experiences

• Encouraging students to visit sites such as Railway station and research establishment around the institution.

Mapping of Course Outcomes with Programme Outcomes

CO	Course Outcome	PO Mapped	Cognitive Level R/U/A	Theory Sessions In Hrs	Allotted marks for CIE on cognitive levels		TOTAL
					R	U	
CO1	Importance Of ecosystem and terminology	1,5,7	R, U	03	02	02	04
CO2	The extent of air pollution, effects, control measures and acts.	1,5,7	R, U	03	03	02	05
CO3	The extent of noise pollution, effects, control measures and acts.	1,5,7	R, U	02	03	02	05
CO4	The water and soil pollution, effects, control measures and acts	1,5,7	R, U	06	03	02	05
CO5	Different renewable energy resources and efficient process of harvesting.	1,5,7	R, U	07	03	02	05
CO6	Solid Waste Management and Environmental acts.	1,5,7	R, U	05	02	04	06
Total Hours of instruction				**26**	**30**		

R-Remember; U-Understanding.

Level of Mapping PO's with CO's

Course	CO's	Programme Outcomes (PO's)						
		1	**2**	**3**	**4**	**5**	**6**	**7**
Environmental Science	**CO1**	3	0	0	0	2	0	1
	CO2	3	0	0	0	2	0	1
	CO3	3	0	0	0	2	0	1
	CO4	3	0	0	0	2	0	1
	CO5	3	0	0	0	2	0	1
	CO6	3	0	0	0	2	0	1

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Method is to relate the level of PO with the number of hours devoted to the CO's which maps the given PO.
If ≥50% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 3
If 30 to 50% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 2
If 5 to 30% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is mapped at Level 1
If < 5% of classroom sessions related to the CO are addressing a particular PO, it is considered that PO is considered not-mapped i.e.; Level 0

Course Assessment and Evaluation Chart

Sl. No	Assessment	Duration	Max marks	Conversion
1.	CIE Assessment 1 (Written Test -1 - At the end of 3rd week	80 minutes	30	Average of three written tests 30
2.	CIE Assessment 2 (Written Test -2) - At the end of 7th week	80 minutes	30	
3.	CIE Assessment 3 (Written Test -3) - At the end of 13th week	80 minutes	30	
4	CIE Assessment 4 (MCQ/Quiz) - At the end of 5th week	60 minutes	20	Average of three 20
5	CIE Assessment 5 (Open book Test) - At the end of 9th week	60 minutes	20	
6	CIE Assessment 6 (Student activity/Assignment)- At the end of 11th week	60 minutes	20	
7.	Total Continuous Internal Evaluation (CIE) Assessment			50
	Total Marks			**50**

Note:

1. Average marks of Three CIE shall be rounded off to the next higher digit.
2. Assessment of assignment and student activity is evaluated through appropriate rubrics by the respective course coordinator. The secured mark in each case is rounded off to the next higher digit.

MANDATORY STUDENT ACTIVITY: EACH STUDENT HAS TO SELECT ANY ONE OF THE LISTED

1. Students chose one thing to reduce at home each week and write journal entries about their successes and challenges implementing the change. In class, they form groups and create "Do You Know?" posters.
2. Students pretend they are architects and come up with a series of design changes to make their school more environmentally friendly. They then grade their projects according to a rubric.
3. A presentation for Green Team Club members to introduce themselves and the purpose of their club. They explain how to use their new recycling bins, in the classroom and in the cafeteria.
4. Ever wonder what's in your school's waste? This hands-on activity helps students assess their school's waste in order to think of ways to reduce it. The results can be incorporated into the school's recycling plan.
5. How do we measure climate change? What activities contribute to climate change?
6. 6. Start a compost or worm bin. Composting is a hands-on way to learn about important life science concepts such as ecosystems, food webs and biodegradation. Students experience how worms and other decomposers recycle fruits and vegetable scraps into compost. Use the

compost in your college garden! Have green team students make up a skit and present details about the new composting program to all classrooms. Have them make signs for the bins (compost, recycle, and landfill), monitor the waste collection at lunchtime, cart the food waste to the compost, and decide how and where the compost will be used.

7. Paint posters and decorate bulletin boards or the doors to the cafeteria with waste- free lunch messages to announce or support a waste-free event, and have students vote for their favorite poster.

8. Conduct a classroom audit to identify waste and look for ideas to reduce and reuse. Empower the student to set goals, search for solutions and review progress.

9. Go on a field trip. Visit your local landfill, recycling center, or a nearby composing facility where the students can see first-hand what is happening to waste and learn about the lifecycle of waste and its affect on the environment.

10. Home energy audit:Have students make a list of all the appliances and light bulbs in their house. How much energy does their house use if all the lights are on for 4 hours per day? If their appliances are on for 2 hours per day? How much energy could they save if they switched to energy-efficient appliances or lightbulbs?

11. Use recycled material in art projects:Recycled materials can make beautiful art projects such as jewelry, planters, and bird houses. Incorporating materials that would otherwise be thrown away into art projects can show your students how to find new uses for these items.

12. Life cycle :One way to show students what happens when you put something in the trash versus recycling or reusing the object is to do a life cycle analysis. This is a flow chart that shows the environmental impacts of an object, from extracting the raw materials to decomposition and everything in between. When something is put in the trash instead of being reused or recycled, the life cycle assessment will show a bigger environmental impact. When something is reused or recycled, the environmental impact is less because raw materials don't need to be extracted to create something new.

Model Question Paper
I A Test (CIE)

Programme :	**Semester: I**
Course :	**Max Marks : 30**
Course Code :	**Duration : 1 Hr 20 minutes**
Name of the course coordinator:	**Test : I/II/III**

Note: Answer one full question from each section. One full question carries 10 marks.

Qn.No	Question	CL	CO	PO	Marks
	Section-1				
1.a)					
b)					
c)					
2.a)					
b)					
c)					
	Section-2				
3.a)					
b)					
c)					
4.a)					
b)					
c)					
	Section-3				
5.a)					
b)					
c)					
6.a)					
b)					
c)					